Wiley
European Journal of Cancer Care
Volume 2025, Article ID 4179990, 11 pages
https://doi.org/10.1155/ecc/4179990

WILEY

Research Article

Decisional Conflict Regarding Perioperative Oral Nutritional Supplementation in Gastric Cancer Patients Based on a Random Forest Model: A Cross-Sectional Study

Ni Yang[1], **Yuan Xu**[2], **Shuli Guo**[3], **Haiyan Hou**[3], **Ying Liu**[3], **Ge Liu**[4], **Xinyi Zhou**[1] and **Yufen Ma**[5]

[1]*Department of Nursing, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China*
[2]*Department of Health and Medical Care, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China*
[3]*Department of General Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China*
[4]*Department of International Medical Services, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China*
[5]*Department of Trade Union, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China*

Correspondence should be addressed to Yufen Ma; yumafen@126.com

Received 25 September 2025; Revised 17 October 2025; Accepted 24 November 2025

Academic Editor: Luigi Marano

Background: Identifying patients' decisional conflict and its predictors is essential since it is a critical step before developing a patient decision aid for gastric cancer patients to promote decision-making in perioperative oral nutritional supplementation.
Aims: To investigate the current status of decisional conflict and its relationship with decision preparation and decision participation regarding perioperative oral nutritional supplementation in gastric cancer patients and to explore the predictors of decisional conflict.
Methods: A convenience sampling method was employed to recruit inpatients undergoing radical gastrectomy for gastric cancer, and self-reported questionnaires were used to collect data. The Random Forest model, least absolute shrinkage and selection operator regression, and multivariate stepwise linear regression analysis were employed for data analysis.
Results: A total of 181 patients with gastric cancer were investigated. 42.5% of them had no decisional conflict, and 57.5% of them had decisional conflict. 71.3% of them expressed a desire to engage in shared decision-making, but only 29.3% of them actually participated in it. The actual type of decision-making and knowledge about oral nutritional supplementation were predictors of decisional conflict.
Conclusion: Over half of the gastric cancer patients experienced decisional conflict regarding oral nutritional supplementation during the perioperative period. The actual type of decision-making and knowledge about oral nutritional supplementation among gastric cancer patients are two predictors for decisional conflict. Healthcare professionals should consider the two predictors when developing a patient decision aid to provide decision support.

Keywords: cross-sectional study; decisional conflict; decision participation; decision preparation; predictors

1. Introduction

According to the estimation from the International Agency for Research on Cancer (IARC), there were over 968,000 new cases of gastric cancer (GC) in 2022 and close to 660,000 deaths, ranking the disease as fifth in terms of both incidence and mortality worldwide [1]. GC has become a global cancer issue that requires attention. Radical surgery is the main method for curing gastric cancer [2]. However, due to adverse changes in the gastrointestinal anatomy and delayed gastric emptying caused by surgery, GC patients often experience impaired digestion and absorption of nutrients postoperatively; furthermore, reduced oral intake occurs as a result of pyloric obstruction and tumor-induced metabolic alterations. These factors all contribute to malnutrition in GC patients during the perioperative period [3]. Relevant studies indicate that the incidence of malnutrition in GC patients is as high as 65%–85%, characterized by its prolonged duration and severe manifestations [4]. Malnutrition not only increases the risk of postoperative complications, prolongs hospital stays, and elevates healthcare costs for GC patients, but it also negatively impacts their quality of life, overall survival, treatment compliance, and therapeutic outcomes [5, 6]. Hence, integrating nutritional care into perioperative management for GC patients is of great significance [7]. Oral nutritional supplementation (ONS), a nutritional support method involving the oral intake of foods for special medical purposes (FSMPs) to address inadequate dietary intake, has been recommended as the preferred approach for perioperative nutritional support in GC patients due to its convenience, safety, cost-effectiveness, and efficacy [8]. The perioperative nutritional status of GC patients has a significant influence on both postoperative recovery and long-term clinical outcomes. Studies indicated that preoperative ONS for 5–7 days in GC patients with nutritional risk effectively attenuates postoperative inflammatory responses, enhances immune function, and improves nutritional status [9]. Findings from a meta-analysis suggested that preoperative ONS lowers the incidence of postoperative complications and decreases all-cause mortality [10]. A comprehensive bibliometric analysis showed that the perioperative use of ONS containing immunonutrients has become an integral component of multimodal recovery programs for cancer patients, reducing postoperative inflammation and supporting tissue repair [11]. Furthermore, due to surgical alterations in gastrointestinal anatomy, GC patients experience greater difficulty meeting energy and protein requirements postoperatively compared with other cancer populations, resulting in significant weight loss. Research demonstrated a weight reduction of 8.9%–13.8% within 1 year after gastrectomy [12], with underweight status (BMI $< 18.5\,kg/m^2$) serving as a reliable predictor of poor long-term prognosis [13]. A meta-analysis enrolling 1743 patients who underwent GC surgery found that postoperative ONS significantly mitigates weight loss [14].

With the development of FSMPs, an increasing variety of ONS differing in type, dosage form, added ingredients, flavor, price, and other attributes has emerged, providing more ONS options. However, each has its advantages and disadvantages. A study has shown that whole-protein-based ONS are more likely to cause enteral nutrition intolerance symptoms such as nausea, vomiting, and diarrhea, yet tend to be more palatable and less expensive; in contrast, amino acid-based and short-peptide-based ONS are associated with fewer instances of intolerance but are typically more costly and less palatable [15]. Therefore, GC patients need to weigh the benefits against the side effects of different ONS regimens and clarify their personal preferences and values before decision-making. Furthermore, influenced by factors such as enteral nutrition intolerance, the healthcare system and personnel, and ONS palatability, the average perioperative ONS adherence rate among GC patients is only 24.7%–30.6%, severely compromising the effectiveness of nutritional therapy [16, 17].

Shared decision-making (SDM) is a "patient-centered" decision-making model. In SDM, healthcare professionals, having understood the patient's decision-making needs, preferences, and values, engage in thorough discussions with the patient regarding all available options. This process aims to assist the patient in making healthcare decisions that align with their personal preferences and values [18]. Multiple studies have indicated that SDM can enhance patient motivation and adherence to treatment, thereby leading to improved therapeutic outcomes [19, 20]. However, a survey found that cancer patients perceive their level of involvement in SDM during the treatment process as low, expressing a desire for healthcare providers to offer them decision support [21]. Patient decision aids (PtDAs), grounded in the Ottawa Decision Support Framework (ODSF), represent the most commonly employed decision support intervention [22]. Nevertheless, no PtDA has yet been identified that provides decision support specifically for perioperative ONS in GC patients. Consequently, there is a critical need to develop a corresponding PtDA. This tool would promote SDM by offering decision support for perioperative ONS in GC patients, ultimately enhancing patient adherence to ONS and improving the effectiveness of nutritional treatment.

