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Prevention of underfeeding during enteral nutrition after gastrectomy in adult patients with gastric cancer: an evidence utilization project

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ABSTRACT

Background: Enteral nutrition is commonly used in patients with gastric cancer after a partial or full gastrectomy since it is safe to use and nutrient delivery is in line with human physiological characteristics. However, enteral feeding often leads to deficiency, when the actual intake of the patient is lower than the target demand, which seriously affects the recovery of patients.

Objective: To implement the best practice for preventing and managing underfeeding during enteral nutrition, and to improve the nutritional status of patients with gastric cancer.

Methods: The current study was conducted following the Joanna Briggs Institute Practical Application of Clinical Evidence System program. Phase one referred to the development of the project, consisting of the generation of the best evidence, mainly based on literature review and discussions within a panel of experts. Phase two was the implementation of the project, including baseline audit, training of enteral nutrition and change of clinical practice. Phase three was a postimplementation reaudit. The intake of enteral nutrition was observed in the first 3 days, and feeding intolerance of enteral nutrition was observed within the first week of enteral nutrition. Data were collected using self-designed questionnaires. The nutritional status of patients was measured using Patient-Generated Subjective Global Assessment (PG-SGA) at admission, and 1 week after surgery.

Results: A total of 60 patients with gastric cancer and 10 registered nurses were enrolled in this study. The compliance rate for all audit criteria increased postimplementation. The feeding rate of enteral nutrition postimplementation was higher than the baseline audit on the third day, 54.29% (± 12.01) vs. 42.89% (± 10.63), and the incidence of underfeeding was lower (30%, $n = 30$) than the baseline audit (76.67%, $n = 30$). Furthermore, the feeding intolerance postimplementation (26.67%, $n = 30$) was lower than the baseline audit (76.67%, $n = 30$) within 1 week of enteral nutrition. The PG-SGA scores were not significantly different between the baseline audit and postimplementation on the day of admission, while the scores were lower postimplementation (12.90 ± 1.47) compared with the baseline audit (14.00 ± 1.82).

Conclusion: In this study, we performed an audit of the clinical nursing quality, which can guide nurses to accurately identify obstacles to the implementation of enteral nutrition, and standardize the implementation and management process, thereby improving the quality of nursing and the nutritional status of patients.

Relevance to clinical practice: The evidence-based practice might optimize the enteral nutrition process, enhance the efficacy of enteral nutrition, and improve the nutritional status of patients. Medical staff should develop an individualized nutritional support protocol for patients based on the results of nutritional status assessments.

Key words: enteral nutrition, evidence-based nursing, gastric cancer, underfeeding

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What is known about the topic?

- There is a higher incidence of malnutrition in patients with gastric cancer during hospitalization, and there is a need for artificial nutritional support.
- Enteral nutrition represents a critical nursing practice for patients with gastric cancer, but underfeeding affects efficacy.
- A reasonable and effective enteral nutrition process is essential for patients.

What does this article add?

- Implementing an evidence utilization project about prevention of underfeeding following the process of audit and feedback can align current practice with best practice recommendations.
- The PG-SGA can be successfully applied in the nutrition assessment and intervention of the patient with gastric cancer by the nursing information system.
- Completed the nutrition intervention by a multidisciplinary team including the doctor, the nurse and the dietician. A consistent and agreed approach from all members of the multidisciplinary team is required to achieve optimal enteral feeding technology, assessment and management of the nutrition and solve the barriers of evidence in clinical transformation to optimize the enteral delivery of calories.

Background

Gastric cancer is one of the most common gastrointestinal malignancies in the world,^{1,2} which are the second highest cause of malignancy-related mortality in China, which seriously threatens the life and health of humans.³ The primary treatment is the surgery-based comprehensive treatment for gastric cancer at present.⁴ However, gastric cancer patients commonly suffer from varying degrees of malnutrition due to the high metabolic demand of the preoperative tumor, postoperative fasting, surgical trauma, and postoperative complications. It has been reported that 40.0–70.5% of patients with gastric cancer are at risk of malnutrition in China.^{3,5} Proper perioperative nutritional intervention has positive effects on postoperative recovery of disease in malnourished patients with gastric cancer.⁶

