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ORIGINAL RESEARCH

Needs Analysis of Supportive Care for Postoperative Wound Rehabilitation in Anal Fistula Patients Based on the Kano Model

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Objective: To qualitatively analyze the supportive care needs (including health education and nursing care) of anal fistula patients after fistulotomy using the Kano model.

Methods: A total of 183 anal fistula patients who underwent fistulotomy from December 2021 to December 2023 were selected via cluster sampling. Sociodemographic data were collected, and a self-designed questionnaire based on the Kano model (validated through two rounds of expert consultation and referring to the related literature) was used to assess patients' supportive care needs. The questionnaire covered health education needs (eg, delivery methods, content) and nursing needs (eg, physiological and psychological support). Satisfaction indices (SI), dissatisfaction indices (DSI), and a DSI-SI matrix were calculated.

Results: Among 12 health education needs, 3 were Must-be (M) (25.00%), 4 were One-dimensional (O) (33.33%), 4 were Attractive (A) (33.33%), and 1 was Indifferent (I) (8.33%). The DSI-SI matrix identified 2 high-priority (16.67%), 2 to-be-improved (16.67%), 3 secondary-improvement (25.00%), and 5 low-priority (41.67%) items. Among 12 nursing needs, 2 were M (16.67%), 3 were O (25.00%), and 7 were A (58.33%). The matrix showed 1 high-priority (8.33%), 1 to-be-improved (8.33%), 1 secondary-improvement (8.33%), and 9 low-priority (41.67%) items.

Conclusion: The Kano model effectively identifies supportive care needs for anal fistula patients post-surgery, providing a comprehensive basis for precision treatment and postoperative nursing.

Keywords: Kano model, anal fistula, fistulotomy, wound rehabilitation, supportive care

Introduction

Anal fistula, a prevalent anorectal disorder characterized by pathological tracts between the anal canal and perianal skin, manifests clinically as severe pain, swelling, bleeding, and purulent discharge, significantly compromising patients' quality of life.[1,2] Fistulotomy remains a primary surgical intervention, effectively eliminating blind sinuses, abscess cavities, and secondary tracts while preserving sphincter function.[3] However, the postoperative wound's anatomical proximity to the anal canal predisposes it to fecal contamination, resulting in delayed healing accompanied by pain, pruritus, edema, and exudation. Additionally, wound pain, malodorous discharge, and altered elimination patterns adversely impact daily functioning and psychosocial well-being.[4,5] Evidence indicates that supportive care interventions enhance postoperative recovery by alleviating pain, reducing purulent drainage, and mitigating psychological distress.[6,7] Nevertheless, suboptimal recovery outcomes persist due to patients' limited disease literacy of causes and postoperative precautions and clinicians' insufficient attention to individual variability in conventional care models.[8,9] Consequently, accurately identifying patients' rehabilitation needs and developing tailored interventions have emerged as critical research priorities in the field of nursing intervention. In recent years, the Kano model, proposed by Noriaki Kano and commonly used in quality management, industrial engineering, and business administration to determine quality attributes, customer needs, and customer satisfaction, has been extended to the practice of clinical care interventions.[10] This framework classifies service attributes into six categories based on Herzberg's dual-factor theory: Must-be (M), One-

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dimensional (O), Attractive (A), Indifferent (I), Reverse (R), and Questionable (Q) qualities.[11] Recent studies demonstrate that prioritizing M/O attributes while strategically enhancing A attributes and transforming I attributes can significantly pinpoint the individualized needs of patients and improve the quality of their nursing intervention.[12,13] This study employed the Kano methodology to analyze wound rehabilitation needs among fistulotomy patients through structured questionnaires. The findings aim to establish an evidence base for precision nursing interventions in this population.