According to the ODSF, identifying patients' decisional conflict and its predictors to understand their decision-making needs is essential since it is a critical step before developing a PtDA [23]. However, current research on decisional conflict in nutritional therapy primarily focuses on areas such as end-of-life care, diabetes, and pediatric patients [24]. As for GC patients, decisional conflict concerning perioperative nutritional therapy remains poorly understood. Moreover, a study of head and neck cancer patients showed that decision conflict was associated with decision participation and decision preparation [25]. Therefore, this study aims to investigate the current status of decisional conflict and its relationship with decision preparation and decision participation regarding perioperative ONS among GC patients via a cross-sectional survey. Furthermore, the Random Forest model, a tree-based algorithm, facilitates data dimensionality reduction and prescreening of features. It enables the importance ranking of predictors, aiding in identifying key variables [26]. Thus, we also seek to explore the predictors of decisional conflict using

a Random Forest model, thus aiming to provide an empirical basis for the development of a PtDA for ONS in this population.

2. Materials and Methods

2.1. Study Design. This is a cross-sectional studyand the reporting standard for this study followed the STROBE guideline.

2.2. Study Setting and Sampling. A convenience sampling method was employed to recruit inpatients undergoing radical gastrectomy for GC at a tertiary hospital in Beijing, China.

The sample size was calculated based on a requirement of 10–15 participants per study variable [27]. Given 15 variables in the study and accounting for an estimated 20% invalid response rate, the final sample size was determined to be 180–270 participants.

2.3. Inclusion and/or Exclusion Criteria. The inclusion criteria comprised (a) age ≥ 18 years; (b) provision of informed consent; (c) preoperative pathological confirmation of GC (stages I–IV); and (d) scheduled for radical gastrectomy during hospitalization.

Exclusion criteria were (a) contraindication to or patient refusal of perioperative ONS following admission; (b) concurrent diagnosis of other malignancies; (c) cognitive impairment or consciousness disorders precluding reliable communication; and (d) inability to complete study questionnaires independently or with research staff assistance.

2.4. Instrument With Validity and Reliability

2.4.1. General Questionnaire. The questionnaire was designed to align with the research objectives and encompassed three key domains: (1) demographic characteristics (gender, age, occupation, marital status, education level, monthly income, living situation, medical burden); (2) disease-related characteristics (cancer staging, neoadjuvant therapy, Nutritional Risk Screening 2002 [NRS 2002] score); and (3) decision-making characteristics (patient experience, understanding of the disease, knowledge about oral nutritional supplements, and experiences about SDM).

2.4.2. Decisional Conflict Scale (DCS). The DCS, developed by O'Connor et al., measures patients' perceptions of uncertainties in their healthcare decision-making process [28]. The scale comprises three dimensions: information and values, decision support and effectiveness, and decision uncertainty, encompassing a total of 16 items. Each item is rated on a 5-point Likert scale ranging from 0 ("strongly disagree") to 4 ("strongly agree"). Higher total scores reflect greater decisional conflict. The raw total score is transformed into a 100-point scale using the formula: (total score/16) × 25. Based on this 100-point scale, decisional conflict levels are categorized as follows: < 25 points indicate no significant conflict, 25 points to 37.5 points indicate moderate conflict, and > 37.5 points indicate high conflict. This study employed the Chinese version of DCS. The scale demonstrated good internal consistency (Cronbach's $\alpha = 0.963$) and acceptable test–retest reliability ($r = 0.528$) [29].

2.4.3. Preparation for Decision-Making Scale (PrepDM). The PrepDM was developed by Bennett et al. following International Patient Decision Aid Standards (IPDAS) to assess the extent to which existing decision support helps patients prepare for decision-making [30]. The scale consists of 10 items, with scores ranging from 1 to 5, corresponding to "strongly disagree" to "strongly agree." The raw total score is transformed into a 100-point scale using the formula: (total score/10) × 25. A score below 60 points indicates insufficient decision preparation. Cronbach's α coefficient for the scale is 0.946.

2.4.4. Control Preference Scale (CPS). The CPS was developed by Degner et al. to assess the type of participation patients expect and actually experience when involved in decision-making [31]. The scale consists of five options: A, B, C, D, and E. A or B indicates an active decision-making type, C indicates an SDM type, and D or E indicates a passive decision-making type. Cronbach's α coefficient for the scale is 0.910.

2.5. Data Collection. Data collection proceeded in two phases. Firstly, on the day of admission for GC, two researchers screened eligible participants against the inclusion criteria. After obtaining informed consent, participants completed the general questionnaire, PrepDM, and the decision participation expectation subscale of the CPS under researcher guidance. Secondly, following the initiation of oral nutritional supplements, participants completed the DCS and the actual decision participation subscale of the CPS. The study adopted paper-based questionnaires. To ensure data accuracy, all responses underwent dual-entry verification prior to electronic data capture in Microsoft Excel.

2.6. Data Analysis. Statistical analyses were performed using SPSS (version 26.0; IBM Corp., Armonk, NY, USA). Normally distributed quantitative data were presented as mean ± standard deviation (SD). Categorical variables were summarized as frequencies and percentages. Group comparisons employed independent sample *t*-tests or one-way analysis of variance, while associations between variables were assessed using Pearson's correlation coefficients or Spearman's rank correlation. Random Forest model was implemented using the Random Forest package in RStudio, incorporating variables demonstrating statistical significance ($p < 0.05$) from univariate and correlation analyses. The model was seeded with a value of 123, using 500 trees, and the relative importance of each predictor was assessed through ranked importance analysis. A 10-fold cross-validation

was used to verify the model's fit. The least absolute shrinkage and selection operator (LASSO) regression employs an L1 regularization term, forcing some coefficients of unimportant features to zero and achieving feature selection. Therefore, LASSO regression was used for variable screening. The selected variables were entered into a multivariate stepwise linear regression analysis. Statistical significance was defined as a two-tailed p value < 0.05.