Enteral nutrition is absorbed through either the remaining portion of the stomach (for partial gastrectomy) or the small intestine before it reaches the liver, and metabolism is in line with the physiological characteristics of the body, which is beneficial to the synthesis and metabolic regulation of visceral proteins in patients.⁷ Early enteral nutrition support can protect the integrity of gastrointestinal mucosa and enhance the immune function of patients.⁸ Therefore, for patients who have a functional gastrointestinal tract after surgery and are able to tolerate enteral nutrition, enteral nutrition alone, or with parenteral nutrition, is recommended in the clinic as the enteral route is commonly utilized for nutritional support, which can improve patient health and wellbeing.⁴

The European Society of Parenteral and Enteral Nutrition (ESPEN) clinical practice guidelines suggest that patients who undergo gastrointestinal tumor surgery should start enteral nutrition within 24 h after surgery,^{1,9} the energy requirements of surgical patients are 25–

30 kcal/kg/day,¹ and patients should receive 50–65% of the goal energy demand by enteral support in the first week to obtain beneficial clinical results.¹⁰ Similarly, the project ‘Accelerating Total Postoperative Recovery’ proposed that surgical patients should receive at least 30 kcal/kg/day during enteral nutrition to meet their needs.¹¹ So, underfeeding was defined as the patient’s intake being less than 60% of the target energy demand (30 kcal/kg/day) from the start to the third day of enteral nutrition in this study. However, given the risk of aspiration, patients are required to fast long-term after surgery and delay the initiation of enteral nutrition. Studies have shown that most patients with gastric cancer start enteral nutrition between 24 and 120 h after surgery, while only 14.67% of patients start enteral nutrition at 24 h after surgery.¹² Thus, the incidence of underfeeding is high, with an incidence of 79.27% in gastric cancer patients after surgery in China.¹³

Multiple factors contribute to this deficiency. Due to the change of the gastrointestinal tract’s anatomical structure, the gastrointestinal function is not fully recovered in the early postoperative period, and the use of inappropriate nutritional formulation and poor feeding techniques cause intolerance of enteral nutrition. The incidence of feeding intolerance during enteral nutrition is 68%, such as abdominal pain, bloating, nausea, and vomiting,¹⁴ which hinders increases in the rate of enteral nutrition infusion, and is the main reason for underfeeding. In addition, a study found that enteral nutrition administered as a continuous infusion by peristaltic pumps may lead to high gastric residual volumes (GRV) in patients, which affect the ability of the patient to achieve the target demand of energy.¹⁵ In addition, the energy requirement of patients with gastric cancer is affected by the patient’s bodyweight. However, doctors rarely determine the individualized dose of enteral nutrition based on the body weight or increase the dose of enteral nutrition in time, resulting in inadequate nutrition.¹⁶

Underfeeding is associated with harmful clinical outcomes such as infections, pressure ulcers, slower wound healing, and prolonged hospital stays.¹⁷ Previous studies proposed systematic intervention based on the best evidence, including the positioning management of patients, reasonable adjustment of the infusion rate, control of the temperature of the nutrient solution, and monitoring of the GRV.¹⁸ However, summaries of the best evidence are not comprehensive, and there are certain deficiencies in the methodology of evidence-based nursing practice. Therefore, there is a need for improving the process management of enteral nutrition on the basis of multidisciplinary cooperation through the synthesis and transformation of the best evidence, and developing the optimal nutritional support protocol

through scientific nutrition assessment to feeding individually according to the nutritional demand of patients, and patient acceptance also requires consideration.

The Joanna Briggs Institute (JBI) model for evidence-based healthcare includes four key contributing domains: generating the evidence from a research study, evaluating and synthesizing the evidence, transfer of the evidence to the clinic, care providers, and practitioners, and use of the best evidence in everyday practice. This provides a framework of evidence-based practice, which considers that all forms of credible evidence should be critically considered and combined with patient preference, where appropriate, to address questions in practice of meaningfulness, appropriateness and feasibility.¹⁹ Similarly, evidence-based practice in China is considered as the process of clinical decision-making which should be based on the best available evidence and patient preferences, the context of the healthcare system, and the professional judgment of the clinician.^{20,21} Therefore, we developed and applied a systematic and appropriate evidence-based nursing practice project based on the JBI model to verify the effect of the best evidence summary and transformation on improving the quality of nursing, and the ultimate aim to prevent underfeeding of enteral nutrition in patients with gastric cancer and improve their nutritional status. It is worth noting that this project fits within the evidence implementation component of the model.

