Application and Evaluation of a Care Plan for Enhanced Recovery After Thyroidectomy

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Abstract
Purpose: To develop and evaluate a nursing care plan based on the ERAS (Enhanced Recovery After Surgery) approach for thyroid surgery patients. Methods: A nursing care plan has been developed after the literature review and focus group discussion. The content was validated using the Delphi method. Then, a quasi-experimental study was designed. A total of 120 cases with thyroid surgery at Ruijin Hospital from March to June 2018 were divided equally into an ERAS group and a conventional group. Results: The nursing care plan consisted of 13 first-level and 32 second-level indicators. Strikingly the outcomes, such as pain scores, length of hospital stay, and hospitalization costs, were significantly less in the ERAS group than those in the conventional group (P<.001), while no difference was detected in the postoperative complications rate. Conclusion: A scientific and reliable nursing care plan has been used for thyroidectomy patients to enhance recovery.

Keywords
enhanced recovery after surgery, Delphi method, nursing care plan, thyroid surgery patients

What do we already know about this topic?
The ERAS approach has achieved positive outcomes in colorectal surgeries and some other specialties. An ERAS nursing care plan is different from traditional routine nursing care for thyroidectomy patients.

How does your research contribute to the field?
Application and evaluation of an innovative nursing care plan for thyroidectomy patients.

What are your research’s implications towards theory, practice, or policy?
A scientific nursing care plan can be used to apply ERAS approach to daily practice, improving patient outcomes and promoting socioeconomic benefits.

Introduction
The rapid development of diagnostic imaging has led to a rapid increase in thyroid cancer patients population. The age-standardized incidence rates (ASIRs) for thyroid cancer has risen alarmingly by approximately 20% per 100,000 individuals annually (from 2.74 to 3.3) for both genders worldwide. This increase is higher in developing countries (33%; from 2.06 to 2.74) than that in developed countries (19%; from 4.16 to 4.95).1 Subsequently, many thyroid...
cancer patients need to undergo thyroidectomy as part of their treatment. In recent years, several hospitals in China have introduced enhanced recovery after surgery (ERAS) model for the diagnosis and treatment perioperatively. The acronym ERAS is often used to describe a multimodal perioperative care program. In addition, terms such as enhanced recovery programs (ERP). Also, previously fast-track surgery (FTS) was commonly used, especially in North America. It refers to a series of evidence-based optimized measures during the perioperative period, enabling patients to recover quickly. Furthermore, ERAS reduces the length and cost of postoperative hospitalization, short-term morbidity, and readmission and mortality rates compared to those in conventional care.

ERAS pathways have considerably improved postoperative outcomes and are in use for various types of surgery. For colorectal surgeries, ERAS protocols have been well-established as the best practice. Currently, many healthcare facilities have started utilizing the ERAS approach to benefit patients who underwent liver surgeries. The advantages of applying ERAS models to pancreatic surgeries have also been acknowledged. Interestingly, ERAS shortened the length of hospitalization and did not elevate the risk of postoperative complications or readmissions. Furthermore, a meta-analysis evaluated FTS’s safety and efficacy of gastrectomy patients with gastric cancer. Seven RCTs (524 patients) were analyzed. This study showed that FTS was associated with short postoperative hospitalization, less hospitalization expenditure, less pain, and improved the quality of life. As a result, ERAS has been widely accepted among multiple surgical subspecialties as a modality for increasing the value of health care delivered to our patients. ERAS has been widely applied for thyroid surgery. A systematic review and meta-analysis showed that there was growing literature supporting the role of ERAS protocols for the perioperative management of thyroidectomy. Chinese Association of Thyroid Oncology and Chinese Association of Head and Neck Oncology organized seminars and discussions formulated the “Expert Consensus on Enhanced Recovery After Surgery (ERAS) for Thyroid Surgery (2018 Edition)”. The perioperative ERAS anesthesia management of thyroid surgery was verified as a safe and effective in pain management, patient satisfaction and accelerated recovery. ERAS protocols for thyroidectomy significantly reduce hospital length of stay and costs without increasing complications or readmission rates.

Methods

Based on the ERAS approach, to develop and evaluate a nursing care plan for thyroid surgery patients. The safety and effectiveness of this nursing plan would be verified via clinical application.

Design

We conducted a literature search via Cochrane library, RANO, PubMed, OVID, CBM, CNKI, and WANFANG DATA, using search terms “enhanced recovery after surgery,” “fast track surgery,” “thyroid disease/neoplasms,” “nursing model,” and “nursing measures,” from 2002 to 2016. We identified all studies in which ERAS models were used as interventions.