Materials and Methods

Clinical Data

A total of 183 anal fistula patients who underwent fistulotomy at our hospital from December 2021 to December 2023 were enrolled via cluster sampling. Inclusion criteria: ① Meeting surgical indications for anal fistula and receiving fistulotomy; ② Age ≥18 years; ③ No psychiatric disorders or cognitive impairment, with normal communication abilities and capability to complete questionnaires independently; ④ No concurrent anorectal diseases. Exclusion criteria: ① Comorbid malignancies or severe dysfunction of major organs; ② Poor treatment compliance, communication barriers, or inability to complete questionnaires independently; ③ History of severe trauma; ④ Pregnant or lactating women. All participants and their family members provided informed consent after being fully informed of the study procedures. This study was conducted in accordance with the Declaration of Helsinki and approved by the hospital's Ethics Committee.

Research Methods

Questionnaire Design

Based on the relevant literature,[10,14] we developed a self-designed supportive care questionnaire for post-fistulotomy patients through two rounds of expert consultation. The questionnaire comprised two sections: health education needs and nursing care needs. The two dimensions of the health education needs include educational methods and content, with a content validity index of 0.827 and a pilot test showing a Cronbach's α coefficient of 0.784, were administered at hospital admission; the two dimensions of nursing care needs include physical needs and psychological needs. Six items per dimension, 12 items in total, with a content validity index of 0.803 and a pilot test showing a Cronbach's α coefficient of 0.762, were administered postoperatively. Each item used a 5-point Likert scale: "Like", "Must-be", "Neutral", "Tolerable", and "Dislike."

Survey Methodology

For eligible patients, two trained nurses explained the study purpose and significance to participants and their families. Questionnaires were administered via QR code scanning using Wenjuanxing (a Chinese online survey platform). For participants with limited literacy, investigators assisted with completion.

Evaluation Criteria

Kano Model Classification

Patient needs were categorized according to the following standards:[15] (1) Must-be (M) requirements: basic expectations that cause dissatisfaction when unmet but do not increase satisfaction when fulfilled; (2) One-dimensional (O) requirements: Satisfaction is directly proportional to fulfillment level, and meeting these needs increases patient satisfaction; (3) Attractive (A) requirements: Unexpected features that significantly enhance satisfaction when provided and absence does not cause dissatisfaction. (4) Indifferent (I) requirements: Features that neither improve nor impair satisfaction regardless of provision; (5) Reverse (R) requirements: Implementation actually decreases satisfaction. (6) Questionable results (Q): Responses showing contradictory satisfaction patterns. The questionnaire assessed each attribute through paired positive/negative questions with 5×5 possible answer combinations (Table 1 shows the attribute assessment format). The final classification for each item was determined by the most frequent response pattern.

Importance-Satisfaction Matrix (ISM)

For each questionnaire item, the Satisfaction Index (SI) and Dissatisfaction Index (DSI, also termed Importance Index) were calculated as follows: **SI** = (A + O)/(A + M + I), **DSI** = (O + M)/(A + O + M + I), where A = Attractive, O = One-dimensional, M = Must-be, I = Indifferent attributes in KANO model. Both indices range from 0 to 1, with values closer to 1 indicating

Table 1 KANO Model Requirement Attribute Classification Table

Functional Question	Dysfunctional Question				
	Like It	Must-Be	Neutral	Tolerable	Dislike It
Like it	Q	A	A	A	O
Must-be	R	I	I	I	M
Neutral	R	I	I	I	M
Tolerable	R	I	I	I	M
Dislike it	R	R	R	R	Q

greater impact on satisfaction/importance. The ISM was constructed by plotting SI values on the x-axis against DSI values on the y-axis. Using the 50th percentiles of SI and DSI as thresholds, the scatter plot was divided into four quadrants. Quadrant I is named as Advantage Zone with high SI and high DSI, where fulfilling these needs increases satisfaction, while unmet needs cause significant dissatisfaction; Quadrant II is named as Improvement Zone with low SI & high DSI where unmet needs do not reduce satisfaction, but fulfillment yields substantial satisfaction gains. Quadrant III is named as Low-Priority Zone with low SI & low DSI where satisfaction remains unaffected regardless of fulfillment status; Quadrant IV is named as Basic Requirement Zone with high SI & low DSI where fulfillment maintains baseline satisfaction, but unmet needs trigger severe dissatisfaction.

Statistical Analysis

Data were analyzed using SPSS 23.0. Categorical variables are presented as frequencies and composition rate (%). A chi-square goodness-of-fit test was used to validate the Kano attribute classifications. Independent-samples t-tests were used to compare SI and DSI between health education needs and nursing needs. Statistical significance was set at $P < 0.05$.