Methods

Study design

The current study was conducted through clinical audit and feedback which was supported by the JBI Practical Application of Clinical Evidence System program (PACES), and following the five steps. The first step of this program is to identify the practice topic and establish the project team, retrieving the best available evidence to inform the project protocol development. Second, review practice against evidence-based audit criteria. Third, identify strategies for Getting Research into Practice (GRiP), and fourth, implement changes in the clinical protocol. Lastly, reassess the new practice using a follow-up audit. This study was carried out from January 2018 to July 2018.

Study procedures

Phase one: Identification of the topic and establishment of the project team

The topic of this project was prevention of underfeeding during enteral nutrition after gastrectomy in adult patients with gastric cancer. The topic was identified through direct observation of the practices of both the

medical and nursing teams. The team selected this topic as the incidence of underfeeding during enteral nutrition was 50% due to inappropriate feeding methods and nutrition management in the gastrointestinal surgery department from the period of October 2017 to December 2017. Therefore, preventing underfeeding of patients and improving their nutritional status is the primary goal of the department. In this study, key stakeholders, including patients, nurses, physicians, and dietitians, were informed before the project to gain their support and approval for implementation. The project team consisted of six members, including one senior nurse educator, one dietitian, and four registered nurses. A senior nurse educator led the team, and all members participated in the development and implementation of the project.

Phase two: Baseline audit

The team searched the JBI Database of Recommended Practice²² and guidelines developed by ESPEN and the American Society of Parenteral and Enteral Nutrition^{1,9,12,23} to identify audit criteria based on best practice recommendations and the level of evidence related to underfeeding in enteral nutrition. Recommendations in the JBI Recommended Practice were graded based on both the level of evidence that supports them and their clinical appropriateness. In this study, thirteen experts were invited, including three clinicians (one MSc and two PhD) and 10 nurses (two MSc and eight BSc), to evaluate the feasibility, appropriateness, meaningfulness, and effectiveness of the evidence and constructed eight audit criteria. The audit criteria used in the project, together with a description of the sample and the method to assess compliance with best practice for each audit criterion, are shown in Table 1.

The baseline audit was conducted by a quality control nurse and a researcher from April 2018 to May 2018 for 2 months, according to the audit criteria. The purpose of the baseline audit was to assess the efficacy of existing enteral nutrition nursing practice and processes, and to identify the practice gaps and obstacles in the application of evidence. During the baseline audit, the auditor observed each enteral nutrition nursing procedure, the incidence of underfeeding, and the nutritional status of gastric cancer patients in the ward. The auditor recorded the baseline results on the printed audit list and keyed them into the JBI PACES program upon completion of the baseline audit. The audit team analyzed the medical resources, the knowledge and attitude of nurses, feeding technology support, and so on to identify the barriers and developed strategies by using the JBI GRiP program.

Table 1. Audit criteria and the method to measure compliance

Audit criterion	Audit respondents	Method to measure compliance
(1) Patients were assessed for nutritional status after admission and 1 week after EN by the nurse or dietitian (1b, A)	Baseline audit: 30 patients Postimplementation: 30 patients	The quality control nurse checked the PG-SGA and nursing records
(2) The nurse records the time EN was started after surgery, the daily energy intake, and the incidence of underfeeding (1b, A)	Baseline audit: 10 nurses Postimplementation: 10 nurses	The quality control nurse checked the nursing records
(3) During the EN and 1 h after EN, raise the head-of-bed position of patients to 30–45° (1a, A)	Baseline audit: 30 patients Postimplementation: 30 patients	The quality control nurse conducts on-site observation
(4) Using the clip-heater during EN to ensure the temperature of the nutrient solution is between 38 and 40 °C (1b, A)	Baseline audit: 30 patients Postimplementation: 30 patients	The quality control nurse conducts on-site observation
(5) The nurse receives education on how to prevent underfeeding in EN (3b, B)	Baseline audit: 10 nurses Postimplementation: 10 nurses	Nurses were asked if they had received training to prevent underfeeding in EN previously
(6) Patients were encouraged and guided to perform functional exercise, including chewing gum and abdominal massage 1 day after surgery (1a, A)	Baseline audit: 30 patients Postimplementation: 30 patients	The audit team interviewed patients or caregivers and observed patients' performance
(7) Patients received feeding intolerance prophylaxis management, including the evaluation of the feeding intolerance and GRV every 4 h during EN, and use prokinetic medication or antidiarrheal if necessary (3a, B)	Baseline audit: 30 patients Postimplementation: 30 patients	The audit team interviewed patients or caregivers and audit the treatment and nursing records
(8) The nurse conducts early EN health education for the patient, informs them about the benefits and precautions to be taken for EN, and establishes a non-verbal communication strategy (3b, B)	Baseline audit: 30 patients Postimplementation: 30 patients	The audit team interviewed patients or caregivers

