Effects of Interactive Health Education Combined With Evidence-based Pain Management Nursing on Disease Cognition, Postoperative Pain and Post-traumatic Growth in Patients Undergoing Laparoscopic Salpingectomy

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Ye Cheng[1], Weiwei Shao[1], Lixia Li[1], Yewei Ding[1], Xueping Zou[1]

[1]Gynecological Ward, Yongkang Women and Children's Health Hospital, 321300 Yongkang, Zhejiang, China

AIM: Laparoscopic salpingectomy has been widely used in the clinical treatment of benign tubal lesions. This study aims to explore the effects of interactive health education combined with evidence-based pain management nursing on disease cognition, postoperative pain and post-traumatic growth in patients undergoing laparoscopic salpingectomy, in order to provide new insights into clinical nursing for these patients.

METHODS: In this retrospective study, 360 patients who underwent laparoscopic salpingectomy in our hospital from January 2022 to December 2023 were included. Patients receiving routine care were included in the control group (n = 213) and patients receiving interactive health education combined with evidence-based pain care were classified under the study group (n = 147). General data, disease cognition, postoperative pain and post-traumatic growth of the two groups were collected and compared.

RESULTS: The awareness rate regarding pathogenesis, cardinal symptom, surgical and postoperative precautions, prevention of complications, medication management, diet management, sleep management, and review time and project in the study group were all significantly higher than those in the control group ($p < 0.05$). The numerical rating scale (NRS) scores of the study group were lower than those of the control group at 6 h, 12 h, 24 h and 48 h post-surgery ($p < 0.001$). Before discharge, all dimensions of the post-traumatic growth inventory (PTGI) scores like relating to others, new possibilities, personal strength, spiritual change, and appreciation of life of the study group patients were significantly higher than those of the control group ($p < 0.05$). The time to get out of bed, exhaust time, and hospitalization stay of the study group patients were significantly shorter than those of the control group ($p < 0.05$). The total incidence of complications in the study group was significantly lower than that in the control group ($p < 0.05$).

CONCLUSIONS: Interactive health education combined with evidence-based pain management nursing is conducive to improving disease cognition, reducing postoperative pain, enhancing post-traumatic growth, and promoting postoperative recovery in patients undergoing laparoscopic salpingectomy.

Keywords: interactive health education; evidence-based pain management nursing; laparoscopic salpingectomy; disease cognition; pain; post-traumatic growth; retrospective study; nursing intervention; patient education

Introduction

At present, the gynecologic practice in China sees a gradual rise in the application of laparoscopic technology, which has also been refined over time [1]. Laparoscopic salpingectomy is a minimally invasive surgery performed to remove the diseased fallopian tubes by entering the abdominal cavity under the guidance of laparoscopy. Compared with traditional surgery, laparoscopic salpingectomy has the advantages of less trauma and faster recovery, and has been widely used in clinical treatment of benign lesions such as tubal pregnancy [2–4]. However, invasive operations during surgery may cause damage and irritation to the surrounding tissues, and factors such as intra-surgical application of pneumoperitoneum technology, postoperative inflammatory response, and drugs that promote uterine contraction may all trigger pain, thus affecting the postoperative rehabilitation process [5]. Disease cognition refers to the cognition, evaluation and interpretation of diseases, with the help of various knowledge and experiences, when the body's health is threatened or already in a disease state [6]. Baiardini *et al*. [7] have shown that improving patients' disease cognition is conducive to treatment compliance. Post-traumatic growth refers to a series of positive changes that an individual experiences in response to a traumatic event [8]. Darabos *et al*. [9] pointed out that post-traumatic growth can help improve patients' psychological adjustment ability, thus helping them better cope with the pressure brought by the disease and treatment, and promoting disease recovery. Therefore, it is necessary to implement corresponding nursing intervention measures to improve the disease cognition, alleviate pain and enhance post-traumatic growth ability of patients undergoing laparoscopic salpingectomy.

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Correspondence to: Ye Cheng, Gynecological Ward, Yongkang Women and Children's Health Hospital, 321300 Yongkang, Zhejiang, China (e-mail: 13616896256@163.com).

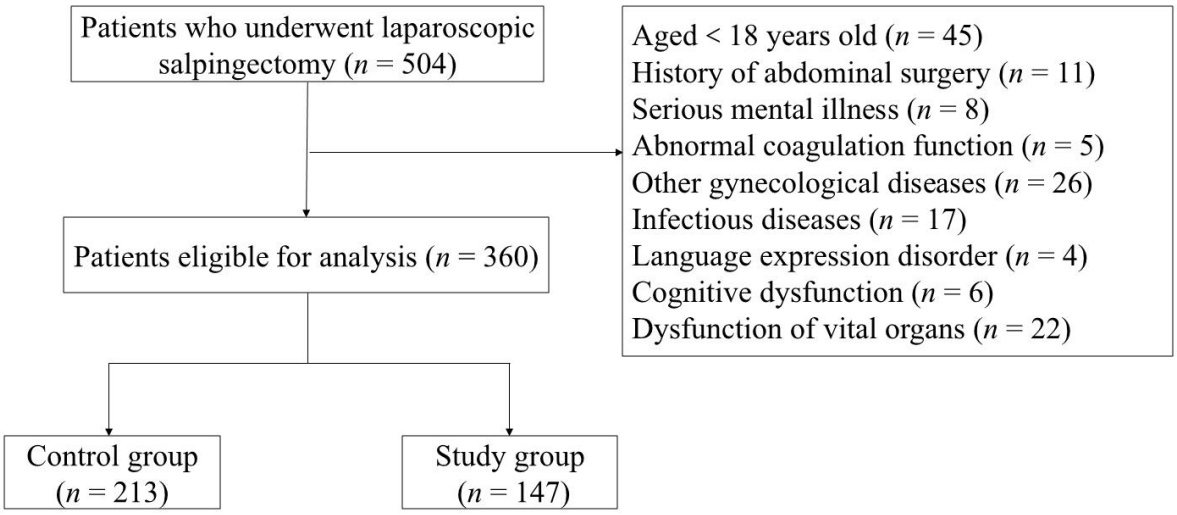

Fig. 1. Flowchart for inclusion and exclusion criteria.