2.7. Ethical Considerations. This study received ethical approval from the Institutional Review Board of Peking Union Medical College Hospital (Reference: I-25PJ0187). Before questionnaire administration, all participants were informed of the research objectives and data collection procedures. Participants who completed phase 1 questionnaires retained the right to voluntarily withdraw or continue participation in phase 2 without penalty.

3. Results

3.1. Characteristics of the Sample and Current Status of Decisional Conflict. The study enrolled 181 participants, with demographic characteristics summarized in Table 1. The standardized decision conflict score was 36.11 points (SD = 14.60), indicating that patients overall experienced moderate levels of decisional conflict; among them, 77 patients (42.5%) had no decisional conflict, 102 patients (56.4%) had moderate decisional conflict, and 2 patients (1.1%) had high decisional conflict. The mean scores for each dimension, from highest to lowest, were as follows: information and values (2.47 points, SD = 1.17), decision support and effectiveness (2.17 points, SD = 0.94), and decision uncertainty (2.04 points, SD = 0.51); see Table 1.

3.2. Current Status of Decision Preparation. The standardized decision preparation score was 48.64 points (SD = 13.06), indicating that patients were generally not sufficiently prepared fordecision-making. The items with high and low average scores are shown in Table 2.

3.3. Current Status of Decision Participation. Among the 181 participants, 129 (71.3%) expressed a desire to engage in SDM. However, only 53 (29.3%) ultimately participated in SDM. A statistically significant discrepancy was observed between patients' willingness and actual participation in SDM ($p < 0.05$). Detailed data are presented in Table 3.

3.4. Correlational Analysis of Decisional Conflict With Decision Preparation, Preferred and Actual Types of Decision-Making. Decisional conflict was negatively correlated with decision preparation ($r = -0.576$, $p < 0.001$), indicating that patients with higher levels of decisional conflict had lower levels of decision preparation. Decisional conflict was positively correlated with preferred and actual types of participation in decision-making ($r = 0.446$ and 0.771, respectively, both $p < 0.001$).

3.5. Univariate Analysis of Decisional Conflict. Univariate analysis showed that a total of nine variables were statistically significant ($p < 0.05$), as shown in Table 1.

3.6. Variable Selection for Decisional Conflict Predictors

3.6.1. Importance Ranking of Variables. Using the decisional conflict score as the dependent variable, we incorporated 12 variables demonstrating statistical significance in univariate or correlational analyses into a Random Forest model. The model was implemented using the Random Forest package in RStudio. Variable coding schemes are detailed in Table 4. Results indicated that the actual type of decision-making constituted the most important predictor, while patient experience showed the lowest variable importance (Figure 1).

3.6.2. Variable Screening. Using the glmnet package in RStudio, we performed LASSO regression analysis incorporating the 12 variables selected from the prior Random Forest model. Results are presented in Figure 2, where the left vertical dashed line indicates lambda. min, and the right denotes lambda. 1se. Within this interval, model variability was minimized. At $\lambda = 0.7823$, the model achieved optimal stability, parsimony, and interpretability with 11 retained predictors. Consequently, all variables except patient experience (the lowest-ranked in importance) were included in subsequent multiple linear stepwise regression analysis.

3.7. Multivariable Analysis of Decisional Conflict Predictors. Using decisional conflict scores as the dependent variable, we incorporated the top 11 predictors identified through Random Forest screening into multiple linear stepwise regression analysis based on LASSO regression results. The analysis revealed that the actual type of decision-making and knowledge about ONS were significant predictors of decisional conflict in GC patients regarding ONS (Table 5).

4. Discussion

Understanding the current status of decisional conflict regarding perioperative ONS among GC patients and identifying its predictors is crucial for developing the PtDA. PtDAs can promote patient participation in SDM with healthcare professionals and improve treatment adherence. Currently, studies in GC screening, treatment, and survivorship care have provided groundwork for developing corresponding PtDAs among GC patients. A meta-analysis comparing the effectiveness of chemotherapy regimens for advanced GC patients provides evidence for developing the PtDA in chemotherapy for GC patients [32]. However, current knowledge about decisional conflict in perioperative ONS among GC patients is limited, and there is a lack of research evidence to support the development of the PtDA. Therefore, this cross-sectional survey aims to address this research gap. The study found that 57.5% of GC patients experienced decisional conflict regarding perioperative ONS, and 71.3% expressed a desire to participate in SDM

Table 1: General characteristics of gastric cancer patients and univariate analysis of their decisional conflicts.

Variables	n (%)	Decisional conflict scores ($\bar{x} \pm s$)	t/F	p
Gender			1.712	0.089
Female	68 (37.6%)	38.72 ± 13.79		
Male	113 (62.4%)	34.89 ± 14.93		
Age (years)			0.791	0.455
≤ 40	9 (5.0%)	32.89 ± 15.77		
41~60	68 (37.6%)	35.07 ± 16.01		
> 60	104 (57.5%)	37.43 ± 13.51		
Marital status			−0.466	0.642
Married	162 (89.5%)	36.14 ± 14.50		
Single/divorced/widowed	19 (10.5%)	37.79 ± 15.72		
Educational level			6.300	< 0.001
Primary school	30 (16.6%)	40.93 ± 12.81		
Middle school	76 (42.0%)	38.68 ± 14.39		
Junior college	38 (21.0%)	37.59 ± 13.45		
Undergraduate	9 (5.0%)	28.22 ± 14.63		
Master or above	28 (15.5%)	25.82 ± 13.37		
Occupation			1.656	0.162
Farmer	37 (20.4%)	40.32 ± 13.12		
Worker	33 (18.2%)	31.45 ± 15.29		
Retired	87 (48.1%)	36.61 ± 14.23		
Self-employed	4 (2.2%)	35.75 ± 11.90		
Freelance	20 (11.0%)	35.68 ± 17.04		
Neoadjuvant therapy			−7.939	< 0.001
Yes	72 (39.8%)	26.73 ± 14.22		
No	109 (60.2%)	42.55 ± 11.07		
Cancer staging			12.639	< 0.001
T_1	46 (25.4%)	43.91 ± 10.79		
T_2	57 (31.5%)	39.21 ± 12.77		
T_3	56 (30.9%)	30.55 ± 15.00		
T_4	22 (12.2%)	27.14 ± 15.19		
NRS 2002 scores			0.277	0.842
3	131 (72.4%)	35.84 ± 15.10		
4	38 (21.0%)	37.84 ± 13.85		
5	11 (6.1%)	35.91 ± 12.04		
6	1 (0.6%)	44.00		
Monthly income (CNY)			6.373	< 0.001
< 1000	1 (0.6%)	43.00		
1000–3000	45 (24.9%)	40.47 ± 11.50		
3000–6000	61 (33.7%)	37.33 ± 13.49		
6000–10,000	59 (32.6%)	35.97 ± 15.57		
> 10,000	15 (8.3%)	19.50 ± 13.84		
Living condition			1.780	0.153
Live alone	9 (5.0%)	42.44 ± 12.87		
Nuclear family household	72 (39.8%)	38.48 ± 12.88		
Empty nesters	89 (49.2%)	34.35 ± 15.51		
Single-parent household	11 (6.1%)	33.18 ± 17.08		
Patient experience			16.587	< 0.001
Excellent	73 (40.3%)	29.64 ± 16.19		
Good	83 (45.9%)	39.39 ± 11.95		
Normal	25 (13.8%)	45.32 ± 8.67		
Medical burden			7.616	< 0.001
Extremely heavy	12 (6.6%)	48.50 ± 4.68		
Heavy	29 (16.0%)	44.55 ± 8.47		
Normal	92 (50.8%)	35.21 ± 14.17		
Relatively light	44 (24.3%)	29.88 ± 16.31		
Very light	4 (2.2%)	34.50 ± 16.20		
Understanding of the disease			16.218	< 0.001
Expert-level knowledge	34 (18.8%)	22.76 ± 14.57		
Advanced knowledge	92 (50.8%)	36.30 ± 13.73		

