A Case-Control Study of the Effects of Implementing the Registered Nurses’ Association of Ontario Guidelines for the Assessment and Management of Postoperative Pain and the Use of Relaxation Therapy in 312 Patients with Bone and Soft-Tissue Malignancy

Qian Gao, Qi Xu, Xiaowei Zhou, Zhaonong Yao, Yuhong Yao

Corresponding Author: Yuhong Yao, e-mail: 2520036@zju.edu.cn

Financial support: None declared
Conflict of interest: None declared

Background: The present study aimed to investigate the effects of implementing the Registered Nurses’ Association of Ontario (RNAO) guidelines for the management of postoperative pain and the use of Jacobson’s relaxation technique (JRT) in patients with bone and soft-tissue malignancy at a single center in China.

Material/Methods: A total of 312 patients were recruited and randomly divided into 2 groups. In the intervention group, the RNAO pain-management technique of JRT was adopted, while the control group received the standard institutional nursing management. Pain scores after the operation, according to the Numerical Rating Scale (NRS) combined with the Wong-Baker Faces Pain Rating Scale and Short-Form McGill Pain Questionnaire, were compared between the 2 groups. Nursing satisfaction was compared as well.

Results: At 6, 24, and 72 h after the operation, the NRS scores combined with the Wong-Baker Faces Pain Rating Scale in the intervention group were significantly lower than those in the control group (P<0.001); 72 h after the operation, the Pain Rating Index, Visual Analogue Scale, present pain intensity, and total scores for the intervention group were significantly lower than those for the control group (P<0.001 for all 4 scores). The scores reported from the patients for nursing response and consequent care (P<0.001), nursing competence (P=0.029), and surgical pain-control satisfaction (P<0.001) in the intervention group were also significantly higher than those in the control group.

Conclusions: JRT can improve postoperative pain-control and nursing satisfaction in patients with malignant bone and soft-tissue tumors. These data suggest a benefit for application of JRT in clinical care.

Keywords: Bone Neoplasms • Pain Management • Sarcoma

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/937496
**Background**

Pain, an unpleasant sensory and emotional experience caused by actual or potential tissue damage, has become the fifth most important vital sign. In the clinical care of patients with bone and soft-tissue malignancy, postoperative pain control is one of the important indicators used to evaluate the quality of nursing care. However, pain control for patients in China is still less than satisfactory, warranting a more standardized and effective pain care management strategy [1,2]. The third edition of the Registered Nurses’ Association of Ontario (RNAO) Best Practice Guideline on the Assessment and Management of Pain (RNAO pain guideline), published in 2013, is designed to apply to all domains of nursing practice, including clinical, administration, and education, to assist nurses in becoming more comfortable, confident, and competent when assessing and managing people with the presence, or risk of, any type of pain. Up to now, there has been no detailed national guideline for pain management for clinical nursing in China. Instead, separate institutional practice guidelines have been used. RNAO pain guidelines have achieved a decrease in the prevalence and intensity of pain in the clinical setting [3,4]. Therefore, it is necessary to explore multimodal analgesia following the RNAO pain guidelines for postoperative pain management in patients with bone and soft-tissue malignancy. In the RNAO guidelines, non-pharmacological regimens are emphasized along with pharmacological approaches. One such technique, non-invasive Jacobson’s relaxation technique (JRT), warrants evaluation in the multimodal analgesia routine.

JRT was originally proposed by Dr. Edmund Jacobson, an American physician, and was originally used to help reduce stress, anxiety, and depression [5]. JRT is a type of physical therapy that includes the sequential tightening and relaxing of specific muscle groups. In further clinical exploration, previous studies have indicated that JRT can help patients with postoperative anxiety relief and pain control [6-8]. JRT emphasizes whole-body progressive muscle relaxation, implying a potentially positive effect on pain control in patients with bone and soft-tissue malignancy, especially those with low pain scores.

The present case-control study aimed to investigate the effects of implementing the RNAO guidelines for the assessment and management of postoperative pain and the use of relaxation therapy in 312 patients with bone and soft-tissue malignancy at a single center in China between January and August, 2021.