Evidence-based pain management nursing is a nursing model used in clinical practice. This model advocates patient-centered, evidence-based medicine as the basis, featuring personalized nursing plan formulated in combination with clinical nursing experience, with the hope to provide high-quality nursing services for patients and promote disease recovery [10,11]. At present, evidence-based pain management nursing has been widely used in pain care for patients undergoing various laparoscopic surgeries, such as laparoscopic cholecystectomy [12], laparoscopic prostatectomy [13] and laparoscopic appendectomy [14], but it has not been reported in patients undergoing laparoscopic salpingectomy. Studies have shown that, health education for patients can improve their disease cognition and health awareness, which is conducive to the rehabilitation of patients [15–17]. However, the traditional health education lacks interaction, which often emphasizes one-way transmission of knowledge from nurses to patients. In this mode, patients are on the receiving end of the knowledge imparted by the attending nurses, being deprived of the opportunities for active participation and interaction, thus limiting the clinical nursing effect somewhat. Previous studies have pointed out that nurse-patient interaction is the core element of clinical nursing practice [18–20]. In light of the revelation of new findings in this field, our hospital developed an interactive health education model on the basis of the traditional health education model through refinements. This study retrospectively analyzed 360 patients who underwent laparoscopic salpingectomy in our hospital from January 2022 to December 2023, aiming to explore the effects of interactive health education combined with evidence-based pain management nursing on their disease cognition, postoperative pain and post-traumatic growth, with the objective to provide new insights into clinical nursing for such patients.

Materials and Methods

Research Subjects

This retrospective analysis includes 360 patients who underwent laparoscopic salpingectomy in Yongkang Women and Children's Health Hospital from January 2022 to December 2023. Patients receiving routine care were included in the control group (n = 213) and patients receiving interactive health education combined with evidence-based pain management nursing were categorized under the study group (n = 147) (Fig. 1).

Inclusion and Exclusion Criteria

Inclusion criteria of this study are as follows: (1) Fulfilled the surgical indications of laparoscopic salpingectomy and received laparoscopic salpingectomy treatment; (2) aged ≥18 years old, with complete clinical data; and (3) no previous history of abdominal surgery.

Patients with the following conditions were excluded: (1) Serious mental illness; (2) abnormal coagulation function; (3) other gynecological diseases; (4) infectious diseases; (5) language expression disorder and cognitive dysfunction; (6) dysfunction of vital organs such as heart, liver and kidney.

Research Methods

Retrospective analysis of baseline and clinical data of 360 patients undergoing laparoscopic salpingectomy, including age, body mass index (BMI), education level, marital status, underlying diseases, surgical site, length of operation, intraoperative bleeding volume, disease cognition, post-operative pain, post-traumatic growth, postoperative recovery-related indicators (the time to get out of bed, exhaust time, and hospitalization stay), and incidence of complications during hospitalization (nausea/vomiting, pelvic infection, vaginal bleeding, abdominal distension) was conducted.

Disease Cognition

The patients undergoing laparoscopic salpingectomy in our hospital were surveyed with a disease cognition questionnaire which was self-made by our hospital. The questionnaire includes 8 questions related to pathogenesis, cardinal symptom, surgical and postoperative precautions, prevention of complications, medication management, diet management, sleep management, and review time and project. Correct answers are counted as 'knowing', while incorrect answers are counted as 'not knowing'. The Cronbach's coefficient was 0.86.

Post-operative Pain

The numerical rating scale (NRS) was used for evaluation, which numerically evaluates the degree of pain [21]. The pain degree is divided into segments on a straight line and represented by 11 numbers from 0 to 10, with 0 indicating no pain and 10 indicating severe pain. Patients self-reported the pain they were enduring by rating. In classifications, a score of 0 indicates no pain, a score of 1–3 indicates mild pain, a score of 4–6 indicates moderate pain, and a score of 7–10 indicates severe pain. The higher the score, the more severe the pain.

Post-traumatic Growth

Developed by Tedeschi and Calhoun [22], the post-traumatic growth inventory (PTGI) was also used for evaluation in this study. The scale includes 5 dimensions: relating to others (7 items), new possibilities (5 items), personal strength (4 items), spiritual change (2 items), and appreciation of life (3 items), totaling 21 items. The higher the score, the higher the level of post-traumatic growth.

Nursing Care Modes

The patients of the control group received routine nursing care, which includes assisting patients in completing perioperative routine examinations; administering medications to patients in adherence to doctor's advice; monitoring adverse reactions during the medication period; offering disease-related knowledge and laparoscopic salpingectomy-related knowledge to patients and their families; closely monitoring changes in vital signs of patients during the perioperative period; and regularly keeping the ward clean and ventilated.