Table 1: Continued.

Variables	n (%)	Decisional conflict scores ($\bar{x} \pm s$)	t/F	p
Intermediate knowledge	48 (26.5%)	45.38 ± 7.81		
Basic awareness	6 (3.3%)	39.33 ± 13.94		
No knowledge	1 (0.6%)	45.00		
Knowledge about oral nutritional supplements			95.758	< 0.001
Expert-level knowledge	24 (13.3%)	17.25 ± 8.08		
Advanced knowledge	45 (24.9%)	23.68 ± 12.33		
Intermediate knowledge	31 (17.1%)	40.29 ± 8.03		
Basic awareness	49 (27.1%)	46.12 ± 5.21		
No knowledge	32 (17.7%)	49.09 ± 4.69		
Experiences with shared decision-making			−19.374	< 0.001
Yes	54 (29.8%)	17.75 ± 8.56		
No	127 (70.2%)	44.06 ± 8.19		

Table 2: Preoperative oral nutritional supplementation decision preparation scores in gastric cancer patients.

Items with high average scores	Scores [mean (SD)]
The current decision support helps you identify questions that you want to ask with medical staff	3.43 (SD = 0.81)
The current decision support helps you recognize decisions that need to be made	2.98 (SD = 0.78)
The current decision support helps you talk to medical staff about what matters most	2.61 (SD = 0.73)
Items with low average scores	**Scores [mean (SD)]**
The current decision support helps you organize your own thoughts about decision-making.	2.10 (SD = 0.78)
The current decision support helps you think about which pros and cons are most important.	1.97 (SD = 0.77)
The current decision support helps you think about how involved you want to be in decision-making.	1.82 (SD = 0.73)

Table 3: Preferred and actual types of decision-making in oral nutritional supplementation decisions among gastric cancer patients.

Preferred type of decision-making	Actual type of decision-making			Total (n, %)
	Active participation in decision-making	Shared decision-making	Passive participation in decision-making	
Active participation in decision-making	0	1	0	1 (0.6%)
Shared decision-making	0	52	77	129 (71.3%)
Passive participation in decision-making	0	0	51	51 (28.1%)
Total (n, %)	0 (0%)	53 (29.3%)	128 (70.7%)	181 (100%)
Kappa		0.132		
p		< 0.001		

concerning perioperative ONS. In contrast, only 29.3% actually participated in SDM. Furthermore, the average decision preparation score indicated insufficient decision preparation among GC patients regarding perioperative ONS. Using a Random Forest model combined with LASSO regression, we identified 11 predictors for decisional conflict related to perioperative ONS in these patients. Multiple linear regression analysis revealed that the actual type of decision-making and knowledge about ONS were the two most significant predictors. This study fills the research gap concerning decisional conflict about perioperative ONS in GC patients and provides a practical foundation for developing the relevant PtDA.

Although a unified definition of decisional conflict remains elusive, its primary characteristic is the hesitation and ambivalence individuals experience when facing decision-making risks, benefits, or value trade-offs. The concept of decisional conflict was first introduced by Janis in 1977 who defined it as the psychological conflict individuals exhibit when accepting or rejecting a given behavior [33]. With the development of SDM, Chien et al. conceptualized decision conflict as the uncertainty experienced when contemplating actions involving risks, losses, or challenges to personal values [34]. Similarly, Sim et al. described it as the patient's uncertainty regarding treatment options during healthcare encounters [35]. In the present study, it is noteworthy that

Table 4: Variable coding method for the Random Forest model.

Independent variables	Variable coding method
Educational level	Primary school = 1; middle school = 2; Junior college = 3; Undergraduate = 4; Master or above = 5
Neoadjuvant therapy	Yes = 1; No = 2
Cancer staging	$T_1 = 1$; $T_2 = 2$; $T_3 = 3$; $T_4 = 4$
Monthly income	< 1000 = 1; 1000–3000 = 2; 3000–6000 = 3; 6000–10,000 = 4; > 10,000 = 5
Patient experiences	Excellent = 1; good = 2; normal = 3
Medical burden	Extremely heavy = 1; heavy = 2; normal = 3; relatively light = 4; very light = 5
Understanding of the disease	Expert-level knowledge = 1; advanced knowledge = 2; intermediate knowledge = 3; basic awareness = 4; no knowledge = 5
Knowledge about ONS	Expert-level knowledge = 1; advanced knowledge = 2; intermediate knowledge = 3; basic awareness = 4; no knowledge = 5
Experiences of SDM	Yes = 1; no = 2
Preferred type of decision-making	Active participation in decision-making = 1; SDM = 2; passive participation in decision-making = 3
Actual type of decision-making	Active participation in decision-making = 1; SDM = 2; passive participation in decision-making = 3
Decisional conflict score	Original value input

