Research Paper

Effectiveness of Nursing-Led Pain Management on Analgesic Use After Orthopedic Surgery

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The objective of the present study is to investigate the effect of nursing-led pain management on patients undergoing orthopedic surgery using analgesics. A total of 102 patients undergoing orthopedic surgery at our hospital from January 2022-December 2022 were randomly partitioned as the control group (51 patients) received routine nursing and the observation group (51 patients) received pain management nursing. The numeric rating scale scores at regular intervals between 6-72 h post-surgery were compared between both the groups. Additionally, the scores of the self-rating depression scale, self-rating anxiety scale, and Pittsburgh sleep quality index were compared 48 h after surgery. Postoperative analgesic satisfaction, length of stay, and incidence of adverse reactions were also compared between both the groups. The numeric rating scale scores of the observation group were significantly lower than those of the control group at all-time points after surgery. Moreover, anxiety, depression, and sleep quality in the observation group were better than those in the control group. The analgesic satisfaction of the observation group was higher, and the average length of hospital stay was shorter compared to the control group. Furthermore, the incidence of adverse reactions was lower in the observation group. All differences were statistically significant ($p<0.05$). Implementing nursing-led pain management intervention for patients using analgesic drugs after orthopedic surgery can effectively alleviate pain, improve mood, enhance sleep quality, increase analgesic satisfaction, reduce adverse reactions to analgesic drugs, and promote rehabilitation. These findings can serve as a valuable reference for clinical practice.

Key words: Pain management, orthopedics, analgesics, nursing

Orthopedic surgery poses distinct challenges compared to other surgical specialties, primarily due to several factors inherent to the nature of the procedures involved. These challenges include significant trauma to the musculoskeletal system, extended duration of surgical procedures, and intense postoperative pain experienced by patients[1]. Pain, often termed as the "fifth vital sign" after body temperature, respiration, pulse, and blood pressure, stands as a pervasive and crucial concern within the realm of orthopedic care[2]. Trauma and surgical interventions trigger an inflammatory response in the body, leading to the release of chemical signals from damaged tissues that activate pain receptors and transmit pain signals to the brain[3].

Studies indicate that a significant proportion of patients undergoing orthopedic surgery experience varying degrees of pain, with up to 75 % reporting noticeable discomfort postoperatively, particularly during movement of the affected limb[4]. Persistent and severe pain can significantly hinder postoperative recovery, leading to prolonged hospital stays, increased healthcare expenses, compromised adherence to treatment regimens, and adverse effects on patients' emotional state, sleep patterns, and overall quality of life[5,6]. Although analgesic treatment is typically administered post-surgery, factors such as individual variability, characteristics of the medication, and healthcare provider practices can all contribute to suboptimal pain relief or the occurrence of drug-related adverse effects[7]. Consequently, effective postoperative pain management is paramount in orthopedic nursing practice. This study aims to evaluate the impact of nurse-led pain management interventions on analgesic utilization in patients undergoing orthopedic surgery, with findings detailed below.

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MATERIALS AND METHODS

General information:

A total of 102 patients who received orthopedic surgery in our hospital from January 2022-December 2022 were selected and divided into control group and observation group according to the order of admission. There were 51 patients in the control group, 27 males and 24 females, aged 25-69 y, average age (47.22±10.25) y old. The surgical procedures included 14 cases of upper limb fractures, 16 cases of lower limb fractures, 10 cases of spinal surgery, and 11 cases of joint replacement. Anesthesia methods consisted of 21 cases of general anesthesia and 30 cases of epidural anesthesia. In the observation group, there were 51 patients, comprising 29 males and 22 females, with ages ranging from 22-69 y and an average age of 44.06±11.46 y. The surgical procedures included 12 cases of upper limb fractures, 15 cases of lower limb fractures, 12 cases of spinal surgery, and 12 cases of joint replacement. Anesthesia methods consisted 22 cases under general anesthesia and 29 cases under epidural anesthesia. Statistical software was employed to analyze the data, revealing no significant difference in general data between the two groups ($p>0.05$), enabling a comparison between them.

Inclusion and exclusion criteria:

The inclusion criteria includes those, aged >18 y old, patients scheduled for elective orthopedic surgery who planned to undergo general anesthesia or epidural anesthesia, classified as I-III according to the American Society of Anesthesiologists (ASA) standards, good compliance, postoperative acceptance Patients receiving analgesic treatment and patients who were informed about the study and signed the consent form. The exclusion criteria includes patients suffering from mental illness or cognitive impairment and unable to communicate normally, patients with severe cardiovascular and cerebrovascular diseases, severe liver and kidney function diseases, patients with contraindications to surgery and anesthesia, pregnant patients or those with cancer, patients who took non-steroidal anti-inflammatory drugs or analgesics for a long time and patients who dropped out, incomplete or missing data.