The patients of the study group received interactive health education combined with evidence-based pain care:

(1) Interactive health education: (a) Nursing staff leveraged multimedia, mainly with pictures and videos, to educate patients about health. Before surgery, they introduced patients to disease-related knowledge, purpose, process, and preoperative precautions of laparoscopic salpingectomy. After surgery, they educated patients about the identification, prevention, and treatment of common complications, and provided dietary guidance and early rehabilitation guidance. Before discharge, they introduced patients to postoperative precautions and the continuity of rehabilitation training. (b) The staff created a good interactive atmosphere during each interactive Q&A session (once a day, 15–20 min each time). During each session, patients and their families were asked about their level of understanding during the presentation. The staff should encourage proactive questioning, and allocate a reasonably sufficient time for answering questions raised by patients and their families. (c) Group discussions with patients and their families in the same ward were organized once a day (15–20 min each time). The patients were encouraged to actively share their treatment experience and insights. During discussion, case analysis could be set up, and Q&A session was held to improve patient participation in learning new health education content. (d) Individual guidance aimed at providing targeted guidance and suggestions for patients with low educational levels and poor acceptance is necessary. Depending on patient needs, each individual should be given no more than 30 min for guidance.

(2) Evidence-based pain care: (a) An evidence-based nursing team was established. Nursing staff with rich clinical nursing experience and strong sense of responsibility were selected to form the evidence-based nursing team, with the head nurse serving as the team leader, who would provide professional training on evidence-based nursing to nursing staff within the team. The training content includes the basic principles of evidence-based medicine, practice methods of evidence-based nursing, methods to search for medical literature, and methods to apply the best evidence for clinical decision-making. The training encompasses theoretical teaching and practical skills training. The nursing staff was required to sign a confidentiality agreement, a training contract and an intellectual property agreement. Only those who pass the assessment would be considered for the role. (b) The second part involves proposing evidence-based questions, conducting a retrospective analysis of case data on pain after laparoscopic salpingectomy, exploring the causes of pain in patients, and proposing nursing issues that need to be addressed for different reasons. (c) The third part entails evidence-based support, exemplified by literature search in domestic and foreign journal databases and relevant information search using keywords such as "laparoscopic salpingectomy", "pain", "evidence-based nursing", *etc.*, and integration of knowledge compiled with clinical experience to develop nursing plans tailored to patients. (d) Specifically, the staff need to explain the relevant information of the surgery, the causes of postoperative pain, and preventive measures to the patient in a timely manner after the surgery. The nurse should assist the patient with lying flat: placed a pillow under the buttocks, raised the buttocks, and changed positions every 2 hours. The nurse should also offer guidance to patient's family in limb massage; respond to patients' concerns and answer their questions with patience; and provide guidance and comfort. For patients with abdominal distension and

pain, abdominal massage should be given within 8 hours after surgery to promote gastrointestinal peristalsis and effectively empty the gas in the abdominal cavity. Four hours after surgery, the patients were guided to perform simple limb movements for 15–20 minutes per session. For patients experiencing mild pain, intervention measures can be executed, which can be broadly classified into two categories: (i) daily-life measures (including developing good sleep and dietary habits, supplementing foods containing anti-inflammatory ingredients), and (ii) psychology-related measures (including psychological counseling, respiratory training, listening to music, watching TV and other relaxation therapies). For patients with moderate pain, physical therapy methods such as hot compress, cold compress, massage, *etc*., can be adopted on the basis of the above interventions. For patients wrestling with severe pain, transdermal patches and oral analgesics can be used under the guidance of a doctor for pain relief. In addition, changes in the patient's body temperature, blood pressure, skin, incision, *etc.* were closely monitored, and abnormal symptoms were addressed or tackled according to medical advice. Patients were also advised to avoid consuming spicy, hard and greasy foods before the incision heals.

Statistical Analysis

SPSS v23.0 software (IBM SPSS Corp, Armonk, NY, USA) was used for data analysis. The categorical variables (education level, marital status, underlying diseases, surgical site, disease-related knowledge awareness rates, and complications) are expressed in frequency (percentage) [n (%)] and analyzed using Chi-squared or Chi-squared correction tests. Shapiro–Wilk test was used to evaluate the normality of continuous data. Data conforming to normal distribution (length of operation, intraoperative bleeding volume, PTGI score, the time to get out of bed, exhaust time, and hospitalization stay) are expressed as mean ± standard deviation and analyzed by independent sample *t*-test for comparison. Non-normally distributed data (NRS score) are expressed as median (min, max) and analyzed using the Mann–Whitney *U* test. $p < 0.05$ indicates a statistically significant difference.

Results

Comparison of Clinical Baseline Characteristics

No significant difference existed between the two groups of patients in clinical baseline characteristics such as average age, BMI, education level, marital status, underlying diseases, surgical site, length of operation, and intraoperative bleeding volume (Table 1).

Comparison of Disease Cognition

The awareness rate regarding pathogenesis, cardinal symptom, surgical and postoperative precautions, prevention of complications, medication management, diet management, sleep management, and review time and project in the study group were all significantly higher than those in the control group ($p < 0.05$) (Table 2).

Comparison of Post-operative Pain

There was no statistically significant difference in NRS scores between the two groups 1 h after surgery ($p > 0.05$). The NRS scores of the study group were lower than those of the control group at 6 h, 12 h, 24 h and 48 h after surgery ($p < 0.001$) (Table 3).

Comparison of Post-traumatic Growth

Before discharge, the scores of different dimensions of the PTGI, such as relating to others, new possibilities, personal strength, spiritual change, and appreciation of life, as well as the total score, of the study group patients were significantly higher than those of the control group ($p < 0.05$) (Table 4).