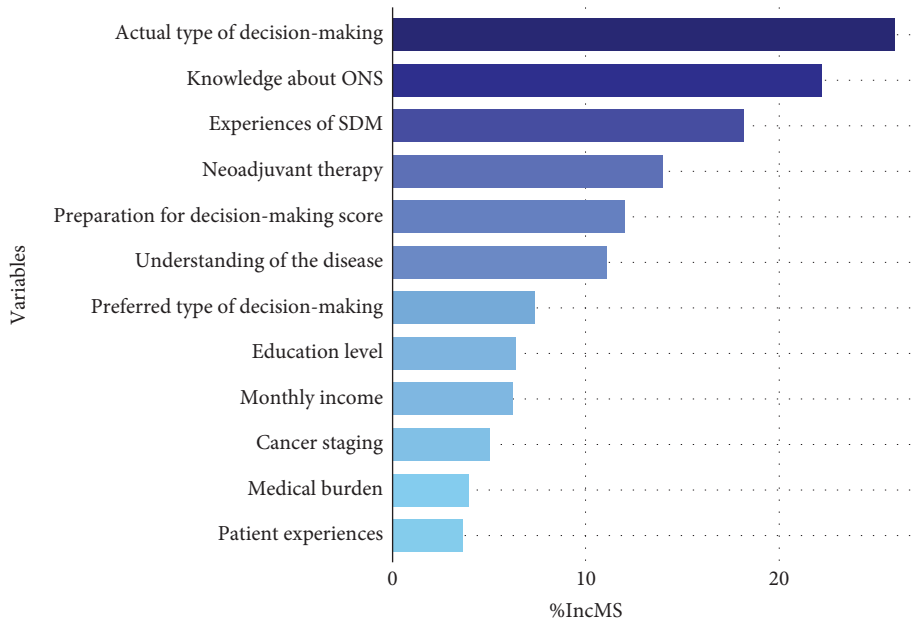

Figure 1: Importance ranking of variables.

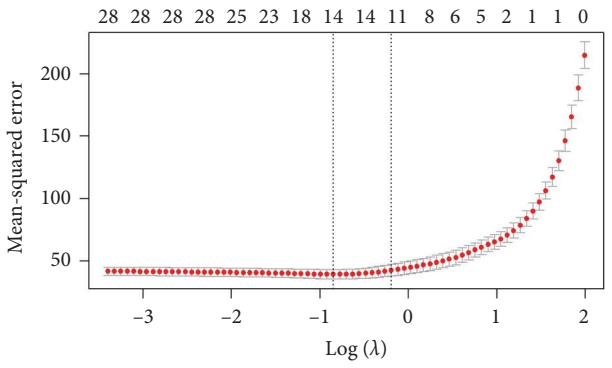

Figure 2: LASSO coefficient paths.

Table 5: The results of multiple linear stepwise regression analysis.

Variable	*b*	*Sb*	*b*′	*t*	*p*
Constant	−21.815	4.711	/	−4.631	< 0.001
Actual type of decision-making	18.907	1.521	0.589	12.427	< 0.001
Knowledge about ONS	3.613	0.534	0.328	6.771	< 0.001

Note: $R = 0.906$; $R^2 = 0.821$; adjusted $R^2 = 0.818$; $F = 268.910$, $p < 0.001$.

over half of the GC patients experienced decisional conflict when confronted with the choice regarding perioperative ONS. Decisional conflict warrants significant attention, as it not only impairs patients' quality of life and triggers negative

emotions such as anxiety and depression but also reduces treatment adherence and may even lead to missed optimal treatment windows, thereby compromising treatment outcomes [34]. Current interventions to reduce decisional conflict are varied, encompassing approaches such as PtDAs, decisional information support, SDM interventions, and decision counseling [36–38]. Among these, the utilization of PtDAs represents the primary approach for mitigating decisional conflict in healthcare settings [39]. A systematic review showed that PtDAs can improve the match between chosen options and the features patients value most while reducing decisional conflict among cancer patients [40]. Therefore, in the context where a majority of GC patients experience decisional conflict regarding perioperative ONS, the development of relevant PtDAs to mitigate this conflict is warranted.

Adequate decision preparation facilitates the reduction of decisional conflict and enables patients to make satisfactory choices when confronting decision-making characterized by uncertainty, unpredictable outcomes, and where personal values, expectations, and preferences are crucial [41]. Our research found that the average decision preparation score for perioperative ONS among GC patients was less than 60 points, indicating insufficient preparation for the decision-making. In addition, we also found that decision preparation was negatively correlated with decisional conflict ($r = -0.576$, $p < 0.001$), i.e., patients with higher levels of decisional conflict had lower levels of decision preparation. Thus, improving decision preparation can be regarded as an effective strategy for reducing decisional conflict. Results from a randomized controlled trial demonstrated that structured consultation delivered by healthcare professionals positively influenced decision preparation among cancer patients [42]. We recommend that healthcare professionals utilize the PrepDM scale to assess patients' decision preparation levels before GC patients engage in SDM regarding perioperative ONS. This assessment enables the identification and targeting of patients with low decision preparation for interventions, thereby laying the groundwork for mitigating decisional conflict and facilitating effective SDM.