EN, enteral nutrition; GRV, gastric residual volumes; PG-SGA, Patient-Generated Subjective Global Assessment.

Phase three: Strategies for getting research into practice

We identified five barriers to conduct the evidence-based practice during the baseline audit and identified strategies designed to overcome them described in detail below (Table 2).

Barrier 1: The time a nurse has to carry out an evidence-based practice cannot be guaranteed due to understaffing and heavy workload and is limited by physicians to a certain extent.

Strategy: A multidisciplinary cooperation group was established with the support of the hospital and department leaders to ensure the successful and effective implementation of the project. There were 15 members with different roles and responsibilities, including three physicians, 10 nurses, and two dietitians.

Barrier 2: The lack of knowledge of nurses on the prevention and management of underfeeding in enteral nutrition.

Strategy: Conduct training on the prevention and management of underfeeding in enteral nutrition

for nurses, explain the meaning of each best evidence item and the method to implement, and carry out a knowledge test by a self-designed test questionnaire. Those who scored 90 or more will be deemed qualified.

Barrier 3: The department lacks a nutritional assessment stool.

Strategy: The Patient-Generated Subjective Global Assessment (PG-SGA) was selected as the nutritional assessment scale and included in the computer system.

Barrier 4: The department lacks a complete functional exercise protocol, and nurses usually just inform the patients orally to perform the functional exercises but lack the operability guidance on how to conduct it, so nurses did not actually guide patients to do it specifically.

Strategy: Develop a standardized functional exercise protocol, including lip breathing, hip lifting, oral mastication, and lower limb movements, and transmit the video, picture and text of it to patients via WeChat through the mobile phone, after which they were guided and trained on site by the responsible nurses.

Table 2. Getting Research into Practice strategies

Barrier	Strategy	Resources	Outcomes
(1) The time a nurse has to carry out evidence-based practice cannot be guaranteed	Established a multidisciplinary cooperation group	✓ Support of the management department	Successful implementation of the project
(2) Lack of knowledge about prevention and management of underfeeding in EN	Implement an education and training program	✓ Guidelines ✓ Training meeting	Increase knowledge about the prevention of underfeeding in EN
(3) Absence of a nutritional risk assessment scale	Selection of a nutritional risk assessment scale: PG-SGA	✓ Team meeting ✓ Computer system ✓ Paper support	Inclusion of PG-SGA in computer system achieved
(4) Lack of a complete functional exercise protocol	Develop and implement a new protocol	✓ Printing protocol ✓ Transmitted to patients through WeChat	Functional exercise protocol instituted
(5) Low participation and cooperation of patients	Carry out health education	✓ Meetings ✓ The health education manual	Increase the compliance of patients

EN, enteral nutrition; PG-SGA, Patient-Generated Subjective Global Assessment.

Barrier 5: Low treatment adherence of some patients due to suffering from discomfort and anxiety caused by early enteral nutrition.

Strategy: Compile the health education manual of enteral nutrition and transmit it to patients via WeChat, then the responsible nurse introduces the benefits of early enteral nutrition face to face, including to promote the recovery of gastrointestinal function and improve their postoperative nutritional status, and reduce their medical expenses, and encourages patients to express their discomfort and requirement, so as to promote patients to better receive enteral nutrition.

Phase four: Implementation of the changed protocol

Setting: The current protocol was carried out in a gastrointestinal surgery department in a public and university-affiliated hospital in a central city in China, which has admission rates of 15–20 patients per month for a gastrectomy.

