Chung Shan Medical Journal 2026; 37:37-44

airiti

Original Article

Multimedia nursing guidance improvement project for gas pain after laparoscopic surgery

Ju-Ying Hsu[1,2], Shu- Hsin Lee[1,2,3*]

[1] *Department of Nursing, Chung Shan Medical University, Taichung City, Taiwan*
[2] *Department of Obstetrics and Gynecology, Chung Shan Medical University Hospital, Taichung City, Taiwan*
[3] *Institute of Medicine, Chung Shan Medical University, Taichung, 402, Taiwan*

Purpose: A project using multimedia nursing guidance to improve gas pain after laparoscopic surgery.
Methods: Problem analysis identified the main reasons for gas pain discomfort after laparoscopic surgery as follows:1. Insufficient nursing guidance teaching materials and incomplete gas pain nursing guidelines, 2. 46% of postoperative gas pain incidence and 34% of comfortable state. We conducted a literature review to identify, formulate, and evaluate the clinical feasibility of various countermeasures, including the creation of a multimedia video on "Activity, deep breathing and cough; ABC aerobic exercises" and hot compresses on both shoulders.
Results: Three months after project implementation, incidence of gas pain after laparoscopic surgery was reduced from 46% to 12.5% through the execution of " ABC aerobic exercises" and hot compresses on both shoulders. Additionally, the comfort state during the hot compress process increased from 34% to 50%.
Conclusion: The authors recommend incorporating "ABC aerobic exercises" and hot compresses into the routine care after laparoscopic surgery to prevent or reduce gas pain.

Keywords: Gas pain, laparoscopic, heating pad, aerobic exercises

1. Introduction

A total of 306,257 people in Taiwan underwent a total hysterectomy between 1998 and 2012. Laparoscopic surgery accounted for 25.2% and 46.2% of these surgeries in 1998 and 2012, while laparotomy rates decreased from 67.2% to 36.5% during the same time period (1); this trend indicates that uterine laparoscopy is safe and universally accepted. However, surgery is an invasive treatment. Compared to traditional laparotomy, laparoscopic surgery has lower risks and leads to smaller wounds and less postoperative wound pain, which is beneficial for patient recovery after surgery (2). However, a decrease in body temperature after surgery can cause vasoconstriction and discomfort due to whole-body tremors (3). In addition, clinical pain often manifests itself as gas pain in the upper abdomen and shoulders, which affects the patient's ability to take deep breaths and move their bodies (4). According to current statistics for this project, in addition to wound pain, gas pain accounts for about 46% of postoperative care needs. There are relatively few previous studies or project reports focused on the management of shoulder pain management after laparoscopic surgery. Therefore, this project was initiated to address the lack of clinical education and care for gas pain after laparoscopic surgery. Our goal was to improve the comfort and recovery of patients by alleviating gas

* Corresponding Author: Shu-Hsin Lee
Address: No. 110, Sec. 1, Jianguo N. Rd., Taichung City, 40201, Taiwan
Tel: 886-4-24730022 ext. 12322
E-mail: shl@csmu.edu.tw

airiti

pain after laparoscopic surgery.

Current Situation Analysis

[1] Current status of the nursing guidance workflow before and after laparoscopic surgery

This is an obstetric and gynecological ward with a total of 30 beds of a medical center. The ward has a total of 15 nurses: six with less than two years of experience (40%) and nine with more than five years of experience (60%). Each nurse cares for an average of 7–8 patients during each day shift and 10–15 patients per nurse during night shifts.

When a patient is hospitalized for laparoscopic surgery, a nurse provides verbal education using the "Pre- and Post-Operative Instructions for Gynecological Surgery" on the day of admission. This educational leaflet is described only in text and includes preparation before, during surgery, and surgery post-care precautions. The education session lasts about 10 minutes, after which the leaflet is given to the patient for reference. However, this nursing guidance is only for general gynecological surgeries and is not specific for laparoscopic surgeries. Therefore, nurses do not have appropriate teaching materials or consistent care methods for gas pain after laparoscopic surgery.

[2] Status of gas pain after laparoscopic surgery in the project

In 2019, the total number of surgical operations on the obstetrics and gynecological ward was 2,539, of which 528 (48.1%) were performed by laparoscopic surgery. On average, approximately 44 patients underwent laparoscopic surgery every month.