Regarding decision participation, the study revealed that over two-thirds of GC patients expressed a desire to engage in SDM concerning perioperative ONS. However, subsequent to ONS initiation, our survey found that fewer than one-third of patients actually participated in SDM. An international multicenter cross-sectional survey showed that performance status, education, and country of origin were predictors of the gap between desired and actual participation in decision-making among cancer patients [43]. Healthcare professionals can consider these factors when developing PtDAs and providing decision support. Furthermore, a significant positive correlation was observed in this study between decision participation and decisional conflict. Identifying and addressing decisional conflict are critical to facilitate patients' actual participation in decision-making. Schuler et al. demonstrated that decision control preference assessment in routine cancer care was possible and provided important information to healthcare professionals, which contributed to less decisional conflict and more individualized decision-making in cancer care [44]. Thus, introducing decision control preference assessment in the PtDA is also an approach to promote SDM. The logistic regression model only demonstrates the direction and degree of the independent variable's influence on the dependent variable, while the importance of each predictor cannot be measured. However, the Random Forest model can accurately rank the importance of various predictors, allowing for the visualization of predictors [45]. Moreover, LASSO regression analysis is used to reduce the dimensionality of the data and identify the most valuable predictors [46]. Therefore, first of all, this study employed a Random Forest model to rank the importance of 12 independent variables identified as statistically significant in univariate analysis and correlation analysis. Subsequently, LASSO regression was applied to screen these variables, resulting in the selection of 11 predictors deemed most valuable for predicting decisional conflict regarding perioperative ONS in GC patients. Finally, these 11 screened predictors were incorporated into a multiple linear stepwise regression analysis. This analysis revealed that the actual type of decision-making and knowledge about ONS are significant predictors of perioperative ONS decisional conflict in GC patients. The application of this methodology not only evaluated the importance of the predictors but also ensured the accuracy of the identified predictors. PtDAs are interventions designed to support individuals in making health decisions. Stacey et al. stated that PtDAs are effective tools to address patients' decisional conflict [20]. When developing PtDAs, considering the predictors of decisional conflict and incorporating them into the PtDA content can effectively address patients' decisional conflict, thereby maximizing their utility. Thus, in future development of a PtDA for perioperative ONS in GC patients, we recommend including an assessment of decision participation types and providing comprehensive ONS knowledge. This approach can both target and effectively reduce perioperative ONS decisional conflict in this population, promote patient engagement in SDM, and consequently enhance ONS adherence and improve nutritional outcomes.

4.1. Strengths and Limitations of the Work. This study is the first to investigate the current status of ONS decision-making among GC patients. The findings reveal the current status of decisional conflict, decision participation, and decision preparation regarding perioperative ONS in GC patients, along with the relationships among these factors. Furthermore, the study identifies significant predictors of decisional conflict, thereby providing a foundation for developing a PtDA for perioperative ONS in this population. However, our research has several limitations. Firstly, the data in this study are based on patient self-reports, and patients' subjective evaluations may lead to overestimation or underestimation of their decisional conflict. Secondly, this study is a single-center cross-sectional survey that used convenience sampling to select perioperative GC inpatients from only a tertiary hospital in Beijing, China. Due to the

differences in healthcare systems and cultural contexts across countries, the findings of this study may be limited in their generalizability.

4.2. Recommendations for Further Research. Future research can refer to the results of this study to develop a PtDA for perioperative ONS in GC patients. Additionally, cross-sectional studies can be conducted in different countries based on this study design to determine whether predictors for decisional conflict regarding perioperative ONS in GC patients vary across nations. This will facilitate the development of PtDA tailored to diverse healthcare systems and cultural contexts.

4.3. Implications for Policy and Practice. In clinical practice, healthcare professionals should address decisional conflict and insufficient decision preparation regarding perioperative ONS among GC patients. Interventions such as PtDAs and decision counseling should be provided to resolve these issues, thereby promoting patient engagement in SDM. Furthermore, when developing PtDAs for perioperative ONS in this population, relevant specialists should consider incorporating assessments of decision participation types and providing comprehensive ONS knowledge. This will enable PtDAs to more specifically and effectively reduce decisional conflict.

5. Conclusion

The study revealed that 57.5% of GC patients experienced decisional conflict regarding ONS during the perioperative period. Moreover, the study also found that GC patients exhibited insufficient decision preparation regarding perioperative ONS, and there was a statistically significant discrepancy between patients' willingness and actual participation in SDM. Through Random Forest modeling followed by LASSO regression analysis, 11 predictors of ONS decisional conflict in this population were identified. Subsequent multiple linear stepwise regression analysis confirmed that the actual decision-making participation and knowledge about ONS are significant predictors. The identified predictors of decisional conflict can guide the development of PtDA for perioperative ONS in GC patients, ultimately improving perioperative ONS adherence, patient satisfaction, and surgical outcomes.

Data Availability Statement

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

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Ni Yang and Yuan Xu contributed to the work equally and should be regarded as co-first authors.

Funding

This work was supported by Peking Union Medical College Hospital Talent Cultivation Program Category D (UHB11451).

Acknowledgments

The authors would like to thank all the healthcare professionals of the General Surgery Department of Peking Union Medical College Hospital who made this study possible. We also thank all the patients who responded to the survey of this study.

References

[1] F. Bray, M. Laversanne, H. Sung, et al., "Global Cancer Statistics 2022: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries," *CA: A Cancer Journal for Clinicians* 74, no. 3 (2024): 229–263, https://doi.org/10.3322/caac.21834.

[2] K. K. Ansari, V. Wagh, A. I. Saifi, I. Saifi, and S. Chaurasia, "Advancements in Understanding Gastric Cancer: a Comprehensive Review," *Cureus* 15, no. 9 (2023): https://doi.org/10.7759/cureus.46046.

[3] M. K. Kang and H.-J. Lee, "Impact of Malnutrition and Nutritional Support After Gastrectomy in Patients with Gastric Cancer," *Annals of Gastroenterological Surgery* 8, no. 4 (2024): 534–552, https://doi.org/10.1002/ags3.12788.

[4] X. Zheng, X. Ruan, X. Wang, et al., "Bayesian Diagnostic Test Evaluation and True Prevalence Estimation of Malnutrition in Gastric Cancer Patients," *Clinical Nutrition ESPEN* 59 (2024): 436–443, https://doi.org/10.1016/j.clnesp.2023.12.019.

[5] S. Sun, W. Huang, Z. Wang, W. Xie, J. Zhou, and Q. He, "Association of Malnutrition Diagnosed Using Global Leadership Initiative on Malnutrition Criteria with Severe Postoperative Complications After Gastrectomy in Patients with Gastric Cancer," *Journal of Laparoendoscopic & Advanced Surgical Techniques Part A* 33, no. 12 (2023): 1193–1200, https://doi.org/10.1089/lap.2023.0310.

[6] Z. Q. Guo, J. M. Yu, W. Li, et al., "Survey and Analysis of the Nutritional Status in Hospitalized Patients with Malignant Gastric Tumors and Its Influence on the Quality of Life," *Supportive Care in Cancer: Official Journal of the Multinational Association of Supportive Care in Cancer* 28, no. 1 (2020): 373–380, https://doi.org/10.1007/s00520-019-04803-3.

[7] F. De Felice, S. Malerba, V. Nardone, et al., "Progress and Challenges in Integrating Nutritional Care into Oncology Practice: Results from a National Survey on Behalf of the NutriOnc Research Group," *Nutrients* 17, no. 1 (2025): 188, https://doi.org/10.3390/nu17010188.