Sample: We recruited 60 patients with gastric cancer and 10 nurses by using convenience sample methods. The sample size was determined according to the calculation formula of experimental research. Patients admitted to the hospital from April to May 2018 were recruited as the baseline audit group, and those admitted to the hospital from June to July 2018 were assessed as the implementation group. Patients were eligible if they met the following conditions: first, diagnosed with gastric cancer and scheduled for a gastrectomy; second, older than 18 years; third, no disturbance of consciousness, have normal reading or verbal ability; fourth, indwelled with a nasointestinal tube (Nutricia, Schiphol, the

Netherlands) after surgery, and planned to receive enteral nutrition for more than 3 days. The exclusion criteria of patients were as follows: first, patients with pleural effusion, severe edema and limb insufficiency; second, incomplete collection of data due to a transfer or death; third, patients who received enteral nutrition and parenteral nutrition simultaneously after surgery. For nurses to be eligible, the criteria included: first, being a registered nurse; second, have more than 3 years of nursing experience. Nurses unable to continue participating in the study were excluded.

The protocol was implemented by the multidisciplinary team based on the best evidence from the admission of patients to 1 week after the surgery. Strategies to reduce barriers were followed to deal with problems encountered during the implementation of the project.

Standard practice of nutrition assessment and management: The dietitian or nurse used PG-SGA to assess the nutritional status of the patient when the patient was admitted to the hospital. The doctor informed patients with malnutrition about nutritional support and then reassessed once a week. At 48 h after surgery, the physician provided the patient with enteral nutrition suspension (short peptide, Nutricia) by calculating the target demand of the patient at 30 kcal/kg/day. In the meantime, the nurse was involved in the management of the infusion position, temperature, and speed, as well as nursing of the nutrition tube, psychological nursing, and health education of enteral nutrition, which was based on the best evidence. At the same time, nurses regularly (every 4–8 h) monitored whether patients had feeding intolerance. If a patient suffered from feeding intolerance, the nurse informed the physician to carry out the corresponding treatment based on the symptoms, or the

speed of enteral nutrition could be increased 10–20 ml/h the next day. Moreover, nurses monitored the patient's daily intake of enteral nutrition and assessed whether they achieved 60% of the target demand on the third day of enteral nutrition.

Tested practice of early functional exercise: The nurse guided patients to perform functional exercise early by providing the protocol to them via WeChat combined with an oral explanation. Patients performed lip breathing, hip lifting, and started to chew gum on the first day after surgery until release from the hospital. Furthermore, patients underwent a small range of stretching exercises on the bed on the first day after surgery, and the nurse assisted the patient to sit up and perform some simple bedside activities on the second day after the operation, and assisted the patient to walk on the third to fifth day after the operation. One week after surgery, patients performed a wide range of exercises, such as going up and down on stairs.

Phase five: Reassess practice using the postimplementation audit

In this phase, the audit team used the same method as in the baseline audit to conduct the postimplementation audit from June 2018 to July 2018. The team leader was responsible for quality control during the audit process. The project team members collated and analyzed the baseline and postimplementation audit results according to the JBI PACES.

Instruments

Nutritional status

A trained nurse or dietitian used the PG-SGA to assess the nutritional status of patients at admission and after 1 week of enteral nutrition. The data were extracted by one researcher, and another researcher checked and confirmed the data. The PG-SGA was developed by Ottery's modification of the SGA,²⁴ which is specifically used for nutritional assessment of patients with malignant tumors and is recommended by the American Dietetic Association as the preferred nutritional assessment tool for patients with cancer, which requires the patient's self-assessment of recent nutritional status and the professional and qualitative evaluation of the medical and health care staff based on the clinical symptoms. This tool can evaluate the nutritional status of patients dynamically and repeatedly.²⁵ The PG-SGA consists of two parts, which are self-assessment by patients that includes weight changes, diet, symptoms, and physical condition, and the assessment of medical staff that includes diseases, stress states, and physical examinations. The total score is the sum of the two parts, with

scores of 0–3 referring to good nutritional status, scores from 4 to 8 to moderate malnutrition, and scores over 8 to severe malnutrition. The total score determines whether the patient requires nutritional intervention. It can help medical staff develop a nutritional support protocol and provide nutritional support for patients on time.