Comparison of Postoperative Recovery and Complications

The time to get out of bed, exhaust time, and hospitalization stay of the study group patients were all significantly shorter than those of the patients of the control group ($p < 0.05$). The total incidence of complications in the study group was significantly lower than that in the control group ($p < 0.05$) (Table 5).

Discussion

In this study, we observed that the awareness rate for disease-related knowledge such as pathogenesis, cardinal symptom, surgical and postoperative precautions, prevention of complications, medication management, diet management, sleep management, and review time and project of the study group were higher than those of the control group. For the study group, the NRS scores at 6 h, 12 h, 24 h, and 48 h after surgery were lower than those of the control group, and the relating to others, new possibilities, personal strength, spiritual change, appreciation of life dimension scores and the total PTGI score were higher than those of the control group. In addition, time to get out of bed, exhaust time, and hospitalization stay were all shorter in the study group than in the control group, and the overall incidence of complications was lower than that of the control group.

Having the right disease cognition can help prevent diseases or identify early symptoms of diseases in a timely manner, and is of great significance for facilitating patients' treatment and promoting their recovery, psychological state, and quality of life improvement [23,24]. Numerous studies have shown that providing health education to patients can improve their disease cognition, shorten the rehabilitation process, and enhance their quality of life [25–30]. Yousif *et al*. [25] found that health education is beneficial for improving the disease cognition of tuberculosis patients. In a study by Mehta *et al*. [26], health education was provided to high school students, enabling them to under-

Table 1. Comparison of clinical baseline characteristics between the study and control groups.

Variables	Study group (n = 147)	Control group (n = 213)	χ^2/t	p
Average age (mean ± SD, years old)	37.15 ± 7.30	38.10 ± 7.65	1.185	0.237
BMI (mean ± SD, kg/m^2)	22.59 ± 2.28	22.43 ± 2.13	0.707	0.480
Educational level [n (%)]			0.049	0.826
Junior high school and below	101 (68.71)	144 (67.61)		
High school and above	46 (31.29)	69 (32.39)		
Marital status [n (%)]			0.306	0.858
Married	113 (76.87)	159 (74.65)		
Unmarried	23 (15.65)	35 (16.43)		
Divorced/widowed	11 (7.48)	19 (8.92)		
Underlying disease [n (%)]			0.832	0.660
Hydrosalpinx	41 (27.89)	69 (32.39)		
Tubal pregnancy	34 (23.13)	46 (21.60)		
Fallopian tube obstruction	72 (48.98)	98 (46.01)		
Surgical site			0.284	0.594
Left fallopian tube	60 (40.82)	81 (38.03)		
Right fallopian tube	87 (59.18)	132 (61.97)		
Length of operation (mean ± SD, min)	97.73 ± 13.45	99.68 ± 14.43	1.289	0.198
Intraoperative bleeding volume (mean ± SD, mL)	91.31 ± 21.64	91.76 ± 20.47	0.200	0.841

Note: BMI, body mass index; SD, standard deviation.

Table 2. Comparison of the scores for disease-related knowledge between the two groups [n (%)].

Disease-related knowledge	Study group (n = 147)	Control group (n = 213)	χ^2	p
Pathogenesis [n (%)]	132 (89.80)	145 (68.08)	21.131	<0.001
Cardinal symptom [n (%)]	136 (92.52)	140 (65.73)	34.893	<0.001
Surgery and postoperative precautions [n (%)]	131 (89.12)	124 (58.22)	40.196	<0.001
Prevention of complications [n (%)]	134 (91.16)	167 (78.40)	10.323	0.001
Medication management [n (%)]	141 (95.92)	180 (84.51)	11.725	0.001
Diet management [n (%)]	138 (93.88)	162 (76.06)	19.888	<0.001
Sleep management [n (%)]	128 (87.07)	130 (61.03)	29.049	<0.001
Review time and project [n (%)]	140 (95.24)	169 (79.34)	18.072	<0.001

Table 3. Comparison of postoperative NRS scores between the two groups (mean ± standard deviation, points).

NRS scores	Study group (n = 147)	Control group (n = 213)	Z	p
1 h after surgery	1.00 (0.00, 2.00)	1.00 (0.00, 2.00)	0.689	0.491
6 h after surgery	3.00 (2.00, 4.00)	5.00 (3.00, 6.00)	8.651	<0.001
12 h after surgery	4.00 (4.00, 5.00)	6.00 (5.00, 7.00)	9.220	<0.001
24 h after surgery	1.00 (0.00, 2.00)	3.00 (2.50, 4.00)	4.994	<0.001
48 h after surgery	1.00 (0.00, 2.00)	2.00 (1.00, 3.00)	8.388	<0.001

Note: NRS, numerical rating scale.

stand the diagnosis, prevention, and other related knowledge of vascular diseases. Yang [27] implemented diversified health education for diabetes patients, and found that their disease cognition level and quality of life were significantly improved afterwards. According to Brodersen *et al.* [28], providing health education to patients undergoing abdominal surgery is beneficial in shortening their hospital stay, reducing the incidence of postoperative complications, and improving anxiety and psychological stress. Through a meta-analysis, Zhao *et al.* [29] proposed that implementing health education for cancer patients postoperatively is beneficial for improving their quality of life. By conducting health education in the form of animated videos for head and neck surgery patients, Turkdogan *et al.* [30] found that patients were more satisfied with the perceived quality of the information they received. It is worth noting

Table 4. Comparison of PTGI scores between the two groups before discharge (mean ± standard deviation, points).