**Material and Methods**

**Ethics Approval**

This study was approved by the Ethics Board (IRB) of the Second Affiliated Hospital of Zhejiang University School of Medicine (SAHZU). The original and translated ethics approval documentation was provided to the editor of the journal. This study was conducted in accordance with the principles of the Helsinki Declaration. All of the patients or the guardians of children signed the informed consent before they participated in the study. The participants were fully aware of the procedure of the study.

**Patients**

The study encompassed 312 patients with bone and soft-tissue malignancy undergoing surgery at SAHZU Bone Tumor Center, Department of Orthopaedics from January 2021 to August 2021. The patients were randomly divided into an intervention group and control group with 156 cases in each group. The study participants joined this study according to the following inclusion criteria: clear indications for surgery resulting in surgical treatment, ability to understand and communicate, and reception of patient-controlled analgesia after surgery. However, those who had mental illness or cognitive impairment, experienced severe postoperative complications, dropped out of followup, or could not complete the JRT were excluded from the study.

**Pain Evaluation Methods**

Numerical Rating Scale (NRS): patients are asked to circle the number between 0 and 10 that fits best to their pain intensity. Zero usually represents “no pain at all” whereas the upper limit represents “the worst pain ever possible”; 1-3 represents mild pain, 4-6 represents moderate pain, and 7-10 represents severe pain.

Wong-Baker Faces Pain Rating Scale: this scale illustrates face cartoons ranging from a happy face at 0 score, representing “no pain at all”, to a crying face at 10 score, which indicates “the worst pain one can imagine”. According to the face cartoons and written descriptions, the patient chooses the face cartoon that best fits their pain intensity. This method was applied only for patients unable to accomplish the NRS system.

Short-Form McGill Pain Questionnaire (SF-MPQ): The measure is calculated by summing the point values for responses to 15 questions. Questions 1-11 deal with the sensory dimension of pain (Pain Rating Index, PRI). Questions 12-15 deal with the affective dimension of pain. Subscores for the sensory and affective dimensions are calculated, in addition to a total McGill Pain Score. In addition, there is a Visual Analogue Scale (VAS) for pain intensity and a final question about present pain intensity (PPI). Higher scores generally correspond to a worse subjective experience of pain.

**Interventions**

Control group: The control group adopted a routine nursing pain management method described by an institutional guideline.

Department of Orthopaedics from January 2021 to August 2021. The study encompassed 312 patients with bone and soft-tissue malignancy undergoing surgery at SAHZU Bone Tumor Center, Department of Orthopaedics from January 2021 to August 2021. The patients were randomly divided into an intervention group and control group with 156 cases in each group. The study participants joined this study according to the following inclusion criteria: clear indications for surgery resulting in surgical treatment, ability to understand and communicate, and reception of patient-controlled analgesia after surgery. However, those who had mental illness or cognitive impairment, experienced severe postoperative complications, dropped out of followup, or could not complete the JRT were excluded from the study.

**Pain Evaluation Methods**

Numerical Rating Scale (NRS): patients are asked to circle the number between 0 and 10 that fits best to their pain intensity. Zero usually represents “no pain at all” whereas the upper limit represents “the worst pain ever possible”; 1-3 represents mild pain, 4-6 represents moderate pain, and 7-10 represents severe pain.

Wong-Baker Faces Pain Rating Scale: this scale illustrates face cartoons ranging from a happy face at 0 score, representing “no pain at all”, to a crying face at 10 score, which indicates “the worst pain one can imagine”. According to the face cartoons and written descriptions, the patient chooses the face cartoon that best fits their pain intensity. This method was applied only for patients unable to accomplish the NRS system.

Short-Form McGill Pain Questionnaire (SF-MPQ): The measure is calculated by summing the point values for responses to 15 questions. Questions 1-11 deal with the sensory dimension of pain (Pain Rating Index, PRI). Questions 12-15 deal with the affective dimension of pain. Subscores for the sensory and affective dimensions are calculated, in addition to a total McGill Pain Score. In addition, there is a Visual Analogue Scale (VAS) for pain intensity and a final question about present pain intensity (PPI). Higher scores generally correspond to a worse subjective experience of pain.