Intake of enteral nutrition

A researcher used our self-designed questionnaire to investigate the patient's intake of enteral nutrition from the initiation to 1 week of enteral nutrition, including the time of starting enteral nutrition, the daily rate of enteral nutrition infusion, daily target demand of patients and actual intake of enteral nutrition, and the occurrence of enteral nutrition feeding intolerance such as bloating, abdominal pain, diarrhea, nausea, vomiting. Underfeeding was defined as the patient's intake being less than 60% of the target energy demand (30 kcal/kg/day) from the start to the third day of enteral nutrition.

Data analysis

Data were analyzed using SPSS Statistics version 22.0 software (IBM, Armonk, New York, USA). Descriptive statistics were used to summarize demographic data (i.e., means, percentages, SDs). Patients' start time of enteral nutrition, the intake of enteral nutrition, and the scores of PG-SGA were compared among the two groups using a *t* test. To analyze the differences between two groups (i.e., the surgical methods, cases of underfeeding of enteral nutrition, and cases of enteral nutrition feeding intolerance), the *Chi-square* test was used. *P* less than 0.05 was regarded as statistically significant.

Results

Samples' demographics

Table 3 displays the demographic data of patients. A total of 60 participants were recruited, and there were no patient transfers to other hospitals or deaths in both groups. Ages ranged from 26 to 82 years, with a mean age of 62 years. Most participants (65%) were male. Of the 60 participants, 42 (70%) underwent distal gastrectomy, nine (15%) underwent proximal gastrectomy, and nine (15%) underwent total gastrectomy. There were no significant differences in age, sex, BMI, nutritional scores, and surgical methods between the two groups ($P > 0.05$).

Postimplementation audit result

The compliance for the audit criteria at the baseline and postimplementation audit is shown in Fig. 1. Criteria 1, 2, and 7 improved from 0 to 100%, criteria 3 and 4

Table 3. Demographic data (n = 60)

Characteristic	Postimplementation, n = 30	Baseline audit, n = 30	t/ χ^2 Value	P value
Sex				
Male/Female	19/11	20/10	0.073	0.787
Age	60.53 ± 13.49	63.17 ± 11.29	-0.820	0.416
BMI (kg/m ²)	22.74 ± 2.62	23.43 ± 3.42	-1.177	0.242
PG-SGA scores	5.70 ± 2.70	6.60 ± 1.75	-1.817	0.074
Surgical methods				
DG	22	20	3.873	0.144
PG	6	3		
TG	2	7		

DG, distal gastrectomy; PG, proximal gastrectomy; PG-SGA, Patient-Generated Subjective Global Assessment; TG, total gastrectomy.

increased from 80 to 100%, criterion 5 improved from 20 to 90%, criterion 6 increased from 0 to 80%, and criterion 8 improved from 80 to 100%.

The start time of enteral nutrition

The postoperative fasting time of patients at postimplementation was shortened, and patients began enteral nutrition at the average of 56.00 (±11.51)h after the surgery, which was significantly earlier than that at the baseline audit 75.20 (±15.09, *P* < 0.05).

Intake of enteral nutrition

After the implementation of the protocol, there were no significant differences in the intake of enteral nutrition between the two groups during the first 2 days. However, the intake of enteral nutrition postimplementation was higher than at the baseline audit on the third day, with a lower incidence of underfeeding. Feeding intolerance

was also lower postimplementation within 1 week of enteral nutrition (Table 4).

Nutritional status

The PG-SGA scores were not significantly different between the two groups on the day of admission (Table 5). The PG-SGA scores of the two groups were more than 8 at 1 week after surgery, but it was lower in the postimplementation 5.70 (±2.07) compared with the baseline audit 6.60 (±1.75, *P* < 0.05). The details are displayed in Table 6.