During the planning phase of this project in September 2020, the information we collected is as follows: A total of 32 patients who underwent laparoscopic surgery in our ward were recruited for investigation and follow-up. The top three postoperative care needs were wound pain (in 29 cases, 90%), gas pain (in 15 cases, 46%), and other problems (in 12 cases, 38%). For the 15 patients with gas pain, this project undertook clinical observations and recorded the survey results. We review literature to identify the symptoms associated with gas pain after laparoscopic surgery and devised a "post-laparoscopic surgery comfort questionnaire". Each item is scored using a five-point Likert scale as: 1 point, "very uncomfortable"; 2 points, "uncomfortable"; 3 points, "normal"; 4 points, "comfortable"; and 5 points, "very comfortable". The lower the score, the more uncomfortable the patient feels. The expert validity of this scale was assessed by two attending physicians and three senior nurses. After the scale was revised according to the experts' suggestions, the validity reached 95%. The post-laparoscopic surgery comfort questionnaire was used to test these 15 gas pain patients, and only 34% were in a comfortable state. Fishbone diagram is used to analyze the possible causes of gas pain and low comfort after laparoscopic surgery as shown in Figure 1。

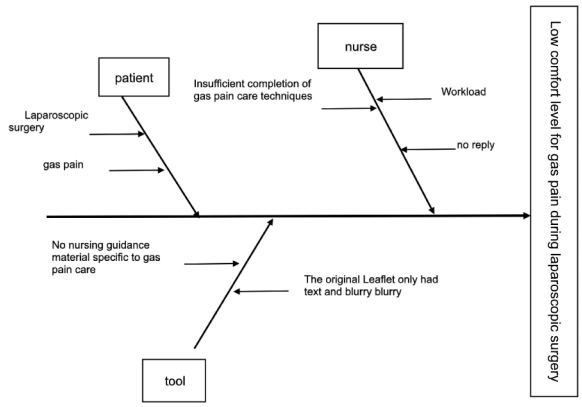


Figure 1. Fishbone Diagram Analysis Cause gas pain

Problem Identification

Problem analysis identified the main reasons for gas pain discomfort after laparoscopic surgery as follows:

[1] Insufficient nursing guidance teaching materials and incomplete gas pain nursing guidelines

[2] 46% of postoperative gas pain incidence and 34% of comfortable state

Project Purpose

The aims of this project were to:

1. Compile a multimedia video of the " Activity, deep breathing and cough; ABC aerobic exercises" and hot compresses " nursing guide.

2. Reduce the incidence of gas pain from 46% to 24% and increase comfort from 34% to 50%.

【Target 1 set value=pre improvement pain rate - (pre improvement pain rate x 80% x caregiver capacity 60%)】

airiti

【Target 2 set value=pre improvement comfort+(pre improvement comfort x 80% x caregiver capacity 60%)】

Literature review

[1] Causes of gas pain after laparoscopic surgery

The technique of laparoscopic surgery is difficult and the steps are cumbersome and require the surgeon to have familiarity with the anatomical positions of the pelvic organs and to avoid a large range of intestinal segments; thus, it is necessary to use some equipment during surgery. As the intestinal segments must be avoided, artificial carbon dioxide gas is used to inflate the abdominal wall and the intestinal segment to separate the abdominal wall, and the Trendelenburg-style position (with the head and the feet high) is also required to expose the surgical site. Most laparoscopic surgeries require the use of electric burners, so a non-combustible or combustion-supporting gas is needed. Carbon dioxide is a colorless, odorless, easy to obtain, inexpensive, rapidly metabolized gas(5). However, the disadvantage is that carbon dioxide reacts with water to produce carbonic acid, which irritates the peritoneum. High concentrations of carbon dioxide accumulate under the diaphragm and near the liver and can result in paralysis of the C3-C5 cervical spinal nerves that innervate the diaphragm, which indirectly leads to shoulder gas pain and epigastric pain(4). The surgical method and posture can also cause gas pain, though the precise physiological mechanisms are still unclear. According to the literature and our own clinical observation of patients, the pain caused by the minimally invasive hand accounts for 35% to 80% of cases of pain, including acute wound pain, shoulder pain, and epigastric pain. This pain can persist for up to 72 hours after surgery(6).

[2] Impact of gas pain on patients

Unrelieved postoperative pain can lead to clinical and psychological changes that increase morbidity, mortality, and medical costs and reduce quality of life(7). Ineffective management of postoperative pain results in poorer clinical outcomes, including deep vein thrombosis, pulmonary embolism, coronary ischemia, myocardial infarction, pneumonia, poor wound healing, insomnia, and depression(8). Additionally, improper treatment of gas pain can increase myocardial oxygen consumption, hinder deep breathing and coughing, and lead to respiratory problems and complications and the possibility of delayed hospital discharge(9). Gas pain causes patients to have increased demand for different types and higher doses of painkillers, increases the burden on the patient's body, and can cause gastrointestinal irritation and other possible side effects.