**Interventions**

Control group: The control group adopted a routine nursing pain management method described by an institutional guideline.
in SAHZU. Routine pain assessment and treatment were carried out for postoperative patients according to the “Pain Assessment and Management System” of the authors’ hospital. For patients with a pain score of 1-3, nurses gave psychological support. For patients with a pain score ≥4, timely assessment, instant report to the physician, and pain relief therapeutics would be done according to the physician’s advice. Patients with a pain score ≥7 should be treated as an emergency. Reassessment was required after the pain medications were taken.

Intervention group: The intervention group adopted the RNAO pain-management protocol of JRT. A multidisciplinary pain-management team was established, including orthopedists, anesthesiologists, and pain-control specialist nurses. Orthopedists are responsible for formulating primary analgesia strategies to alleviate pain based on the results of pain assessment and contacting anesthesiologists for assistance when necessary. Anesthesiologists have key roles in dealing with ineffective postoperative pain control. Pain-control specialist nurses are responsible for the nursing management of pain in patients guided by RNAO pain guidelines, including assessment, planning, implementation, and evaluation. The care plan needs to be comprehensive, and based on the patient’s beliefs, knowledge, and understanding. Pain assessment using multi-dimensional assessment tools: NRS, Wong-Baker Faces Pain Rating Scale for patients with difficulty in expressing their pain using the NRS, and the Short-From McGill Pain Questionnaire. Before surgery, pain-control specialist nurses strengthened pain education and psychological intervention by introducing the causes, influences, and prognosis of the pain, as well as the common postoperative analgesia methods. Misconceptions were also addressed, to ease the concerns of patients and their families about postoperative pain. Multimodal analgesia: in addition to patient-controlled analgesia after surgery, non-pharmacological measures should be taken for patients with NRS scores of 1-3. The nurses should also instruct patients to use JRT combined with psychological support. For patients with NRS score ≥4, the multidisciplinary pain-management team formulated a targeted analgesia plan, with a combination of analgesic drugs and regular re-evaluation of the effectiveness of the pain management.

**JRT Procedure**

For JRT, the patient starts from the foot muscle group and moves to the shoulder, continuously contracting and relaxing 16 muscle groups in the body twice a day for 10 min each time. Each muscle group is contracted for 10 s, followed by relaxing the muscle group for 20 s, and consequently moving on to the contraction-relaxation cycle of the next muscle group. Muscle groups that are affected by the surgery or cannot complete this relaxation are skipped, with the patient moving on to the next muscle group.

**Outcome Measurement**

The effectiveness of pain control of the 2 groups was compared. The NRS combined with the Wong-Baker Faces Pain Rating Scale was used to evaluate the pain intensity on the day of admission and at 6 h, 24 h, and 72 h after the operation. The SF-MPQ was used to evaluate the pain intensity on the day of admission and 72 h after the operation. Satisfaction with the nursing was evaluated using a self-made questionnaire filled out by members of the 2 groups of patients when discharged. The content of the self-made questionnaire included 6 parts: basic information, overall satisfaction with the nursing, satisfaction with nurse-patient communication, satisfaction with nursing response and care, satisfaction with nursing competence, and satisfaction with surgical pain control. The degree of satisfaction was divided into 5 levels: poor (1 point), fair (2 points), good (3 points), very good (4 points), and excellent (5 points).

**Statistical Methods**

In this study, Epidata3.1 was used for data input, and SPSS21.0 was used for data analysis. The t-test was used to compare the NRS score, Wong-Baker Faces Pain Rating Scale score, and SF-MPQ score between the intervention group and the control group, as used in Tables 1-3. The t-test was used to compare the satisfaction with nursing care in the 2 groups, as shown in Table 4. P<0.05 was considered statistically significant.