Methods:

Patients in the control group were given routine care including environmental care, skin care, health education, psychological care, perioperative care, postoperative care, condition observation, dietary care, medication as prescribed by the doctor and rehabilitation exercise, etc. On the basis of patients in the control group, pain management and nursing care were added to the patients in the observation group. Health education involved explaining the purpose of surgery, precautions, operation process and operation, anesthetic drugs and medication methods, postoperative precautions, traction frame, plaster, fixation, etc., instrument usage, treatment methods for postoperative pain, drug selection, possible drug side effects, and countermeasures. Pain assessment involved evaluating the patient's pain sensitivity before operation, and the anesthetist formulates a personalized anesthesia plan according to the individual situation of the patient; evaluate the patient's vital signs every hour before the patient wakes up after surgery, keep the airway normal, and observe the patient's urine output; the patient is awake then evaluate the pain degree of the patient. If the pain is severe pain, report to the doctor for treatment and make an evaluation every 0.5 h. If the pain is severe, report to the doctor for treatment and make an evaluation every 1 h. The doctor will give treatment according to the specific situation and conduct an assessment every 2 h. If the pain level decreases to mild pain, the assessment will be performed every 4 h. If the two consecutive assessments are all mild pain, the assessment will be performed every 6 h. Change from mild pain to assessment every 12 h for 2 consecutive days. Pain care involved the rational use of analgesics according to the doctor's advice, use ear acupuncture, moxibustion, acupuncture, acupoint sticking, ice compress, heat therapy, massage and other methods to assist in analgesia. Use methods such as listen to music, chat, read, watch TV diverting attention to increase the pain threshold; the patient should be operated gently to avoid pain, elevate the affected limb, and reduce tissue swelling. Management of adverse drug reactions included strict control of analgesic dosages, prohibit repeated use of analgesics in a short period of time, record the time, dosage and method of analgesics used by patients, and carefully handover patients at the bedside. The diet should be gradual, mainly light and easy to digest, avoid greasy and spicy food, keep the stool unobstructed, and avoid gastrointestinal reactions; ensure adequate drinking water, observe the filling of the bladder, and assist the patient to urinate in

time to avoid urinary retention, turn over regularly and massage the limbs and check the traction and immobilization, observe the blood pressure circulation at the extremities, avoid the formation of ischemic necrosis and thrombus in pressure sores, avoid sudden rise in early postoperative activities, strengthen the monitoring of vital signs of patients, strengthen nutritional intake, and avoid hypotension, keep patients' skin clean and dry, and change bed sheets and hospital gowns frequently to avoid skin itching and infection. Nursing of all patients continued until discharge.

Observation indicators:

The Numeric Rating Scale (NRS) was used to measure the pain degree of the two groups of patients in a quiet state at 6 h, 12 h, 24 h, 48 h and 72 h after operation. Mark your own pain level on this line, and the length of the mark is a score. The total score is 0-10 points. The severity of pain increases with a higher score. The anxiety, depression and sleep quality of the two groups were compared 48 h after operation. The Self-rating Anxiety Scale (SAS) was used to assess the anxiety level of the patients, and the Self-rating Depression Scale (SDS) was used to assess the depression level of the patients. The Pittsburgh Sleep Quality Index (PSQI) was used to evaluate the sleep quality of patients. Comparing the satisfaction degree of analgesia and length of hospitalization between the two groups, the satisfaction degree of analgesia was surveyed on the day of discharge.

Analgesic satisfaction=(satisfactory cases+comparatively satisfactory cases)/total cases.

Compared the incidence of adverse reactions such as dizziness, nausea and vomiting, urinary retention, skin itching, hypotension, and constipation after postoperative analgesia between the two groups.

Statistical analysis:

Excel software was used for data entry, and Statistical Package for Social Sciences (SPSS) 26.0 software was imported for data processing and analysis. Categorical variables were represented by (n (%)), cross-tabulation chi-square test was performed between groups, and continuous variables were represented by ($\bar{x}\pm s$) indicates that an independent sample T test was performed between groups; $p<0.05$ indicates that the difference is statistically significant.