[3] The nursing guidance and implementation methods to manage gas pain

Pain management following surgery can be effectively approached through both pharmaceutical interventions and non-pharmaceutical interventions (NPIs).

This project focuses on exploring the efficacy of Non-Pharmaceutical Interventions (NPIs) in managing gas pain following laparoscopic surgery. Mohamed et al. conducted a randomized experimental study involving 343 patients undergoing laparoscopic procedures, implementing interventions such as heat application and encouraging early physical movement or getting out of bed. These interventions showed statistically significant differences in shoulder pain relief and marked improvements in comfort (4). In a clinical trial by Hosseinzadeh (2020), 114 female patients undergoing laparoscopic examinations were randomly assigned into three groups of 38 patients each. The first group received a Hemovac drain, the second group was instructed in deep breathing techniques and asked to practice slow, deep breathing three times every hour postoperatively, while the third group received standard care. Pain severity in the abdomen and shoulder was measured using a visual pain scale at 3, 6, 12, and 24 hours post-operation. The results showed a shoulder pain incidence of 0% in the drain placement group, 7.9% in the deep breathing group, and 42.1% in the control group. According to the gate control theory of pain, heat application stimulates the production of action potentials in large nerves on the skin, which closes the pain gate and prevents the conduction of pain stimuli by small nerves (10) . Research by Dehghan & Farahbod (2014) suggests that continuous use of a hot water bottle combined with sedative medications can significantly reduce pain in patients with acute lower back pain compared to medication alone. Collectively, these studies emphasize that physical activity, deep breathing exercises, coughing, and hot compresses

airiti

can effectively alleviate gas pain and enhance patient comfort.

[4] Multimedia teaching

Abstract knowledge can be presented concretely to patients and motivation for learning behaviors can be triggered through video and audio presentation of textbook materials. Many researchers have found that multimedia increases the effectiveness of human learning. The visual learning retention rate for all seen information is 20%, the auditory information retention rate is 30%, the retention rate for information received audio-visually is 50%, and the retention rate for learning by audio-visual and collocation practice at the same time is 80% (11,12). The advantages of video-assisted teaching include the fact that the ability and level of the patient can be used as the basis for teaching progress, various vivid pictures can be provided to deepen the patient's learning ability through audiovisual media, and learners can review the information at any time without no time limits.

Problem solution and implementation process

[1] Problem Solution

According to the analysis of the current situation and the results of the literature review, the project team members proposed a detailed solution. A decision-making matrix analysis based on three items: effectiveness, feasibility, and practicality, which were scored as suitable for implementation (5 points), medium suitability for implementation (3 points), or unsuitable for implementation (1 point). The maximum total score was 45 points and 80% was used as the benchmark to determine whether an option was feasible; thus, the score must be greater than or equal to 36 points for an option to be selected as a solution according to the project policies, as shown in Table 2.

[2] Implementation Process

The implementation period of this project was September 14, 2020, to December 25, 2020, for a total of three months. The project was divided into three stages: the planning period, the implementation period, and the evaluation period. The progress of the improvement project is shown in Table 3.

Table 2. Project Decision Matrix Analysis Table

Problem I	Insufficient nursing guidance teaching materials and incomplete gas pain nursing guidelines	
Countermeasures	1. Standard process of nursing guidance before and after laparoscopic surgery	Compile the "ABC Aerobic Exercise" Nursing Instruction Multimedia Video
Benefit	15	15
Feasibility	9	13
Practicality	9	13
Total Score	33	41
Selected		★
Problem II	The postoperative gas pain rate was 46% and the discomfort rate was 34%	
Countermeasures	1. One-on-one health education for health education videos and actual back-to-room review	
Benefit	15	
Feasibility	13	
Practicality	13	
Total Score	41	
Selected	★	

airiti

[3] Planning period (September 14 to October 30, 2020)

1. Formulate nursing guidelines for before and after laparoscopic surgery: According to the literature and the results of the current situation analysis and review, the content of the guidelines for before and after laparoscopic surgery were integrated to include the surgical process, information on gas pain, and the ABC aerobic exercise process, etc. Secondly, the presentation of health education content using narratives, videos, and text was planned.