PTGI scores	Study group (n = 147)	Control group (n = 213)	t	p
Relating to others	19.46 ± 2.28	15.21 ± 2.24	17.546	<0.001
New possibilities	13.86 ± 2.72	12.21 ± 2.63	5.771	<0.001
Personal strength	12.18 ± 2.35	10.74 ± 2.24	5.910	<0.001
Spiritual change	6.07 ± 1.33	4.95 ± 1.43	7.523	<0.001
Appreciation of life	8.05 ± 2.00	7.09 ± 2.09	4.365	<0.001
Total	59.63 ± 4.86	50.20 ± 4.74	18.355	<0.001

Note: PTGI, post-traumatic growth inventory.

Table 5. Comparison of postoperative recovery-related indicators and incidence of complications between the two groups.

Variables	Study group (n = 147)	Control group (n = 213)	χ^2/t	p
Time to get out of bed (mean ± SD, h)	9.98 ± 1.37	11.72 ± 1.76	10.090	<0.001
Exhaust time (mean ± SD, h)	20.77 ± 2.64	22.09 ± 3.63	3.793	<0.001
Hospital stay (mean ± SD, d)	5.10 ± 1.45	7.09 ± 2.01	10.304	<0.001
Complication [n (%)]				
Nausea/vomiting	4 (2.72)	13 (6.10)	2.211	0.137
Pelvic infection	2 (1.36)	6 (2.82)	0.311	0.577
Vaginal bleeding	3 (2.04)	10 (4.69)	1.760	0.185
Abdominal distension	3 (2.04)	11 (5.16)	2.270	0.132
Total	12 (8.16)	40 (18.78)	7.932	0.005

that the current clinical application of health education lacks interactivity; it is noteworthy that, according to Tähka *et al*. [31], interactive health education is more conducive to promoting beneficial changes in health behaviors. The interactive health education adopted in this study represents an improved version of health education model. Unlike other traditional health education, this model was incorporated with interactive Q&A, group discussions, and individual guidance, which are conducive to stimulating patients' interest in learning, strengthening their willingness to actively participate, and promoting nurse-patient communication and cooperation. Through this nursing mode, patients would gain a deeper understanding of their disease and new insights into health education.

Postoperative pain not only brings physiological discomfort to patients, but may also lead to emotional instability, difficulty falling asleep, decreased appetite, *etc.*, which jeopardize disease recovery [32–34]. In recent years, evidence-based pain management nursing has been proven to be significantly effective in improving postoperative pain [35–41]. Zhang *et al*. [35] studied patients undergoing surgery for finger tendon injuries and pointed out that evidence-based pain management nursing is beneficial for alleviating postoperative wound pain and reducing the risk of wound complications. Wang *et al*. [36] found that evidence-based pain management nursing has a significant effect on improving pain in patients after liver transplantation. Studies by Wang *et al*. [37] and Check *et al*. [38] advocated the beneficial effects of evidence-based nursing on alleviating the pain endured by cancer patients. This study proposes a targeted evidence-based pain management nursing plan and significantly reduces the NRS scores of patients at different time points after surgery. Although the above study has reported the positive effect of evidence-based pain management nursing in improving pain in patients with other diseases, the evidence-based pain management nursing plan in this study is targeted at patients undergoing laparoscopic salpingectomy due to differences in the causes of pain among patients with different diseases or surgeries. In addition, health education has been proven to improve postoperative pain in patients. For example, Liu *et al*. [39] studied fracture surgery patients and proposed that health education is beneficial in reducing their postoperative pain and incidence of complications, improving their quality of life and self-management ability. After studying outpatient ear surgery patients, Butkus *et al*. [40] found that the implementation of health education reduced postoperative opioid use. Besides, Özbaş and Karadağ [41] found that the execution of health education promoted functional recovery in patients after total knee replacement surgery and contributed to effective alleviation of postoperative pain, anxiety, and other issues. In the present study, interactive health education combined with evidence-based pain care worked synergistically to promote postoperative pain mitigation and accelerate patient recovery. At present, to the best of our knowledge, there is no report on the combination of interactive health education and evidence-based pain management nursing.

In addition to physiological effects, the psychological impact of laparoscopic salpingectomy on women is not negligible. Especially women with fertility needs—due to concerns such as "impaired fertility affecting family relationships"—experience elevation of postoperative psychological pressure and become more prone to negative emotions such as anxiety and depression, which may lead to a low level of post-traumatic growth and hinder physical recovery. However, currently, research on post-traumatic growth mainly focuses on healthcare workers and cancer patients. Noushad *et al*. [42] pointed out that physical activity is beneficial for improving the psychological and physiological outcomes caused by post-traumatic growth. Yuan *et al*. [43] found that intermittent pulsed transcranial magnetic stimulation is beneficial for improving symptoms of post-traumatic stress disorder. Faghani *et al*. [44] showed that mindfulness-based supportive psychotherapy is beneficial for improving post-traumatic growth in cancer patients. In this study, interactive health education guided patients to actively acknowledge the substantial postoperative harm and provided corresponding psychological counseling to help them resolve their negative emotions after trauma, ultimately promoting their post-traumatic growth. Our PTGI scale score was measured before discharge to evaluate the effectiveness of nursing interventions during hospitalization. The results of this study also indicate that this nursing model can promote patient self-growth in the short term and help them set a more positive outlook about their life after discharge. Wang *et al*. [45] reported that the nurse-led supportive intervention positively influence the post-traumatic growth of breast cancer patients. Arefian and Asgari-Mobarakeh [46] found that psychological education is conducive to improving the post-traumatic growth of breast cancer patients during chemotherapy. These studies collectively underscore the importance of "being supportive" and "psychological education" for post-traumatic growth. On the other hand, in this study, the interactive health education we applied is a combination of the two above-mentioned intervention methods, providing a new health education model.