Results

Sociodemographic Characteristics

A total of 183 questionnaires were distributed, with 176 valid responses retained (response rate: 96.2%). The cohort comprised 92 males (52.3%) and 84 females (47.7%), with a mean age of 47.38 ± 5.84 years. Detailed demographic characteristics are presented in Table 2.

Table 2 Distribution of Participants' Sociodemographic Characteristics (n=176)

Items	Cases	Composition Rate
Age		
≤39	32	18.18
40–49	61	34.66
50–59	47	26.70
60–69	23	13.07
≥70	13	7.39
Gender		
Male	92	52.27
Female	84	47.73
Educational level		
Primary school or under	51	28.98
Senior high school	68	38.64
High school	33	18.75
University	24	13.64
Household Registration		
Urban household registration	104	59.09
Rural household registration	72	40.91

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Need Analysis

Health Education Needs

KANO model classification of health education needs for dysphagia management in post-fistulotomy anal fistula patients is revealed in Table 3. Must-be (M) requirements: 3 items (25.00%), One-dimensional (O) requirements: 4 items (33.33%), Attractive (A) requirements: 4 items (33.33%), Indifferent (I) requirements: 1 item (8.33%).

Nursing Care Needs

Analysis of nursing care needs using the KANO model demonstrates: Must-be (M) requirements: 4 items (25.00%), One-dimensional (O) requirements: 4 items (33.33%), Attractive (A) requirements: 4 items (41.67%). The complete distribution of demand attributes is shown in Table 4.

Importance-Satisfaction Matrix (ISM) Analysis

ISM for Health Education Needs

Using the 50th percentile of SI values (0.644) and DSI values (0.571) as thresholds, the scatter plot was divided into four quadrants: **Advantage Zone (I)**: 3 items (25.00%) – Q7, Q10, Q12; **Improvement Zone (II)**: 3 items (25.00%) – Q1, Q3, Q11; **Low-Priority Zone (III)**: 3 items (25.00%) – Q2, Q5, Q6; **Basic Requirement Zone (IV)**: 3 items (25.00%) – Q4, Q8, Q9. Details are presented in Figure 1.

ISM for Nursing Care Needs

Using the 50th percentile of SI values (0.6385) and DSI values (0.5125) as thresholds, the scatter plot was divided into four quadrants: **Advantage Zone (I)**: 2 items (8.33%) – Q6, Q9; **Improvement Zone (II)**: 4 items (16.67%)* – Q1, Q2, Q4, Q11; **Low-Priority Zone (III)**: 1 item (8.33%) – Q5, Q8*; **Basic Requirement Zone (IV)**: 4 items (41.67%) – Q3, Q7, Q10, Q12. Details are presented in Figure 2.

Table 3 Summary of KANO Attribute Results of Health Education Needs for Patients (n=176)

Dimensions	Items		A	O	M	I	R	Q	Attributes	SI Coefficient	DSI Coefficient
Educational methods	Q1	Organize health lectures	13	58	84	20	0	1	M	0.406	0.811
	Q2	Distribute health education paper brochures	32	18	79	45	1	1	M	0.287	0.557
	Q3	Telephone consultation	16	76	53	30	1	0	O	0.526	0.737
	Q4	1-to-1 health knowledge counseling	98	27	36	14	1	0	A	0.714	0.360
	Q5	Patient exchange meeting	41	49	48	37	0	1	O	0.514	0.554
	Q6	QQ, Wechat groups	38	32	28	76	2	0	I	0.402	0.345
Educational content	Q7	Causes and triggers of anal fistula	19	88	60	9	0	0	O	0.608	0.841
	Q8	Precautions for postoperative wound rehabilitation	67	52	32	24	1	0	A	0.680	0.480
	Q9	Precautions for wound rehabilitation when applying dressing	72	55	35	13	0	1	A	0.727	0.511
	Q10	How to have a balanced diet after surgery	53	73	37	12	0	1	O	0.720	0.629
	Q11	Methods of defecation and urination after surgery	52	51	68	5	0	0	M	0.585	0.676
	Q12	Matters related to daily life and medication after discharge from the hospital	44	82	42	11	0	0	O	0.716	0.705