After a literature review, further studies were proceeded with a focus group discussion to establish an ERAS nursing care plan for thyroidectomy patients. According to feedback, we adjusted the nursing care plan’s content for the second round focus group discussion. Finally, we collected Delphi questionnaires for this ERAS nursing care plan and sent them to the experts by email. The Delphi process consisted of 2 rounds with 2 weeks for each round. The consensus was reached based on experts’ opinions.

A non-randomized controlled trial was designed to evaluate the effect of this ERAS nursing care plan. Interventions were adopted based on Delphi results. This trial was designed to compare patients’ pain scores after surgery, Barthel index score, postoperative complications, length of hospital stay, and hospital costs between ERAS and conventional groups.

Participants

A total of 120 cases subjected to thyroid surgery at Ruijin Hospital from March to June 2018 were divided equally into an ERAS group and a conventional group according to ward. The ERAS group consisted of 15 males (25%) and 45 females (75%), aged 40.62 ± 11.52 years. The cases were collected from the Department for Thyroid Vascular Surgery. The conventional group consisted of 18 males (30%) and 42 females (70%), aged 40.00 ± 10.06 years. The cases were collected from Day Surgery Center.

Inclusion criteria were as follows: a) thyroidectomy is required for treatment; b) aged from 20 to 70 years; c) ability to cooperate with the study; d) ability for self-care.

Exclusion criteria were as follows: a) patients with preoperative complications, abnormal blood glucose, history of cervical spondylisis; b) patients who cannot understand or read correctly due to mental health disabilities.

Sample Size

Based on a previous study data, we calculated sample size was 45 each group (test power of .80 and an alpha of .05). Considering a drop-out rate (20%), the sample size was at least 56 cases each group. Finally, we decided the study sample size was 60 each group.

Setting

The cases were collected from the Department for Thyroid Vascular Surgery and Day Surgery Center. These were operated at a large tertiary referral hospital in Shanghai, China. The total number of beds was 79. Patients with thyroid disease admitted to these units were from all areas of China.
Data Collection

Pain scores were assessed using a visual analog scale (VAS), a tool for measuring pain. The score range is 0-10; a higher pain score represents a higher pain level.

The Barthel index is a scale that indicates one’s ability to perform daily living activities. This scale comprises 10 items, including the following scoring combinations: a) 0 and 5, b) 0, 5, and 10, or c) 0, 5, 10, and 15. These items in the Barthel index address a patient’s ability in feeding, bathing, grooming, dressing, bowel and bladder control, toileting, chair transfer, ambulation, and stair climbing. A higher Barthel index indicates a better ability of self-caring.

Data Analysis

Descriptive statistical methods were utilized to analyze data via SPSS (26.0). Numerical variables were described using mean and standard deviation (SD). Moreover, t-test and chi-square ($\chi^2$) were used to compare the patients’ baseline data. The independent sample t-test was used to compare patients’ VAS scores, Barthel index score, length of stay, and costs between the 2 groups. The data analysis was conducted as expected.

Results

Delphi Method Results

A purposive sample of thyroid specialists consisted of 16 experts, including 7 (43.75%) nurse specialists, 7 (43.75%) medical specialists, and 2 (12.5%) anesthetists, who participated in the Delphi survey. The average working age of the selected specialists was 19.44 ± 11.51 years old. The selected specialists’ educational background consists of 8 postgraduates (50%) and 8 (50%) undergraduates. The response rate was 100% for both rounds.

Firstly, we drafted a care plan with 14 first-level indicators and 35 second-level indicators. After 2 rounds of Delphi surveys, we revised the nursing care plan to 13 first-level indicators and 32 second-level indicators (Table 1).

In the 2 rounds of the Delphi survey, experts rated the importance of each indicator on a four-point scale. They could make comments about each indicator and suggest adding or deleting specific indicators. The authoritative coefficient for the first round was .8703, and that of the second round was .8828 (Table 2).

The coordination of Delphi experts’ opinions was tested by Kendall’s coefficient of coordination. A higher value indicates an enhanced concordance. Statistics indicate that our expert concordance was .246 and .227 (Table 3).

Concentration and variation in Delphi experts’ opinions were measured by mean scores and coefficients of variation for each indicator. In this study, the mean value of importance scoring of first-level indicators ranged from .9 to .95, the full score ratio from .5 to .87, CV ranged from 0 to .19. On the other hand, the mean value of importance scoring of second-level indicators ranged from .89 to .96, the full score ratio was .56-.93, and the CV was 0-.15. A higher mean score represents the higher importance of an indicator. On the other hand, a lower coefficient of variation means there is more agreement for the indicator.
Demography Results

Background data, such as age, gender, smoking history, and surgical outcomes did not show any significant difference between the 2 groups (P > .05) (Table 4).