Although it is a retrospective study, we set up a control group, and ensured that patients in the two groups were similar in key features, so as to improve the reliability and generalizability of the study findings.

This study is not without limitations: (1) This study is a single-center research and due to human and material resource constraints, only a small sample was included. (2) In this study, only patients undergoing laparoscopic salpingectomy were selected and patients undergoing other surgical procedures were not included. (3) Despite the significant improvement in various indicators in the study group relative to the control group, continuous improvement of the evidence-based pain management nursing plan is still needed to continuously improve the intervention effect. (4) Although the nursing staff in this study have been trained and assessed, the nursing effectiveness may still be affected by factors such as nurse workload and acceptance level. (5) As a retrospective study, the data used in this study were gathered from 2022 to 2023. Thus, the research results may not be fully applicable to patients in the current clinical settings. In future research, we will further expand the sample size, include patients undergoing different surgical procedures, and refine the nursing plan to validate conclusions of the current study.

Despite the shortcomings of this research, one prominent highlight of the study is that it was the first to combine interactive health education with evidence-based pain management nursing and apply the combined model to patients undergoing laparoscopic salpingectomy. The model was found to have positive significance in improving patients' disease cognition, postoperative pain, and post-traumatic growth, an innovative method that offer fresh insights into clinical treatment for these patients.

Conclusions

Interactive health education combined with pain evidence-based pain management nursing is beneficial for improving disease cognition, reducing postoperative pain, enhancing post-traumatic growth, and promoting postoperative recovery in patients undergoing laparoscopic salpingectomy.

Availability of Data and Materials

The data analyzed are available from the corresponding author upon reasonable request.

Author Contributions

YC and WWS designed the research study and wrote the first draft. LXL and YWD performed the research. YWD and XPZ analyzed the data. All authors have been involved in revising it critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

This study was approved by the Institutional Ethical Committee of Yongkang Women and Children's Health Hospital, and the ethics approval number of this study is AF/SQ-01(03/02.01.04). This study complies with the relevant principles and regulations of the Declaration of Helsinki, and all subjects are aware of this study and have signed informed consent.

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Conflict of Interest

The authors declare no conflict of interest.

References

[1] Wu S, Xing X, He R, Zhao H, Zhong L, Sun J. Comparison of laparoscope-assisted single-needle laparoscopic percutaneous extraperitoneal closure versus open repair for pediatric inguinal hernia. BMC Surgery. 2022; 22: 334. https://doi.org/10.1186/s12893-022-01787-6.

[2] Ng KYB, Cheong Y. Hydrosalpinx - Salpingostomy, salpingectomy or tubal occlusion. Best Practice & Research. Clinical Obstetrics & Gynaecology. 2019; 59: 41–47. https://doi.org/10.1016/j.bpobgyn.2019.01.011.

[3] Wenjing L, Haibo L. Therapeutic effect of laparoscopic salpingotomy vs. salpingectomy on patients with ectopic pregnancy: A systematic review and meta-analysis. Frontiers in Surgery. 2022; 9: 997490. https://doi.org/10.3389/fsurg.2022.997490.

[4] Wu Q, Lin Y, Zhang J, Zhou Y, Chen L, Lin T. Preliminary hysteroscopic tubal hydrotubation improves fertility outcomes after laparoscopic salpingotomy for tubal ampullary pregnancy. BMC Surgery. 2022; 22: 53. https://doi.org/10.1186/s12893-021-01367-0.

[5] You S, Xu F, Wu Y, Qin S, Shu B, Chen Y, *et al*. Effect of noise isolation using noise-cancelling headphones during laparoscopic surgery for postoperative pain reduction: A randomized clinical trial. Journal of Clinical Anesthesia. 2024; 92: 111286. https://doi.org/10.1016/j.jclinane.2023.111286.

[6] Peng S, He J, Huang J, Tan J, Liu M, Liu X, *et al*. A chronic kidney disease patient awareness questionnaire: Development and validation. PloS One. 2019; 14: e0216391. https://doi.org/10.1371/journal.pone.0216391.

[7] Baiardini I, Rogliani P, Santus P, Corsico AG, Contoli M, Scichilone N, *et al*. Disease awareness in patients with COPD: measurement and extent. International Journal of Chronic Obstructive Pulmonary Disease. 2018; 14: 1–11. https://doi.org/10.2147/COPD.S179784.

[8] Alvarez-Calle M, Chaves C. Posttraumatic growth after perinatal loss: A systematic review. Midwifery. 2023; 121: 103651. https://doi.org/10.1016/j.midw.2023.103651.

[9] Darabos K, Renna ME, Wang AW, Zimmermann CF, Hoyt MA. Emotional approach coping among young adults with cancer: Relationships with psychological distress, posttraumatic growth, and resilience. Psycho-oncology. 2021; 30: 728–735. https://doi.org/10.1002/pon.5621.

[10] Crawford CL, Rondinelli J, Zuniga S, Valdez RM, Cullen L, Hanrahan K, *et al*. Testing of the Nursing Evidence-Based Practice Survey. Worldviews on Evidence-based Nursing. 2020; 17: 118–128. https://doi.org/10.1111/wvn.12432.

[11] Cheng L, Feng S, Hu Y. Evidence-based nursing implementation in Mainland China: A scoping review. Nursing Outlook. 2017; 65: 27–35. https://doi.org/10.1016/j.outlook.2016.07.016.