[8] M. Muscaritoli, J. Arends, P. Bachmann, et al., "ESPEN Practical Guideline: Clinical Nutrition in Cancer," *Clinical Nutrition* 40, no. 5 (2021): 2898–2913, https://doi.org/10.1016/j.clnu.2021.02.005.

[9] X. Chen, K. Yang, X. Zhang, and K. Li, "Meta-Analysis of Preoperative Oral Nutritional Supplements for Patients with Gastric Cancer: East Asian Experience," *European Journal of Clinical Nutrition* 74, no. 7 (2020): 991–1000, https://doi.org/10.1038/s41430-019-0483-0.

[10] S. R. Knight, A. U. Qureshi, T. M. Drake, et al., "The Impact of Preoperative Oral Nutrition Supplementation on Outcomes in Patients Undergoing Gastrointestinal Surgery for Cancer in low- and middle-income Countries: a Systematic Review and

meta-analysis," *Scientific Reports* 12, no. 1 (2022): https://doi.org/10.1038/s41598-022-16460-4.

[11] F. De Felice, C. G. Cattaneo, G. E. Poto, et al., "Mapping the Landscape of Immunonutrition and Cancer Research: a Comprehensive Bibliometric Analysis on Behalf of NutriOnc Research Group," *International Journal of Surgery* 110, no. 1 (2024): 395–405, https://doi.org/10.1097/js9.0000000000000783.

[12] M. Takahashi, M. Terashima, H. Kawahira, et al., "Quality of Life After Total Vs Distal Gastrectomy with Roux-en-Y Reconstruction: Use of the Postgastrectomy Syndrome Assessment Scale-45," *World Journal of Gastroenterology* 23, no. 11 (2017): 2068–2076, https://doi.org/10.3748/wjg.v23.i11.2068.

[13] K. Migita, T. Takayama, S. Matsumoto, et al., "Impact of Being Underweight on the long-term Outcomes of Patients with Gastric Cancer," *Gastric Cancer* 19, no. 3 (2016): 735–743, https://doi.org/10.1007/s10120-015-0531-y.

[14] M. Choi, J.-Y. Kim, H.-H. Kang, E. Park, and S. R. Shim, "Oral Nutritional Supplements Reduce Body Weight Loss After Gastrectomy in Patients with Gastric Cancer: a Systematic Review and Meta-Analysis of Randomized Controlled Trials," *Nutrients* 15, no. 18 (2023): 3924, https://doi.org/10.3390/nu15183924.

[15] Y.-Q. Wang, Y.-H. Li, Y.-T. Li, H.-X. Li, and D. J. Zhang, "Comparisons Between short-peptide Formula and intact-protein Formula for Early Enteral Nutrition Initiation in Patients with Acute Gastrointestinal Injury: a single-center Retrospective Cohort Study," *Annals of Translational Medicine* 10, no. 10 (2022): 573, https://doi.org/10.21037/atm-22-1837.

[16] X. Jiang, X. Chen, S. Chen, et al., "Compliance with Oral Nutritional Supplementation Among Gastric Cancer Patients at Nutritional Risk: a Cross-Sectional Study," *Nutrition and Cancer* 74, no. 9 (2022): 3312–3321, https://doi.org/10.1080/01635581.2022.2074474.

[17] G. Wan, H. Yuan, H. Xue, H. Li, H. Hu, and X. Zhang, "Assessment of Compliance with Oral Nutritional Supplementation and Exploration of Barriers and Facilitators for Patients After Gastrectomy: a mixed-methods Study," *Journal of Advanced Nursing* 77, no. 6 (2021): 2845–2859, https://doi.org/10.1111/jan.14851.

[18] F. Légaré and H. O. Witteman, "Shared Decision Making: Examining Key Elements and Barriers to Adoption into Routine Clinical Practice," *Health Affairs (Project Hope)* 32, no. 2 (2013): 276–284, https://doi.org/10.1377/hlthaff.2012.1078.

[19] T. F. Hack, L. F. Degner, P. Watson, and L. Sinha, "Do Patients Benefit from Participating in Medical Decision Making? Longitudinal follow-up of Women with Breast Cancer," *Psycho-Oncology* 15, no. 1 (2006): 9–19, https://doi.org/10.1002/pon.907.

[20] D. Stacey, K. B. Lewis, M. Smith, et al., "Decision Aids for People Facing Health Treatment or Screening Decisions," *Cochrane Database of Systematic Reviews* 1, no. 1 (2024): https://doi.org/10.1002/14651858.CD001431.pub6.

[21] V. F. Reyna, W. L. Nelson, P. K. Han, and M. P. Pignone, "Decision Making and Cancer," *American Psychologist* 70, no. 2 (2015): 105–118, https://doi.org/10.1037/a0036834.

[22] X. Li, M. Meng, S. Chen, et al., "Research Progress on Shared Decision-Making in Healthcare from a cross-cultural Perspective in China," *China Nursing Management* 24 (2024): 956–960, https://doi.org/10.3969/j.issn.1672-1756.2024.06.031.

[23] L. Hoefel, A. M. O'Connor, K. B. Lewis, et al., "20th Anniversary Update of the Ottawa Decision Support Framework Part 1: a Systematic Review of the Decisional Needs of People Making Health or Social Decisions," *Medical Decision Making: An International Journal of the Society for Medical Decision Making* 40, no. 5 (2020): 555–581, https://doi.org/10.1177/0272989x20936209.

[24] E. Clarke, G. Pugh, E. van den Heuvel, et al., "Understanding the Patient and Family Experience of Nutrition and Dietetic Support During Childhood Cancer Treatment," *Supportive Care in Cancer* 31, no. 6 (2023): 326, https://doi.org/10.1007/s00520-023-07787-3.

[25] A. Hoesseini, M. C. Dorr, E. A. C. Dronkers, R. J. Baatenburg de Jong, A. Sewnaik, and M. P. J. Offerman, "Decisional Conflict in Patients with Head and Neck Cancer," *JAMA Otolaryngology–Head & Neck Surgery* 149, no. 2 (2023): 160–167, https://doi.org/10.1001/jamaoto.2022.4269.

[26] X. Zhang, B. Guo, H. Zhu, et al., "H-type Hypertension Status and Influencing Factors of the Elderly People over 80 Years Old Based on Random Forest Model," *International Heart Journal* 65, no. 2 (2024): 263–270, https://doi.org/10.1536/ihj.23-488.