RESULTS AND DISCUSSION

The NRS scores of the two groups were compared at 6 h, 12 h, 24 h, 48 h and 72 h after operation. Table 1 presents a comparison of NRS scores between both the groups at different time points following an operation. At 6 h post-operation, the NRS score in the observation group was significantly lower at 2.25 compared to 3.71 in the control group ($p<0.001$; Table 1). This trend continued at subsequent time points, with the observation group consistently exhibiting lower NRS scores compared to the control group. Specifically, at 12 h post-operation, the NRS scores were 4.33 in the observation group and 7.03 in the control group ($p<0.001$). At 24 h post-operation, the NRS scores ($p<0.001$) were 3.82 in the observation group and 6.26 in the control group (Table 1). At 48 h post-operation, the NRS scores were 3.94 in the observation group and 5.67 in the control group ($p<0.001$). Finally, at 72 h post-operation, the NRS scores ($p<0.001$) were 2.75 in the observation group and 3.71 in the control group (Table 1). These findings suggest that the observation group experienced lower levels of pain compared to the control group across multiple time points following the operation (Table 1).

The scores of SAS, SDS and PSQI evaluated 48 h after operation were compared between the two groups. Table 2 compares SAS, SDS and PSQI between two groups 48 h after an operation. In the observation group, the SAS score ($p<0.001$) was significantly lower at 42.12 compared to 55.39 in the control group (Table 2). Similarly, the SDS score ($p<0.001$) was notably lower in the observation group at 38.63 compared to 45.86 in the control group (Table 2). Additionally, the PSQI score ($p<0.001$) was lower in the observation group at 8.39 compared to 13.76 in the control group (Table 2). These findings suggest that the observation group experienced lower levels of anxiety, depression, and better sleep quality compared to the control group at this time point following the operation.

On the day of discharge, the patients' satisfaction with postoperative analgesia was investigated. Analgesia satisfaction is reported as the number and percentage of patients categorized as dissatisfied, relatively satisfied, and satisfied. In the observation group, 2 patients (3.92 %) were dissatisfied with analgesia, 19 patients (37.26 %) were relatively satisfied, and 30 patients (58.82 %) were satisfied (Table 3). This results in an overall analgesia satisfaction rate of 96.08 % (Table 3). The mean hospital stay for this group was 12.59±2.37 d (Table 3). In contrast, in the control group, 14 patients (27.45 %) were dissatisfied

with analgesia, 20 patients (39.22 %) were relatively satisfied, and 17 patients (33.33 %) were satisfied (Table 3). The overall analgesia satisfaction rate for this group was 72.55 %. The mean hospital stay for the control group was longer at 14.35±2.40 d (Table 3). The t-test results indicate significant differences between the two groups in terms of analgesia satisfaction (p=0.002) and hospitalization time (p<0.001) (Table 3). Specifically, the observation group showed higher analgesia satisfaction and shorter hospitalization time compared to the control group (Table 3). Overall, these findings suggest that the observation group had higher levels of analgesia satisfaction and shorter hospitalization time compared to the control group, indicating potential benefits associated with the intervention provided to the observation group.

Table 4, displays the incidence of adverse reactions after analgesia in two groups of patients, reported as the number and percentage of occurrences for each reaction. In the observation group, adverse reactions were reported as follows, 3 patients (5.88 %) experienced dizziness, 6 patients (11.76 %) felt sick and vomited, 3 patients (5.88 %) had urinary retention, 3 patients (5.88 %) experienced itchy skin, 3 patients (5.88 %) suffered from hypotension, and 2 patients (3.92 %) reported constipation (Table 4). The total incidence of adverse reactions in this group was 20 patients (39.22 %) (Table 4). In contrast, in the control group, adverse reactions were less frequent, 1 patient (1.96 %) experienced dizziness, 2 patients (3.92 %) felt sick and vomited, 1 patient (1.96 %) had urinary retention, 1 patient (1.96 %) experienced hypotension, and there were no reported cases of itchy skin or constipation (Table 4). The total incidence of adverse reactions in this group was 5 patients (9.80 %) (Table 4). The χ^2 value was calculated to be 12.922, with a corresponding p-value of 0.044 (Table 4). This indicates a statistically significant difference in adverse reaction incidence between the observation and control groups. Overall, these findings suggest that the observation group had a higher incidence of adverse reactions after analgesia compared to the control group (p<0.05) (Table 4).