[12] Fisher AT, Bessoff KE, Khan RI, Touponse GC, Yu MMK, Patil AA, *et al*. Evidence-based surgery for laparoscopic cholecystectomy. Surgery Open Science. 2022; 10: 116–134. https://doi.org/10.1016/j.sopen.2022.08.003.

[13] Lemoine A, Witdouck A, Beloeil H, Bonnet F, PROSPECT Working Group Of The European Society Of Regional Anaesthesia And Pain Therapy (ESRA). PROSPECT guidelines update for evidence-based pain management after prostatectomy for cancer. Anaesthesia, Critical Care & Pain Medicine. 2021; 40: 100922. https://doi.org/10.1016/j.accpm.2021.100922.

[14] Unglert AK, Lehnick D, Szavay PO, Zundel S. A Novel Tool to Predict Postoperative Opioid Need after Laparoscopic Appendectomy in Children: A Step toward Evidence-Based Pain Management. European Journal of Pediatric Surgery: Official Journal of Austrian Association of Pediatric Surgery. 2022; 32: 529–535. https://doi.org/10.1055/s-0042-1744148.

[15] Warren A. Preserved Consciousness in Alzheimer's Disease and Other Dementias: Caregiver Awareness and Communication Strategies. Frontiers in Psychology. 2021; 12: 790025. https://doi.org/10.3389/fpsyg.2021.790025.

[16] Chen S, Chen M, Ma X, Fan G, Zhang W, Su B. Application effect of 317 Nursing App Teaching Platform in health education for patients with sudden deafness. Minerva Surgery. 2023; 78: 209–211. https://doi.org/10.23736/S2724-5691.21.09080-8.

[17] Bakke A. Empowering Our Youth: Initiating Sexual Health Education on the Inpatient Unit for the Chronically Ill Pediatric Patient. Urologic Nursing. 2016; 36: 267–273.

[18] Shattell M. Nurse-patient interaction: a review of the literature. Journal of Clinical Nursing. 2004; 13: 714–722. https://doi.org/10.1111/j.1365-2702.2004.00965.x.

[19] Allande-Cussó R, Gómez-Salgado J, Macías-Seda J, Porcel-Gálvez AM. Assessment of the nurse-patient interaction competence in undergraduate nursing students. Nurse Education Today. 2021; 96: 104627. https://doi.org/10.1016/j.nedt.2020.104627.

[20] Cleary M, Hunt GE, Horsfall J, Deacon M. Nurse-patient interaction in acute adult inpatient mental health units: a review and synthesis of qualitative studies. Issues in Mental Health Nursing. 2012; 33: 66–79. https://doi.org/10.3109/01612840.2011.622428.

[21] Wikström L, Nilsson M, Broström A, Eriksson K. Patients' self-reported nausea: Validation of the Numerical Rating Scale and of a daily summary of repeated Numerical Rating Scale scores. Journal of Clinical Nursing. 2019; 28: 959–968. https://doi.org/10.1111/jocn.14705.

[22] Tedeschi RG, Calhoun LG. The Posttraumatic Growth Inventory: measuring the positive legacy of trauma. Journal of Traumatic Stress. 1996; 9: 455–471. https://doi.org/10.1007/BF02103658.

[23] Bauersachs R, Brodmann M, Clark C, Debus S, De Carlo M, Gomez-Cerezo JF, *et al*. International public awareness of peripheral artery disease. VASA. Zeitschrift Fur Gefasskrankheiten. 2021; 50: 294–300. https://doi.org/10.1024/0301-1526/a000945.

[24] Ramachandran HJ, Wu VX, Kowitlawakul Y, Wang W. Awareness, knowledge and healthy lifestyle behaviors related to coronary heart disease among women: An integrative review. Heart & Lung: the Journal of Critical Care. 2016; 45: 173–185. https://doi.org/10.1016/j.hrtlng.2016.02.004.

[25] Yousif K, Ei Maki M, Babikir RK, Abuaisha H. The effect of an educational intervention on awareness of various aspects of pulmonary tuberculosis in patients with the disease. Eastern Mediterranean Health Journal. 2021; 27: 287–292. https://doi.org/10.26719/emhj.20.102.

[26] Mehta M, Teymouri M, Puthuparampil-Mehta B, Sawh C, Paty P, Kostun ZW, *et al*. Outcomes of the V-Healthy education and awareness program that empowers high school students to understand and diagnose vascular disease risk factors. Journal of Vascular Surgery. 2023; 77: 1245–1249. https://doi.org/10.1016/j.jvs.2022.12.014.

[27] Yang S. The integration of the LEARNS model with diversified health education has an impact on disease awareness and the Quality of Life of diabetes patients. Panminerva Medica. 2024; 66: 222–224. https://doi.org/10.23736/S0031-0808.23.05036-X.

[28] Brodersen F, Wagner J, Uzunoglu FG, Petersen-Ewert C. Impact of Preoperative Patient Education on Postoperative Recovery in Abdominal Surgery: A Systematic Review. World Journal of Surgery. 2023; 47: 937–947. https://doi.org/10.1007/s00268-022-06884-4.

[29] Zhao G, Zhang Y, Liu C. The effect of health education on the quality of life of postoperative patients with gastric cancer: a systematic review and meta-analysis. Annals of Palliative Medicine. 2021; 10: 10633–10642. https://doi.org/10.21037/apm-21-2420.

[30] Turkdogan S, Roy CF, Chartier G, Payne R, Mlynarek A, Forest

VI, *et al*. Effect of Perioperative Patient Education via Animated Videos in Patients Undergoing Head and Neck Surgery: A Randomized Clinical Trial. JAMA Otolaryngology– Head & Neck Surgery. 2022; 148: 173–179. https://doi.org/10.1001/jamaoto.2021.3765.