[27] N. Jiang, P. Gu, X. Sun, et al., "Acceptance of COVID-19 Vaccines in Patients with Chronic Diseases: a cross-sectional Study," *Journal of Clinical Nursing* 31, no. 21-22 (2022): 3286–3300, https://doi.org/10.1111/jocn.16284.

[28] A. M. O'Connor, "Validation of a Decisional Conflict Scale," *Medical Decision Making: An International Journal of the Society for Medical Decision Making* 15, no. 1 (1995): 25–30, https://doi.org/10.1177/0272989x9501500105.

[29] C. Lu, W. Mu, Y. Jin, et al., "Cross-Cultural Adaptation and Psychometric Assessment of the Statement Format Decisional Conflict Scale for Mandarin Version," *BMC Health Services Research* 19, no. 1 (2019): 873, https://doi.org/10.1186/s12913-019-4717-6.

[30] C. Bennett, I. D. Graham, E. Kristjansson, S. A. Kearing, K. F. Clay, and A. M. O'Connor, "Validation of a Preparation for Decision Making Scale," *Patient Education and Counseling* 78, no. 1 (2010): 130–133, https://doi.org/10.1016/j.pec.2009.05.012.

[31] L. F. Degner, J. A. Sloan, and P. Venkatesh, "The Control Preferences Scale," *Canadian Journal of Nursing Research* 29, no. 3 (1997): 21–43.

[32] R. Petrioli, G. Roviello, L. Zanotti, et al., "Epirubicin-Based Compared with Docetaxel-based Chemotherapy for Advanced Gastric Carcinoma: a Systematic Review and meta-analysis," *Critical Reviews In Oncology-Hematology* 102 (2016): 82–88, https://doi.org/10.1016/j.critrevonc.2016.04.001.

[33] J. L and M. L, *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment* (Free Press, 1977).

[34] C.-H. Chien, C.-K. Chuang, K.-L. Liu, C.-L. Li, and H.-E. Liu, "Changes in Decisional Conflict and Decisional Regret in Patients with Localised Prostate Cancer," *Journal of Clinical Nursing* 23, no. 13-14 (2014): 1959–1969, https://doi.org/10.1111/jocn.12470.

[35] J. A. Sim, J. S. Shin, S. M. Park, et al., "Association Between Information Provision and Decisional Conflict in Cancer Patients," *Annals of Oncology* 26, no. 9 (2015): 1974–1980, https://doi.org/10.1093/annonc/mdv275.

[36] T.-J. Wang, P.-P. Chiu, K.-K. Chen, and L.-P. Hung, "Efficacy of a Decision Support Intervention for Reducing Decisional Conflict in Patients with Elevated Serum Prostate-specific Antigen: a Randomized Controlled Trial," *European Journal of Oncology Nursing* 50 (2021): https://doi.org/10.1016/j.ejon.2020.101865.

[37] N. Andaroon, M. Kordi, S. A. Kimiaee, and H. Esmaeili, "The Effect of Individual Counseling on Attitudes and Decisional

Conflict in the Choice of Delivery Among Nulliparous Women," *Journal of Education and Health Promotion* 9, no. 1 (2020): 35, https://doi.org/10.4103/jehp.jehp_472_18.

[38] M. León-García, B. Humphries, P. R. Morales, et al., "Assessment of a Venous Thromboembolism Prophylaxis Shared decision-making Intervention (DASH-TOP) Using the Decisional Conflict Scale: a mixed-method Study," *BMC Medical Informatics and Decision Making* 23, no. 1 (2023): 250, https://doi.org/10.1186/s12911-023-02349-3.

[39] V. Coronado-Vázquez, C. Canet-Fajas, M. T. Delgado-Marroquín, R. Magallón-Botaya, M. Romero-Martín, and J. Gómez-Salgado, "Interventions to Facilitate Shared decision-making Using Decision Aids with Patients in Primary Health Care," *A systematic review* 99, no. 32 (2020): e21389, https://doi.org/10.1097/md.0000000000021389.

[40] K. McAlpine, K. B. Lewis, L. J. Trevena, and D. Stacey, "What is the Effectiveness of Patient Decision Aids for Cancer-Related Decisions? A Systematic Review Subanalysis," *JCO Clinical Cancer Informatics* 2, no. 2 (2018): 1–13, https://doi.org/10.1200/CCI.17.00148.

[41] D. L. Berry, Q. Wang, B. Halpenny, and F. Hong, "Decision Preparation, Satisfaction and Regret in a multi-center Sample of Men with Newly Diagnosed Localized Prostate Cancer," *Patient Education and Counseling* 88, no. 2 (2012): 262–267, https://doi.org/10.1016/j.pec.2012.04.002.

[42] A. A. Rogge, S. M. Helmer, R. King, et al., "Effects of Training Oncology Physicians Advising Patients on Complementary and Integrative Therapies on patient-reported Outcomes: a Multicenter, cluster-randomized Trial," *Cancer* 127, no. 15 (2021): 2683–2692, https://doi.org/10.1002/cncr.33562.

[43] S. Yennurajalingam, L. F. Rodrigues, O. M. Shamieh, et al., "Decisional Control Preferences Among Patients with Advanced Cancer: an International Multicenter cross-sectional Survey," *Palliative medicine* 32, no. 4 (2018): 870–880, https://doi.org/10.1177/0269216317747442.

[44] M. Schuler, J. Schildmann, F. Trautmann, et al., "Cancer Patients' Control Preferences in Decision Making and Associations with patient-reported Outcomes: a Prospective Study in an Outpatient Cancer Center," *Supportive Care in Cancer* 25, no. 9 (2017): 2753–2760, https://doi.org/10.1007/s00520-017-3686-8.

[45] X. Tang, X. Yi, H. Mao, M. Wang, R. Chen, and A. Zhu, "Predictors of return-to-work After Thyroid Cancer Surgery Based on Random Forest Model: a cross-sectional Study," *BMC Surgery* 25, no. 1 (2025): 253, https://doi.org/10.1186/s12893-025-02901-0.

[46] Y. Lin, Y. Feng, S. Wu, H. Kang, X. Han, and B. Wang, "Development and Validation of a Nomogram for Arthritis: a cross-sectional Study Based on the NHANES," *Scientific Reports* 15, no. 1 (2025): 7248, https://doi.org/10.1038/s41598-025-92014-8.