**Results**

**Baseline Characteristics**

Clinical characteristics of the participants at baseline are shown in Table 1. This study included 312 patients, including 169 male and 143 female patients; the ages ranged from 12 to 75 years old, with an average age of 46.43±20.26 years; among the 312 patients, 213 had primary bone and soft-tissue malignancy, and 99 had metastatic bone and soft-tissue malignancy. The mean age of the intervention group was 46.69±20.58, while the mean age of the control group was 46.17±20.00. There was no statistically significant difference between the 2 groups of patients in terms of sex, age, or tumor type distribution (P>0.05).

**Pain Scores**

As is shown in Table 2, the results of the study showed that there was no statistically significant difference between the 2 groups in NRS scores combined with the Wong-Baker Faces Pain Rating Scale scores on the day of admission. The scores in the intervention group and control group were 5.50±2.13 and 5.63±1.90, respectively (P=0.287). However, 6 h, 24 h, 48 h, and 5 days after admission, the scores in the intervention group were lower than those in the control group (P<0.05). 7 days after admission, there was no statistically significant difference in the pain scores between the intervention group and control group (P>0.05).
and 72 h after the operation, the NRS combined with the Wong-Baker Faces Pain Rating Scale scores in the intervention group were significantly lower than those in the control group (P < 0.001). At the timepoint of 72 h after operation, the scores were 2.76 ± 1.12 in the intervention group, while they were 3.47 ± 1.47 in the control group.

In addition, the PRI, VAS, PPI, and total scores of the SF-MPQ on the day of admission were not statistically different between the intervention group and the control group, with P values of 0.144, 0.287, 0.152, and 0.470, respectively. However, 72 h after the operation, the PRI, VAS, PPI, and total scores of the SF-MPQ were significantly lower than those of the control group.

Table 1. Patient characteristics. There was no statistical difference between the 2 groups regarding sex, age, or tumor types.

|                     | Number | Sex (n) | Age (mean, SD) | Type of tumor (n) |
|---------------------|--------|---------|----------------|-------------------|
|                     |        | Male    | Female         | Primary           | Metastasis        |
| Intervention group  | 156    | 79      | 77             | 46.69 ± 20.58     | 108               | 48               |
| Control group       | 156    | 90      | 66             | 46.17 ± 20.00     | 105               | 51               |
| t/χ²                |        | 1.562   | 0.226          | 0.133             |
| P-value             |        | 0.211   | 0.822          | 0.715             |

SD – standard deviation.

Table 2. Pain scores (NRS system in combination with Wong-Baker rating scale). Patients in the intervention group had significantly lower scores when compared with individuals in the control group.

|                     | Number | Admission | 6 h after the operation | 24 h after the operation | 72 h after the operation |
|---------------------|--------|-----------|-------------------------|--------------------------|-------------------------|
| Intervention group  | 156    | 5.50 ± 2.13 | 4.75 ± 1.70              | 3.33 ± 1.16              | 2.76 ± 1.12              |
| Control group       | 156    | 5.63 ± 1.90 | 5.62 ± 2.18              | 4.25 ± 1.82              | 3.47 ± 1.47              |
| t                   |        | 1.067     | 6.443                    | 6.907                    | 5.595                   |
| P-value             |        | 0.287     | <0.001                   | <0.001                   | <0.001                  |

NRS – numerical rating system.

Table 3. The SF-MPQ scale was used to compare the scores between the intervention group and control group. The scores in the SF-MPQ scale were significantly lower in the intervention group.

|                     | Number | Admission | 72 h after the operation | PRI | VAS | PPI | Total scores |
|---------------------|--------|-----------|--------------------------|-----|-----|-----|--------------|
| Intervention group  | 156    | 5.54 ± 2.86 | 2.77 ± 1.13              | 5.54 ± 2.86 | 2.77 ± 1.13 | 1.55 ± 0.98 | 9.87 ± 3.22  |
| Control group       | 156    | 7.43 ± 3.56 | 3.52 ± 1.45              | 7.43 ± 3.56 | 3.52 ± 1.45 | 2.85 ± 1.17 | 13.78 ± 4.49 |
| t                   |        | 14.937    | 5.454                    | 18.623                   | 20.223                   |
| P-value             |        | <0.001    | <0.001                   | <0.001                   | <0.001                   |