2. Use computers and mobile phones to record multimedia aerobic exercise guidance for after laparoscopic surgery: The three-step ABC process was recorded as a video, with the exercises performed by clinical nurses and recorded in Mandarin. Two senior specialist nurses and three attending physicians watched the video and relevant opinions were collected, and revisions and finalized decisions on the multimedia videos were made. The "ABC Aerobic Exercise" nursing guidance video for gas pain after laparoscopic surgery was completed on October 28, 2020. The film is about four minutes long. The video was linked to a QR code so that patients could access the video and practice the exercises at any time without being limited by time or space.

3. Planning to purchase heating pads

Each intervention takes about 30 minutes. The temperature is controlled at 45–50 degrees, and the electric heating bag is a Biddeford FH96 heating mat, size 30.5 × 61 cm.

[4] Implementation period (November 11 to December 25, 2020).

Using Multimedia Strategies: The implementation period of this project was November 11, 2020, to December 25, 2020. According to the newly devised nursing guidelines for before and after laparoscopic surgery, multimedia strategies were used to implement the nursing guidelines, including one-on-one practical teaching of deep breathing, coughing, and points for attention during application of a hot compress (Figure 2). The QR code was scanned to play the “ABC Aerobic Exercise" health education



Figure 2. One-on-one teaching
Figure 3. Response Room Teaching
Figure 4. Execution record sheet

Table 3. Gantt chart of the project to improve nursing guidance for gas pain after laparoscopic surgery

Project / Time	Year	2020			
	Month	9	10	11	12
一、Planning period					
1. Formulate nursing guidelines for before and after laparoscopic surgery		★	★		
2. Using computers and mobile phones, record multimedia aerobic exercise guidance content for after laparoscopic surgery			★		
3. Planning to purchase heating pads			★		
二、Execution period					
Implement multimedia "ABC Aerobic Exercise" health education and guidance				★	★
三、Evaluation period					
Result evaluation				★	★

airiti

video (Figure 4), and patients were asked to reply to provide an evaluation of the classroom teaching (Figure 3). Questions were asked on a case-by-case basis to provide individual nursing guidance. When a patient performed exercise or applied a hot compress, this information was recorded in the form and the execution time was indicated.

[5]. Evaluation period - from (November 11 to December 25, 2020)

November–December 2020 was the evaluation period for the "ABC Aerobic Exercise" health education video and electronic heating pads. The four execution time points were 4, 6, 12, and 24 hours after surgery; these timepoints are recorded in the execution form. One-on-one teaching in the reply room was adopted. If patients encountered problems, the nurses immediately gave an explanation. A total of 15 patients were enrolled and classified into an intervention group (n=8) and the non-intervention group (n=7). Both groups were prescribed injectable painkillers (Dynasta) once or twice after surgery and began to take painkillers orally eight hours after their operation. The care and treatment of the two groups were consistent, apart from the intervention. The integrity of the nursing guidance was ensured during implementation in order to assess the effectiveness of this project.

2. Results

After implementation of the special countermeasures, the rate of gas pain after laparoscopic surgery reduced from 46% to 12.5% after performing "**ABC aerobic exercise" and applying hot compresses** on both shoulders, and the comfort state during application of the hot compress increased from 34% to 50%. During the process, some patient also felt too comfortable to sleep, and stiffness of the limbs improved accordingly. The patient outcomes after implementation of the project are shown in Table 4.

3. Discussion and Conclusion

Laparoscopic surgery is increasingly replacing traditional surgical methods; however, postoperative gas pain remains a prevalent issue, potentially impacting patient comfort after surgery (13). Through systematic analysis, researchers have explored the incidence of gas pain post-laparoscopic surgery in this ward, challenges nurses face in caregiving, and utilized a project-based approach to identify and address these issues. This approach garnered consensus among colleagues, referenced literature, and led to the creation of a multimedia nursing guide on "ABC aerobic exercises" and applying hot compresses, followed by the implementation of these interventions and evaluating their effectiveness (3).

Post-intervention results demonstrated a decrease in the incidence of gas pain from 46% to 12.5%, and comfort levels rose from 34% to 50%, highlighting the project's success. In medical practice, beyond the traditional vital signs of temperature, pulse, respiration, and blood pressure, 'pain' intensity is now recognized as the 'fifth vital sign'. The World Health Organization has designated October 17th as the Global Day Against Pain, promoting the alleviation of suffering as a fundamental human right. Pain is a subjective experience and varies among individuals; the perception of pain by an individual confirms its existence (4).