[31] Tähka V, Viinamäki H, Koskela K. Interaction in health education. The International Journal of Social Psychiatry. 1990; 36: 99–110. https://doi.org/10.1177/002076409003600203.

[32] Tola YO, Chow KM, Liang W. Effects of non-pharmacological interventions on preoperative anxiety and postoperative pain in patients undergoing breast cancer surgery: A systematic review. Journal of Clinical Nursing. 2021; 30: 3369–3384. https://doi.org/10.1111/jocn.15827.

[33] Waxman JA, Shenouda KG, Lin HS. Assessment and Management of Postoperative Pain Associated with Sleep Apnea Surgery. Otolaryngologic Clinics of North America. 2020; 53: 765–777. https://doi.org/10.1016/j.otc.2020.05.006.

[34] El Sayed Ahmad Y, Nehme J, Moukarzel N. Comparison of Postoperative Pain and Appetite in Pediatric Patients Undergoing Monopolar Tonsillotomy and Cold Steel Tonsillectomy. International Journal of Otolaryngology. 2020; 2020: 8060971. https://doi.org/10.1155/2020/8060971.

[35] Zhang XL, Wang CY, Pan LL, Li YJ. Effects of evidence-based nursing care interventions on wound pain and wound complications following surgery for finger tendon injury. International Wound Journal. 2024; 21: e14818. https://doi.org/10.1111/iwj.14818.

[36] Wang H, An B, Zhou G, Ma D, Xin L. Study on the relieving effect of evidence-based nursing model on pain nursing of patients after liver transplantation. Minerva Medica. 2021; 112: 676–677. https://doi.org/10.23736/S0026-4806.20.06581-7.

[37] Wang H, Kwok WH, Yao LQ, Liu XL, Bressington D, Chen ML, *et al*. An evidence-based breathing exercise intervention for chronic pain management in breast cancer survivors: A phase II randomized controlled trial. European Journal of Oncology Nursing: the Official Journal of European Oncology Nursing Society. 2024; 71: 102625. https://doi.org/10.1016/j.ejon.2024.102625.

[38] Check DK, Winger JG, Jones KA, Somers TJ. Predictors of Response to an Evidence-Based Behavioral Cancer Pain Management Intervention: An Exploratory Analysis From a Clinical Trial. Journal of Pain and Symptom Management. 2021; 62: 391–399. https://doi.org/10.1016/j.jpainsymman.2020.12.020.

[39] Liu Q, Wang J, Han J, Zhang D. Effect of Combining Operating Room Nursing Based on Clinical Quantitative Assessment with WeChat Health Education on Postoperative Complications and Quality of Life of Femoral Fracture Patients Undergoing Internal Fixation. Journal of Healthcare Engineering. 2022; 2022: 2452820. https://doi.org/10.1155/2022/2452820.

[40] Butkus JM, Awosanya S, Scott ER, Perlov N, Hannikainen P, Tekumalla S, *et al*. Multimodal Analgesia and Patient Education Reduce Postoperative Opioid Consumption in Otology. Otolaryngology–head and Neck Surgery: Official Journal of American Academy of Otolaryngology-Head and Neck Surgery. 2023; 169: 120–128. https://doi.org/10.1002/ohn.229.

[41] Özbaş N, Karadağ M. The Effect of Education Planned According to Health Literacy Level on Functionality, Problems Experienced, and Quality of Life in Patients Undergoing Total Knee Replacement: A Nonrandomized Comparison Group Intervention Study. Orthopedic Nursing. 2023; 42: 165–176. https://doi.org/10.1097/NOR.0000000000000943.

[42] Noushad S, Ansari B, Ahmed S. Effect of nature-based physical activity on post-traumatic growth among healthcare providers with post-traumatic stress. Stress and Health: Journal of the International Society for the Investigation of Stress. 2022; 38: 813–826. https://doi.org/10.1002/smi.3135.

[43] Yuan H, Liu B, Li F, Jin Y, Zheng S, Ma Z, *et al*. Effects of intermittent theta-burst transcranial magnetic stimulation on post-traumatic stress disorder symptoms: A randomized controlled trial. Psychiatry Research. 2023; 329: 115533. https://doi.org/10.1016/j.psychres.2023.115533.

[44] Faghani F, Choobforoushzadeh A, Sharbafchi MR, Pourshekhali H. Effectiveness of mindfulness-based supportive psychotherapy on posttraumatic growth, resilience, and self-compassion in cancer patients: a pilot study. Wiener Klinische Wochenschrift. 2022; 134: 593–601. https://doi.org/10.1007/s00508-022-02057-4.

[45] Wang G, Li Z, Luo X, Wei R, Liu H, Yang J, *et al*. Effects of nurse-led supportive-expressive group intervention for post-traumatic growth among breast cancer survivors: A randomized clinical trial. Journal of Nursing Scholarship: an Official Publication of Sigma Theta Tau International Honor Society of Nursing. 2022; 54: 434–444. https://doi.org/10.1111/jnu.12752.

[46] Arefian M, Asgari-Mobarakeh K. Psychoeducational intervention for pain, psychological distress, hope, and post-traumatic growth among breast cancer patients during chemotherapy: a pilot randomized controlled trial. Pain Management Nursing: Official Journal of the American Society of Pain Management Nurses. 2024; 25: e355–e366. https://doi.org/10.1016/j.pmn.2024.04.012.