SF-MPQ – Short-Form McGill Pain Questionnaire; PRI – Pain Rating Index; VAS – Visual Analogue Scale; PPI – present pain intensity.
Table 4. The nursing satisfaction status was compared between the 2 group. The patients in the intervention group had favorable nursing satisfaction in the aspects of nurse-patient communication, nursing responsiveness and care, nursing competence, and pain control.

|                        | Number | Overall   | Nurse-patient communication | Nursing responsiveness and care | Nursing competence | Surgical pain control |
|------------------------|--------|-----------|-------------------------------|--------------------------------|-------------------|-----------------------|
| Intervention group     | 156    | 4.53±0.77 | 4.85±0.72                    | 4.61±1.56                      | 4.64±0.94         | 4.78±0.97             |
| Control group          | 156    | 4.47±1.09 | 4.78±0.82                    | 4.33±0.97                      | 4.52±1.23         | 4.15±1.36             |
| t-value                |        |           | 0.904                        | 1.592                          | 5.188             | 2.189                 | 14.036               |
| P-value                |        | 0.367     | 0.112                        | <0.001                         | 0.029             | <0.001                |

(P<0.001 for all of the 4 scores above; Table 3). The SF-MPQ scores in the intervention group 72 h after operation were 5.54±2.86, 2.77±1.13, 1.55±0.98, and 9.87±3.22, whereas they were 7.43±3.56, 3.52±1.45, 2.85±1.17, and 13.78±4.49 in the control group (P<0.001).

Nursing Satisfaction

The study showed that the patients in the 2 groups were satisfied with the following parameters: “the general nursing during hospitalization”, “the nurses take the initiative to inform regarding relevant matters”, “the nurses respond and help in a timely manner when they encounter problems”, “nurses’ working competence”, and “postoperative pain management and control”, with average scores between “very good” and “excellent”. There was no statistically significant difference between the 2 groups in terms of general nursing (P=0.367) and the level to which the patients felt they were adequately informed about the nursing process (nurse-patient communication) (P=0.112), but the intervention group showed a significantly higher score in nursing response and care (P<0.001), nursing competence (P=0.029), and surgical pain control (P<0.001) (Table 4).

Discussion

Our study herein showed the effectiveness of implementing the RNAO pain-management method of JRT, which decreased pain scores at 6 h, 24 h, and 72 h after operation. The scores reported from the patients in the aspects of nursing response and consequent care, nursing competence, and surgical pain-control satisfaction, were significantly improved as well. Compared with other studies in the literature on implementing RNAO pain guidelines or JRT, the intensity of pain improved, as determined on the basis of all measures. This project combined the RNAO pain guidelines and JPR, towards the goal of being guided by nurses in China, and showed that this is an effective way to manage pain.

In clinical care, postoperative pain control of surgical patients is considered to be of great importance [9], but previous studies indicated that pain control in China still needs to be improved. The reasons for poor pain control may be related to the type of disease, surgical approach, drug selection, pain-related nursing care, and others, of which pain-related nursing care is one of the important factors [10]. In previous nursing care protocols, because of insufficient knowledge on pain and the lack of a standardized pain-management system, passive medication is mainly given to relieve the pain of patients, which leads to unsatisfactory results [11,12]. Bone and soft-tissue tumors, which are generally treated with surgery-based comprehensive therapy, encompass malignant tumors that occur in the bones and their accessory tissues such as blood vessels, nerves, and bone marrow. These tumors are usually accompanied by symptoms such as pain, swelling, and limited limb function [13-15]. It is reported that 50% of patients with bone and soft-tissue tumors experience moderate to severe pain, which seriously affects the prognosis of patients and even causes psychological disorders [16]. Thus, an effective strategy to control postoperative pain has become an important endeavor for nursing staff. In addition, although patients with mild pain do not require analgesics, combining physical therapy with psychological support may help relieve pain. This study aims to explore the effect of the RNAO pain-management method JRT on postoperative pain-control and nursing satisfaction in patients undergoing surgery for malignant bone and soft-tissue tumors in Chinese individuals.