Healthcare professionals should prioritize this issue, continually seeking effective strategies, especially non-pharmaceutical interventions, which can save medical costs and enhance professional care quality. For this project, a digital nursing guide on "ABC aerobic exercises" and hot compresses was developed, and its application in clinical care by ward nurses proved convenient and satisfactory, effectively alleviating gas pain and enhancing comfort for

Table 4. Outcomes for the ABC aerobic exercises and hot compresses of the project (N = 15).

Project	Intervention group (n=8)	Non-intervention group (n=7)
Gas pain on shoulders and diaphragm	1(12.5%)	4(57.1%)
Comfort state	4(50%)	2(28.6%)

airiti

patients undergoing laparoscopic surgery. However, the implementation of this project was limited to a small sample of 15 people and did not reach the rigor of a well-designed study, thus limiting its inferential power. Future efforts should aim for a rigorous clinical trial design to establish an empirical basis.

During the implementation of this project amidst the COVID-19 period, patient education was prioritized, potentially extending to family involvement in the future for greater engagement. Despite the challenges of a busy work environment and various constraints, the project was actively pursued, and the involvement of each colleague is gratefully acknowledged. The implementation process not only contributed to professional growth in medical care but also improved the quality of postoperative care. The authors suggest incorporating this project model into routine educational measures for patients undergoing laparoscopic surgery.

References

1. Huang C C, Lo TS, Huang YT, Long CY, Law KS, Wu MP. Surgical trends and time frame comparison of surgical types of hysterectomy: A nationwide, population-based 15-year study. Journal of Minimally Invasive Gynecology. 2020;27(1):65-73. e1.
2. Powell F, Khaund A. Laparoscopy and laparoscopic surgery. Obstetrics, Gynaecology & Reproductive Medicine. 2016;26(10):297-303.
3. Lee J, Jeon M, Park E, Lee J, Ahn G, Lee S, et al. Influence of Gas Pain, Post-operative Resilience, and Body Temperature Discomfort in Laparoscopic Myomectomy Patients after Thermotherapy. Korean Journal of Women Health Nursing. 2019;25(1):4-18.
4. Mohamed AI, Elhady R. Heating pads and early mobilization for reducing postoperative shoulder pain and enhancing recovery of women undergoing gynecological laparoscopic surgery. IOSR Journal of Nursing and Health Science. 2016;5(1):10-16.
5. Sao CH, Chan-Tiopianco M, Chung KC, Chen YJ, Horng HC, Lee WL, et al. Pain after laparoscopic surgery: Focus on shoulder-tip pain after gynecological laparoscopic surgery. Journal of the Chinese Medical Association. 2019;82(11):819-826.
6. Kreindler G, Attias S, Kreindler A, Hen H, Haj B, Matter I, et al. Treating postlaparoscopic surgery shoulder pain with acupuncture. Evidence-Based Complementary and Alternative Medicine. 2014;2014(1):120486.
7. Meissner W, Huygen F, Neugebauer EA, Osterbrink J, Benhamou D, Betteridge N, et al. Management of acute pain in the postoperative setting: the importance of quality indicators. Current medical research and opinion. 2018;34(1):187-196.
8. Breivik H. Postoperative pain management: why is it difficult to show that it improves outcome? European journal of anaesthesiology. 1998;15(6):748-51.
9. Park JS, Lee MH, Lee HR. Effects of preoperative pain management education on the control of postoperative pain-Focused on the PCA used surgical patients with uterine tumor. Journal of Korean Oncology Nursing. 2011;11(2):108-115.
10. Summers S. Evidence-based practice part 1: Pain definitions, pathophysiologic mechanisms, and theories. Journal of Perianesthesia Nursing. 2000;15(5):357-365.
11. Tu L, Lee M, Chang T. Utilizing multimedia instruction to improve post-partum group nursing education. New Taipei Journal of Nursing. 2007;9(1):81-91.
12. Her S,Leo F. The Strategy of Efficiency Improvement for Multimedia Ward Orientation. VGH Nursing.2002;19(2):179-185.
13. Major AL, Jumaniyazov K, Yusupova S, Jabbarov R, Saidmamatov O, Mayboroda-Major I. Laparoscopy in gynecologic and abdominal surgery in regional (spinal, peridural) anesthesia, the utility of the technique during COVID-19 pandemic. Medicines. 2021;8(10):60.
14. Hosseinzadeh F, Nasiri E, Behroozi T. Investigating the effects of drainage by hemovac drain on shoulder pain after female laparoscopic surgery and comparison with deep breathing technique: a randomized clinical trial study. Surgical Endoscopy. 2020;34(12):5439-5446.