TABLE 1: COMPARISON OF NRS SCORES BETWEEN THE TWO GROUPS AT EACH TIME POINT AFTER OPERATION (n=51)

Group	6 h	12 h	24 h	48 h	72 h
Observation group	2.25±0.44	4.33±0.42	3.82±1.39	3.94±0.49	2.75±0.98
Control group	3.71±0.64	7.03±1.06	6.26±0.45	5.67±0.33	3.71±0.63
t	-13.455	-16.954	-11.737	-20.902	-5.868
p	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE 2: COMPARISON OF SCORES OF ANXIETY, DEPRESSION AND SLEEP QUALITY BETWEEN THE TWO GROUPS 48 HOURS AFTER OPERATION (n=51)

Group	SAS	SDS	PSQI
Observation group	42.12±7.95	38.63±2.88	8.39±1.95
Control group	55.39±3.57	45.86±2.79	13.76±2.34
t	-10.872	-12.902	-12.604
p	<0.001	<0.001	<0.001

TABLE 3: COMPARISON OF ANALGESIA SATISFACTION AND HOSPITALIZATION TIME BETWEEN THE TWO GROUPS (n (%))/($\bar{x}$±s)

Group	Dissatisfied	Relatively satisfied	Satisfied	Analgesia satisfaction	Hospital stay (d)
Observation group (n=51)	2 (3.92)	19 (37.26)	30 (58.82)	49 (96.08)	12.59±2.37
Control group (n=51)	14 (27.45)	20 (39.22)	17 (33.33)	37 (72.55)	14.35±2.40
t	14 (27.45)			12.621	-3.739
p	14 (27.45)			0.002	<0.001

TABLE 4: THE INCIDENCE OF ADVERSE REACTIONS AFTER ANALGESIA IN THE TWO GROUPS OF PATIENTS (n (%))

Group	Dizzy	Sick and vomit	Urinary retention	Itchy skin	Hypotension	Constipate	Incidence of adverse reactions
Observation group (n=51)	3 (5.88)	6 (11.76)	3 (5.88)	3 (5.88)	3 (5.88)	2 (3.92)	20 (39.22)
Control group (n=51)	1(1.96)	2 (3.92)	1 (1.96)	0 (0.00)	1 (1.96)	0 (0.00)	5 (9.80)
χ^2							12.922
p							0.044

Orthopedic patients usually feel the most intense pain within 24 hours after the disappearance of surgical anesthesia, which gradually relieves after 3 to 4 days, and some patients can continue to feel pain for more than 6 d[8]; about 10 %-50 % of patients after surgery along with persistent pain, 2 %-13 % of postoperative patients develop chronic pain that persists for several years[9,10]. Opioids are often used for analgesia after orthopedic surgery, but these drugs have large side effects, and the analgesic effect varies from person to person, with a certain degree of dependence[11]. It is an important reason for the high incidence of side effects of analgesic drugs, so it is necessary to pay attention to the pain management of patients after orthopedic surgery[12]. Pain management refers to the process of diagnosis and treatment that tries its best to reduce pain and make patients feel comfortable through assessment, recording, treatment and nursing control.

In this study, a variety of non-drug intervention methods are used to provide nursing intervention for pain management of patients. Non-drug intervention is divided into physical therapy and psychotherapy. Physical therapy can relieve muscle tension, reduce edema of damaged tissues, and inhibit the release of pain substances. The pain perception of patients can be relieved by mechanisms such as transmission and conduction[13]; psychotherapy is to divert the patient's attention to pain, relieve negative psychological emotions, and focus more on the things that make them comfortable, so as to improve the patient's pain perception threshold[14]. In this study, the pain scores of the observation group at 6 h, 12 h, 24 h, 48 h, and 72 h after operation were significantly lower than those of the control group, while their anxiety and depression were lower than those of the control group, and their sleep quality was better than that of the control group. Pain assessment of patients, timely analgesic treatment for patients with moderate to severe pain, combined with non-drug nursing intervention, can effectively reduce the pain experience of patients, relieve anxiety and depression; after reducing the interference of pain, the quality of sleep of patients is also improved accordingly. The results of this study also show that the analgesic satisfaction of the patients in the observation group is higher than that of the control group. The average length of hospitalization is less than that of the control group, and the incidence of adverse drug reactions in the observation group is also lower than that of the control group. This outcome may be related to effective pain management nursing intervention can reduce the pain sensation of patients. And the reduction the use of analgesics can promote the recovery of patients.

In summary, the integration of pain management nursing interventions for patients undergoing orthopedic surgery has shown significant benefits. These interventions effectively alleviate pain, reduce reliance on analgesic medications, lower the occurrence of adverse drug reactions, mitigate negative emotions, and enhance postoperative rehabilitation. This holistic approach not only addresses physical discomfort but also promotes overall well-being and facilitates a smoother recovery process for orthopedic surgery patients.

Author's contributions:

Shenjia Zhou and Yinyuan Zheng contributed equally to this work.

Conflict of interests:

The authors declared no conflict of interests.

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