Discussion

Currently, gastrectomy is the most effective treatment for gastric cancer patients. Early enteral nutrition support after surgery can provide the necessary energy and nutrients for patients. The ESPEN clinical practice guidelines recommend that patients with a gastrointestinal

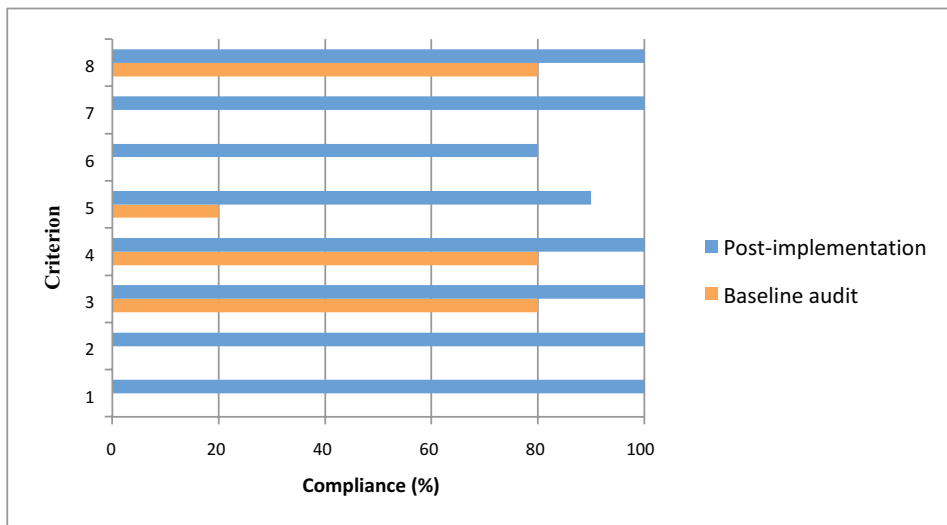


Figure 1. Compliance in postimplementation audit compared with baseline audit.

Table 4. Intake of enteral nutrition

Category	Postimplementation, <i>n</i> = 30	Baseline audit, <i>n</i> = 30	<i>t</i> / χ^2 Value	<i>P</i> value
Intake of EN (%)				
The first day	28.12 ± 4.98	27.34 ± 5.68	0.563	0.576
The second day	33.87 ± 10.27	31.18 ± 8.71	1.092	0.279
The third day	54.29 ± 12.01	42.89 ± 10.63	3.894	0.000
Underfeeding of EN, <i>n</i>	9	23	13.125	0.000
Feeding intolerance, <i>n</i>	8	23	11.382	0.003
Abdominal pain/Bloating	2	11	7.954	0.005
Diarrhea	2	5	1.456	0.228
Nausea	4	5	0.131	0.718
Vomiting	0	2	2.069	0.150

EN, enteral nutrition.

Table 5. Comparison of preoperative Patient-Generated Subjective Global Assessment scores between two groups

Characteristics	Postimplementation, <i>n</i> = 30	Baseline audit, <i>n</i> = 30	<i>t</i> Value	<i>P</i> value
Total scores	5.70 ± 2.07	6.60 ± 1.75	−1.817	0.074
Self-assessment of patients	2.87 ± 1.55	3.53 ± 1.50	−1.693	0.096
Diseases	1.33 ± 0.48	1.50 ± 0.51	−1.306	0.197
Stress states	0.30 ± 0.47	0.33 ± 0.48	−0.273	0.786
Physical examinations	1.20 ± 0.55	1.23 ± 0.77	−0.192	0.848

tumor should receive enteral nutrition within 24 h after surgery,¹ and previous research confirmed that early enteral nutrition after surgery is beneficial to improve the clinical outcome.⁴ However, there may be gaps between practice and evidence due to different baseline characteristics of patients, medical resources, human resources, and other conditions in different countries or regions. In this study, the experience and judgment of professionals in the clinic and the patient's preferences were combined for reasonable decision making. Considering that the time of surgery is inconsistent among different patients, due to the relatively long time of surgery, some patients may return to the ward in the evening or even later. However, doctors generally prescribe according to the patient's condition after the consultation in the morning. For these patients, the doctor will continue to observe for a period of time, and will not start enteral nutrition temporarily, and

usually starting on the second day after the operation. Thus, in this study, the time to start enteral nutrition is uniformly specified within 48 h after surgery to ensure that all patients can start enteral nutrition early. In addition, during the baseline audit, we found that patients and their families have a low degree of cooperation for enteral nutrition. The reason for this may be that patients and families have little knowledge of enteral nutrition and are not familiar with the procedure. To improve the patient's willingness to implement the project, a nurse fully informed patients and their families of the specific process of enteral nutrition support, detailed knowledge of enteral nutrition, and functional exercise methods through WeChat and oral explanation.