The RNAO pain guidelines point out that pain management needs to consider the physical and psychological needs of patients, suggesting a person-centered, multifaceted, and comprehensively professional team, and emphasize working with patients to develop appropriate pain-management plans. Saiz Vine et al [3] mention, in a 3-year study, that the application of RNAO pain guidelines were able to not only reduce pain intensity and frequency, but also help the nursing staff to record the nursing practice more adequately, and consequently ensure the continuity of patient pain management. Rolin-Gilmant et al [4] verified the effectiveness of RNAO pain guidelines in clinical application to...
relieve pain in patients. In addition, the guidelines have also been affirmed by the International Association for the Study of Pain.

JRT is also known as progressive muscle relaxation. As a kind of non-invasive physical therapy, although initially applied to relieve anxiety and tension in individuals, it was soon tried for multimodal pain management in postoperative patients, especially those with low pain scores who did not require medicines [17,18]. In the oncology field, Parás-Bravo et al [7] organized a multicenter clinical trial in 10 hospitals and found that the application of JRT in cancer patients with moderate to severe pain can significantly reduce the use of analgesics. Dikmen and Terzioglu [19] and Ozdemir et al [20] also reported similar results in studies of multiple tumor types. Regarding orthopaedic research, Giordano et al [21] proposed that the application of JRT in postoperative multimodal analgesia in orthopaedic trauma patients reduced average hospital stay length. Whale et al [22] also found that the application of JRT after total knee arthroplasty was helpful for pain management in a multicenter clinical trial. However, there is no relevant research on the application of JRT in patients with malignant bone and soft-tissue tumors in China.

In the present study, 156 patients in the intervention group received adjusted pain-control strategy guided by the RNAO pain management method JRT, while the control group was treated with routine care. The results of the study demonstrated that the scores of preoperative NRS combined with the Wong-Baker Faces Pain Rating Scale were not significantly different between the 2 groups, but at 6 h, 24 h, and 72 h after the operation, the pain scores were significantly lower in the JRT group than in the control group, indicating that patients who received JRT had better control of postoperative pain. In addition, the scores on the PRI, VAS, and PPI within the SF-MPQ were significantly lower in the intervention group than in the control group at 72 h postoperation, which also indicated the effectiveness of JRT. Our results suggested that successful postoperative pain control could be related to the multidisciplinary pain care management team, pain education, psychological intervention, and individualized multimodal analgesia. Similar conclusions were also obtained in patients with non-chondral tumors in previous studies. Patton et al [23] stated that the pain care specialist group played an important role in pain care management. Huang et al [24] found in a study of elderly patients with total hip arthroplasty in northern Taiwan that adopting a pain nursing management protocol with strengthened pain education and psychological intervention not only corrected patients’ misconceptions about pain, but also helped them understand the necessity and importance of analgesia, increased the motivation of patients to actively cooperate with treatment and nursing care, and improved the satisfaction with postoperative pain control.

The present study also explored the effect of JRT on nursing satisfaction. Patient satisfaction is an important evaluation index for clinical nursing care. Pain-related nursing satisfaction refers to the satisfaction of patients with the nursing staff’s ability to deal with postoperative pain and reflects the quality of nursing care [25-28]. The results of our study suggested that the patients who adopted the practice of JRT had no significant difference in overall nursing satisfaction and nurse-patient communication satisfaction compared with the control group, but had significant differences in satisfaction with nursing responsiveness and care, nursing competence, and surgical pain-control ability, indicating that this management strategy reinforced the patients’ experience during clinical nursing and improved the ability of nurses to harness postoperative pain. The underlying reason may be related to the comprehensive and dynamic pain management provided. This nursing work increased the trust of patients in the nurses’ ability, promoted harmony between nurses and patients, improved the medical experience of patients, and thus increased the patients’ satisfaction with nursing care [1,27]. Lee et al [29] obtained similar results in a study of an education intervention with patients undergoing spinal surgery. In addition to the factors of nurse-patient harmony, the positive correlation between pain-related nursing management mode and overall nursing satisfaction may also be related to the reduced psychological distress of patients. Hollander et al [16] pointed out that many patients who experience the diagnosis of cancer have significant psychological distress, and that there is a positive correlation between pain and psychological distress. Strengthening pain management can help reduce psychological distress; using appropriate pain-control measures can effectively reduce psychological distress, thereby improving the nursing satisfaction of patients [20,30].