Enhanced Recovery After Surgery Nursing Care Plan Results

We established the nursing care plan for 2 groups patients based on ERAS nursing model in thyroid surgery (Table 5). A significant difference was detected in the pain scores, Barthel index score, length of stay, and hospitalization costs between the 2 groups (P<.001). Pain scores, length of stay, and costs in the ERAS group were lower than those in the conventional group, while the Barthel index score was higher in the ERAS group. However, no significant difference was observed in the postoperative complications between the 2 groups (Table 6).

Discussion

Applying Delphi Method to Establish an Enhanced Recovery After Surgery Nursing Care Plan

In order to develop an accurate and consistent nursing care plan, 2 rounds of Delphi surveys were conducted after the

Table 3. Coordination of experts’ opinions.

| Round          | Kendall’s W | c²        | P      |
|----------------|-------------|-----------|--------|
| First round    | .246        | 133.71    | <.001  |
| Second round   | .227        | 120.058   | <.001  |

Table 4. Characteristics of study participants [n (%)].

| Characteristics                                | Total (n = 120) | ERAS (n = 60) | Conventional (n = 60) | T    | c²     | P      |
|------------------------------------------------|-----------------|---------------|-----------------------|------|--------|--------|
| Age (years)                                    | 40.31 ± 10.77   | 40.62 ± 11.52 | 40.00 ± 10.06         | .312 | .755   |        |
| Sex                                            |                 |               |                       |      |        |        |
| Male                                           | 33              | 15 (25%)      | 18 (30%)              |      | .376   | .540   |
| Female                                         | 87              | 45 (75%)      | 42 (70%)              |      |        |        |
| Length of operation (min)                      | 127.2 ± 35.3    | 122.5 ± 32.1  | 131.8 ± 37.8          | 1.444|        | .151   |
| Diagnosis                                      |                 |               |                       |      |        |        |
| Thyroid papillary carcinoma                    | 87 (72.5%)      | 41 (68.3%)    | 46 (76.7%)            |      | 2.327  | .312   |
| Follicular thyroid carcinoma                   | 8 (6.7%)        | 6 (10.0%)     | 2 (3.3%)              |      |        |        |
| Nodular goiter                                 | 25 (20.8%)      | 13 (21.7%)    | 12 (20.0%)            |      |        |        |
| Surgery                                        |                 |               |                       |      |        |        |
| Hemithyroidectomy + neck dissections           | 74 (61.7%)      | 37 (61.7%)    | 37 (61.7%)            |      | .448   | .930   |
| Total thyroidectomy + neck dissections         | 21 (17.5%)      | 10 (16.7%)    | 11 (18.3%)            |      |        |        |
| Hemithyroidectomy                              | 20 (16.7%)      | 11 (18.3%)    | 9 (15.0%)             |      |        |        |
| Total thyroidectomy                            | 5 (4.2%)        | 2 (3.3%)      | 3 (5.0%)              |      |        |        |
| Smoking history                                |                 |               |                       |      |        |        |
| Yes                                           | 10              | 3 (5%)        | 7 (11.67%)            |      | 1.745  | .186   |
| No                                            | 110             | 57 (95%)      | 53 (88.33%)           |      |        |        |
comfort and satisfaction. A multidisciplinary team, including anesthesiologists, surgeons, nurses, and pharmacists, are recommended for pain management.3

Overall, a more scientific and comprehensive ERAS nursing care plan for thyroidectomy patients can be developed using the Delphi method.

**Applying ERAS Nursing Care Plan to Thyroidectomy Patients**

Herein, we evaluated the outcomes of the novel ERAS nursing care plan by a non-randomized controlled trial. Statistical results indicated that pain scores, length of stay, and hospital costs for the ERAS group were lower than those for the conventional group. Also, on postoperative day 1, the Barthel index score for the ERAS group was high.

Optimal perioperative patient care is of the utmost importance to ensure that the recovery period is efficiently and effectively managed in an effort to provide the best possible outcome for the patient.14 Patients had sufficient psychological preparation and good physiological conditions in ERAS group. Preoperative education is probably a useful intervention because the psychosocial aspects of undergoing surgery are believed to have an important impact on clinical outcomes.14