Patients with gastric cancer must temporarily fast after surgery, which has a severe impact on the recovery. The current study showed that patients usually have a long period of fasting before they receive enteral

Table 6. Comparison of postoperative Patient-Generated Subjective Global Assessment scores between two groups

Characteristics	Postimplementation, <i>n</i> = 30	Baseline audit, <i>n</i> = 30	<i>t</i> Value	<i>P</i> value
Total scores	12.90 ± 1.47	14.00 ± 1.82	−2.576	0.013
Self-assessment of patients	9.13 ± 1.14	9.90 ± 1.24	−2.495	0.015
Diseases	2.27 ± 0.45	2.50 ± 0.51	−1.882	0.065
Stress states	0.33 ± 0.48	0.47 ± 0.63	−0.924	0.036
Physical examinations	1.17 ± 0.46	1.20 ± 0.81	−0.197	0.845

nutrition support, which may easily lead to underfeeding, and results in increased risk of undernutrition.²⁶ In this study, all patients in the study group began enteral nutrition at 48–72 h after surgery, which was significantly sooner than the control group. This may be due to the nursing procedure of enteral nutrition determined in this project, and the medical staff's awareness of starting early enteral nutrition, resulting in a shortening of the postoperative fasting time of patients. However, there is still a gap between the ideal time of starting enteral nutrition and that achieved in this study.

At least 50–65% of the goal calories demand should be provided for patients, and target rates for enteral nutrition should be reached within 48–72 h after surgery to improve nutritional status.²⁷ In this study, the study group patients' average intake of enteral nutrition on the third day achieved 54.29% (± 12.01) of the target demand, which was closer to the optimal target, and the incidence of enteral nutrition underfeeding was lower than that in the control group. As the study provided relevant education and training for nurses, the knowledge level and evidence-based practice compliance of nurses were improved. This resulted in increased recognition of the importance of preventing inadequate feeding. In the study group, the nurse guided patients to start early functional exercises to promote the recovery of the gastrointestinal function as soon as possible to avoid the occurrence of enteral nutrition intolerance. Moreover, the physician determined the daily dose of enteral nutrition based on the energy demand of patients and increased the amount of feeding gradually, thus ensuring the intake of enteral nutrition. However, there was no difference in the intake of enteral nutrition between the two groups during the first 2 days, excluding patients with suspension of enteral nutrition due to severe enteral nutrition intolerance.

Studies have shown that the PG-SGA is a good indicator of the patient's nutritional status, and it is superior to the NRS-2002 for nutritional risk screening for gastric cancer patients.²⁸ In this study, 60 patients had malnutrition before surgery, indicating that most gastric cancer patients have poor nutritional status going into surgery. The PG-SGA scores of the two groups were above 8 at 1 week after surgery, indicating that surgery directly affected the nutritional status, requiring adequate and effective nutritional support. However, the postoperative PG-SGA scores of the control group were higher than the study group, which may be because the overall nutritional intake of the patients in the study group was higher than that of the control group after the implementation of the project. The nutritional status of

patients improved significantly, which was conducive to the recovery of patients after surgery.

Limitations

Our study had a few limitations. First, the evidence-based nursing practice project was only implemented in a gastrointestinal surgery department of a tertiary hospital, which may limit the promotion of research results. Second, follow-up monitoring of patients was not performed in this study, and the long-term effect of the project requires further study. Third, the sample size of the study was small, which may cause contingent results. In this study, only one round of audit was conducted after the application of evidence. But the compliance rate of some audit criteria still did not reach the ideal state. In the future, the cause of this problem can be analyzed and new solutions can be formulated to conduct a new round of audit. In addition, this study only monitored the nutritional status of patients during hospitalization, and follow-up investigations can be carried out to evaluate the continued effect of evidence-based practice.

Conclusion

Adequate and effective enteral nutrition support is essential for gastric cancer patients. This project used the process of a baseline audit and reaudit cycle as a strategy to improve clinical practice. We demonstrate the feasibility of transforming evidence into the clinic, with significant improvement in preventing underfeeding of enteral nutrition in patients with gastric cancer. This could improve the therapeutic effect of enteral nutrition as well as the nutritional status of patients.

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Conflicts of interest

The authors report no conflicts of interest.

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