Limitations

This study had potential limitations. An important limitation of this project was that the effect estimates in this model are based on 312 patients. This sample size is small, and also, the study was performed at only one center. Therefore, a larger sample size and a multiple-center double-blinded controlled trial is needed for future studies. Secondly, we only investigated the short-term results of this model, and we could not draw any conclusions about longer-term effects, which deserve future research through randomized clinical trials.

Conclusions

The RNAO pain guidelines method JRT can improve postoperative pain-control and nursing satisfaction in patients with malignant bone and soft-tissue tumors. It is therefore suggested that this method be widely promoted and applied in clinical nursing. Furthermore, choosing appropriate tools to assess and manage postoperative pain according to the types of diseases and the characteristics of the patients can help patients reduce pain more efficiently.
References:

1. Soffin EM, YaDeau JT. Enhanced recovery after surgery for primary hip and knee arthroplasty: A review of the evidence. Br J Anaesth. 2016;117(Suppl. 3):i62-i67.

2. Luo ZY, Yu QP, Zeng WN, et al. Adductor canal block combined with local infiltration analgesia with morphine and betamethasone show superior analgesic effect than local infiltration analgesia alone for total knee arthroplasty: A prospective randomized controlled trial. BMC Musculoskelet Disord. 2022;23(1):468.

3. Salz Vinuesa MD, Alborros-Munoz L, Fernandez Nunez ML, et al. Implementation results of the assessment and management of pain guideline within Best Practice Spotlight Organisations (BPSO(R)). Enferm Clin (Engl Ed). 2020;30(3):212-21.

4. Rolin-Gilman C, Fournier B, Cleverley K. Implementing best practice guidelines in pain assessment and management on a Women’s Psychiatric Inpatient Unit: Exploring patients’ perceptions. Pain Manag Nurs. 2017;18(3):170-78.

5. Jacobson E. Progressive relaxation. Am J Psychol. 1987;100(3/4):522-37.

6. Mehner A, Koch U, Schulz H, et al. Prevalence of mental disorders, psychosocial distress and need for psychosocial support in cancer patients – study protocol of an epidemiological multi-center study. BMC Psychiatry. 2012;12:70.

7. Paras-Bravo P, Salvador-Fuentes P, Alonso-Blanco C, et al. The impact of muscle relaxation techniques on the quality of life of cancer patients, as measured by the FACT-G questionnaire. PLoS One. 2017;12(10):e0184147.

8. Paras-Bravo P, Alonso-Blanco C, Paz-Zulueta M, et al. Does Jacobson’s relaxation technique reduce consumption of psychotropic and analgesic drugs in cancer patients? A multicenter pre-post intervention study. BMC Complement Altern Med. 2018;18(1):139.

9. Kulkarni M, Mallesh M, Wakankar H, et al. Effect of methylprednisolone in periarticular infiltration for primary total knee arthroplasty on pain and rehabilitation. J Arthroplasty. 2019;34(8):1646-49.

10. Liu H, Gao X, Hou Y. Effects of mindfulness-based stress reduction combined with music therapy on pain, anxiety, and sleep quality in patients with osteosarcoma. Braz J Psychiatry. 2019;41(6):540-45.

11. Yin M, Li J, Wang J, et al. Observation of the effect of focused psychological intervention combined with standardized pain nursing on postoperative pain levels and depression and anxiety in patients with intestinal obstruction. Dis Markers. 2022;2022:2467887.

12. Meng X, Yu Y. Effect of rehabilitation nursing under the guidance of the health action process model on perioperative nursing effect of artificial hip arthroplasty: Effect on promoting quality of life and postoperative rehabilitation. Comput Math Methods Med. 2022;9(1):e029742.