Fluid restriction and adequate analgesia are the key factors that determine the fast-track program’s outcome, that is, reduced rate of postoperative complications and length of hospital stay.15 Perioperative intravenous fluid management is thought to be an important step in the surgical journey. The literature indicates that in patients undergoing head and neck cancer surgery large amounts of intraoperative fluids are associated with increased complications.16 As reported in similar study,10 the pain scores of ERAS group were significantly lower than that of the conventional group. Pain management is a significant aspect when applying an ERAS approach. The aim of an optimal analgesic technique should be to facilitate early ambulation and physical therapy.17 Non-steroidal anti-inflammatory drugs (NSAIDs) are a vital component of opioid-sparing regimes in which these drugs indirectly reduce pain by inhibiting inflammation.18 While the ideal multimodal regimen remains to be determined, it is clear that multimodal analgesic therapy has significant benefits over opiate therapy alone.19 Sore throat is common symptom for thyroidectomy due to intraoperative anesthesia intubation. Patients were advised to drink cold water or take medicine such as watermelon frost lozenge to help relieve sore throat.

Postoperative complications included hypocalcemia, vocal hoarseness, nausea, and vomit in this study. No difference was detected in the postoperative complications rate. This showed that ERAS care plan did not increase the risk of postoperative complications after thyroidectomy.

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**Table 5.** Nursing care plan for 2 groups patients.

|                  | ERAS Group                                           | Conventional Group                                    |
|------------------|------------------------------------------------------|-------------------------------------------------------|
| **Preoperative** | Fast for 6 h                                          | Fasting at 8 pm and no drinking at 10 pm before surgery |
|                  | Drink carbohydrate 2-3 h before anesthesia           | 5%GS, 5%GNS 500-1000 mL intravenous infusion           |
|                  | Health education under the guidance of ERAS concept  | Health education                                       |
| **Intraoperative**| Control the amount of intravenous infusion within 1000 mL | No fluid management                                    |
| **Postoperative** | Sit on bed 2 h postoperative                         | Sit on bed 6 h postoperative                          |
|                  | Get out of bed 6 h postoperative                     | Drink water 6 h after surgery                         |
|                  | Drink water 2 h after surgery                        | Pain assessment                                       |
|                  | Pain assessment                                      | Medication if necessary                               |
|                  | Medication if necessary                               | Improvement in the analgesic effect                    |

**Table 6.** Comparison of postoperative outcomes.

| Postoperative Outcomes | ERAS (n=60) | Conventional (n = 60) | T   | χ²  | P    |
|------------------------|-------------|-----------------------|-----|-----|------|
| Pain scores            | 2.17±.59    | 2.78±.35              | 6.950| —   | .000a|
| Barthel index score    | 41.50±11.58 | 23.53±4.01            | 11.359| .000a|
| Length of stay         | 1.03±.18    | 3.40±1.06             | 17.034| .000a|
| Hospital costs         | 10204.75±2118.65 | 12449.15±2088.30 | 5.844| .000a|
| Postoperative complications | 17 (28.3) | 9 (15.0)              | 3.142| .076|
| Hypocalcemia (%)       | 8 (13.3)    | 3 (5.0)               | 2.502| .114|
| Nausea and Vomit (%)   | 2 (3.3)     | 0                     | 2.034| .154|
| Vocal Hoarseness (%)   | 12 (20.0)   | 6 (10.0)              | 2.353| .125|

*P<.001.
Hospitalization days and hospitalization costs in the ERAS group were significantly lower than those in the conventional group in this study. The number of hospitalization days in the ERAS group was 1.03 ± 0.18 days and 3.40 ± 1.06 days in the conventional group. Also, the hospitalization cost (10204.75 ± 2118.65 RMB) of the ERAS group was much lower than that of the conventional group. ERAS is an excellent example of value based surgery. Reports from many different surgery types show that implementation of ERAS reduces complications and shortens hospital stay. These improvements have major impacts on reducing the cost of care even when costs for implementation, and investment in time for personnel and training is accounted for. ERAS is cost-effective and can help ease the healthcare burden.

Quality-focused, cost-effective, patient-centered care is at the forefront of current healthcare reform. Based on this nursing care plan, healthcare professionals can guide their patients to prepare themselves physically and psychologically before the procedure. Also, clear expectations or benchmarks have been established, indicating that an agreed protocol is in place for a multidisciplinary team to follow.

**Limitations**

This study of an ERAS nursing care plan was deemed safe, reliable, and useful for patients who underwent thyroid surgeries. However, the nurses are required to notice the varied needs of the individuals during patient-centered care. Thus, local protocols may be necessary to ensure that the variance is recorded.

**Conclusions**

The above ERAS nursing care plan for thyroidectomy patients was verified as a scientific and reliable model to enhance recovery. It effectuated reduced incidence of postoperative stress reactions, shortened length of stay, and lowered hospitalization costs, thereby providing some socioeconomic benefits.

**Declaration of Conflicting Interests**

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