13. Ramos O, Mierke A, Filler K, et al. Outpatient opioid prescribing habits in pediatric patients with bone sarcomas after undergoing primary tumor resection. J Pediatr Orthop. 2022;42(5):e501-e6.

14. Komatsu S, Okamoto M, Shibata S, et al. Prospective evaluation of quality of life and functional outcomes after carbon ion radiotherapy for inoperable bone and soft tissue sarcomas. Cancers (Basel). 2021;13(11):2591.

15. Weiss MC. Systemic treatment of soft tissue sarcomas in the geriatric population. Curr Treat Options Oncol. 2022;23(6):855-63.

16. van Hollander D, Ledington E, Singer S, et al. “I thought I had fibroids, and now I don’t”: A mixed method study on healthcare workers’ perceptions of quality of life in uterine sarcoma patients. Health Qual Life Outcomes. 2022;20(1):65.

17. Ruan R, Garcia-Torres F, Galvez-Lara M, Mariona IA. Psychological and non-pharmacological treatments for pain in cancer patients: A systematic review and meta-analysis. J Pain Symptom Manage. 2022;63(5):e505-e20.

18. Kazak A, Ozkaraman A. The effect of progressive muscle relaxation exercises on pain on patients with sickle cell disease: Randomized controlled study. Pain Manag Nurs. 2021;22(2):177-83.

19. Dikmen HA, Terzioglu F. Effects of reflexology and progressive muscle relaxation on pain, fatigue, and quality of life during chemotherapy in gynecologic cancer patients. Pain Manag Nurs. 2019;20(1):47-53.

20. Ozdemir C, Karayezbek E, Soyuncu Y. Relationship between quality of care and patient care outcomes for postoperative pain in major orthopedic surgery: Analytical and cross-sectional study. Clin Nurs Res. 2022;31(3):530-40.

21. Giordano NA, Seilern Und Aspang J, Baker J, et al. Integration of life care specialists into orthopaedic trauma care to improve postoperative outcomes: A pilot study. 2022 [Online ahead of print].

22. Whale K, Wylde V, Beswick A, et al. Effectiveness and reporting standards of psychological interventions for improving short-term and long-term pain outcomes after total knee replacement: A systematic review. BMJ Open. 2019;9(12):e029742.

23. Patton L, Aysar P, Nugent DL, et al. What is the impact of specialist palliative care outpatient consultations on pain in adult patients with cancer? A systematic review. Eur J Oncol Nurs. 2021;55:102034.

24. Huang TT, Sung CC, Wang WS, Wang BH. The effects of the empowerment education program in older adults with total hip replacement surgery. J Adv Nurs. 2017;73(8):1848-61.

25. Zeoga S, Ward S, Gunnaridottir S. Evaluating the quality of pain management in a hospital setting: Testing the psychometric properties of the Icelandic version of the revised American Pain Society patient outcome questionnaire. Pain Manag Nurs. 2014;15(1):143-55.

26. Sinnmaz T, Aksanel N. Experience of pain and satisfaction with pain management in patients after a lumbar disc herniation surgery. J Perianesth Nurs. 2021;36(6):647-55.

27. Subramanian B, Shastri N, Aziz L, et al. ASSIST – Patient satisfaction survey in postoperative pain management from Indian subcontinent. J Anaesthesiol Clin Pharmacol. 2017;33(1):40-47.

28. Eti Aslan F, Kula Sahin S, Secginli S, Bulbuloglu S. [Patient satisfaction with nursing practices about postoperative pain management: A systematic review.] Agri. 2018;30(3):105-15 [in Turkish].

29. Lee CH, Liu JT, Lin SC, et al. Effects of educational intervention on state anxiety and pain in people undergoing spinal surgery: A randomized controlled trial. Pain Manag Nurs. 2018;19(2):163-71.

30. Chen LY, Sun YC, Cheng CR, et al. [Evaluation of the nurses’ utilization of the pain management information system based on the information system success model.] Hu Li Za Zhi. 2022;69(1):63-72 [in Chinese].