Table 4 Summary of KANO Attribute Results of Nursing Needs for Patients (n=176)

Dimensions	Items		A	O	M	I	R	Q	Attributes	SI Coefficient	DSI Coefficient
Physiological Needs	Q1	Reducing wound pain	41	42	71	20	1	1	M	0.477	0.649
	Q2	Reducing wound odor	50	46	69	11	0	1	M	0.549	0.657
	Q3	Reducing wound bleeding and oozing	42	76	24	33	1	0	O	0.674	0.571
	Q4	Timely handling of postoperative adverse reactions and complications	33	45	81	15	1	1	M	0.448	0.724
	Q5	Timely changing of wound dressing	41	32	69	33	1	0	M	0.417	0.577
	Q6	Postoperative rehabilitation training	49	70	46	10	0	1	O	0.680	0.663
Psychological Needs	Q7	How to eliminate anxiety and depression	67	59	36	13	0	1	A	0.720	0.469
	Q8	How to maintain a positive and optimistic mindset	70	40	55	10	0	1	A	0.629	0.540
	Q9	How to protect one's own privacy	43	70	51	11	1	0	O	0.646	0.691
	Q10	How to minimize the worry of loved ones	62	52	47	14	0	1	A	0.651	0.566
	Q11	How to deal with the impact of surgery on one's life	32	76	56	10	1	1	O	0.621	0.759
	Q12	How to deal with the social problems brought about by surgery	65	59	40	11	0	1	A	0.709	0.566

Discussion

Anal fistula is a common anorectal disorder, with a prevalence rate of 1.6%–3.6% among anorectal diseases in China.[16] Surgical interventions, such as fistulotomy, remain the primary treatment; however, postoperative pain, malodor, and lifestyle alterations significantly impact patients' physical and psychological well-being, necessitating comprehensive supportive care. Furthermore, inadequate patient knowledge regarding disease etiology, symptomatology, progression, and perioperative care often results in passive compliance with standardized nursing protocols, ultimately compromising optimal recovery outcomes.[17] Consequently, precise identification of patients' health education and psychosocial care needs is paramount for developing targeted rehabilitation strategies and enhancing therapeutic efficacy.

Significance of Characterizing Postoperative Care Need Attributes

Three Must-be (M) requirements in **Health Education Needs** were identified: **Q1, Q2 (Education delivery methods)**: Traditional lectures and printed materials provide accessible, cost-effective health knowledge dissemination, constituting fundamental care components;[18] **Q11 (Education content)**: Instruction on proper postoperative defecation/urination techniques prevents wound contamination by fecal/urinary fluids, thereby reducing pruritus and pain.[19] These findings underscore that conventional education modalities and elimination management are essential baseline requirements, while proper toileting education is critical for infection prevention and recovery optimization. In the section of **Nursing Care Needs**, four M-type requirements emerged in physiological domains (Q1/Q2/Q4/Q5) due to that pain and wound malodor profoundly impact psychosocial functioning and warrant prioritized intervention. Moreover, a series of adverse reactions and complications caused by feces and intestinal bacteria are an important cause of impaired postoperative recovery, and are highly susceptible to systemic inflammation, leading to further deterioration of their physiological functions. Adoption of the correct medication and reasonable dressing protocols can not only relieve postoperative pain but also significantly reduce recovery duration and complication rates.[20,21] In the postoperative supportive care measures for patients with anal fistula, health care workers need to focus on the patient's wound analgesia, malodor elimination and complications, and the treatment of adverse reactions. In the caring process, rough wound dressing needs to be avoided to prevent wound deterioration.

The O-type requirements comprised Q3/Q5 (education methods) and Q7/Q10/Q12 (education content) in **Health Education Needs** reveal that when adverse reactions occur after discharge from the hospital, patients usually hope to obtain professional guidance from doctors through telephone consultation, with a view to exercising self-control over these factors affecting their recovery in daily life; regular communication with patients can reduce their negative

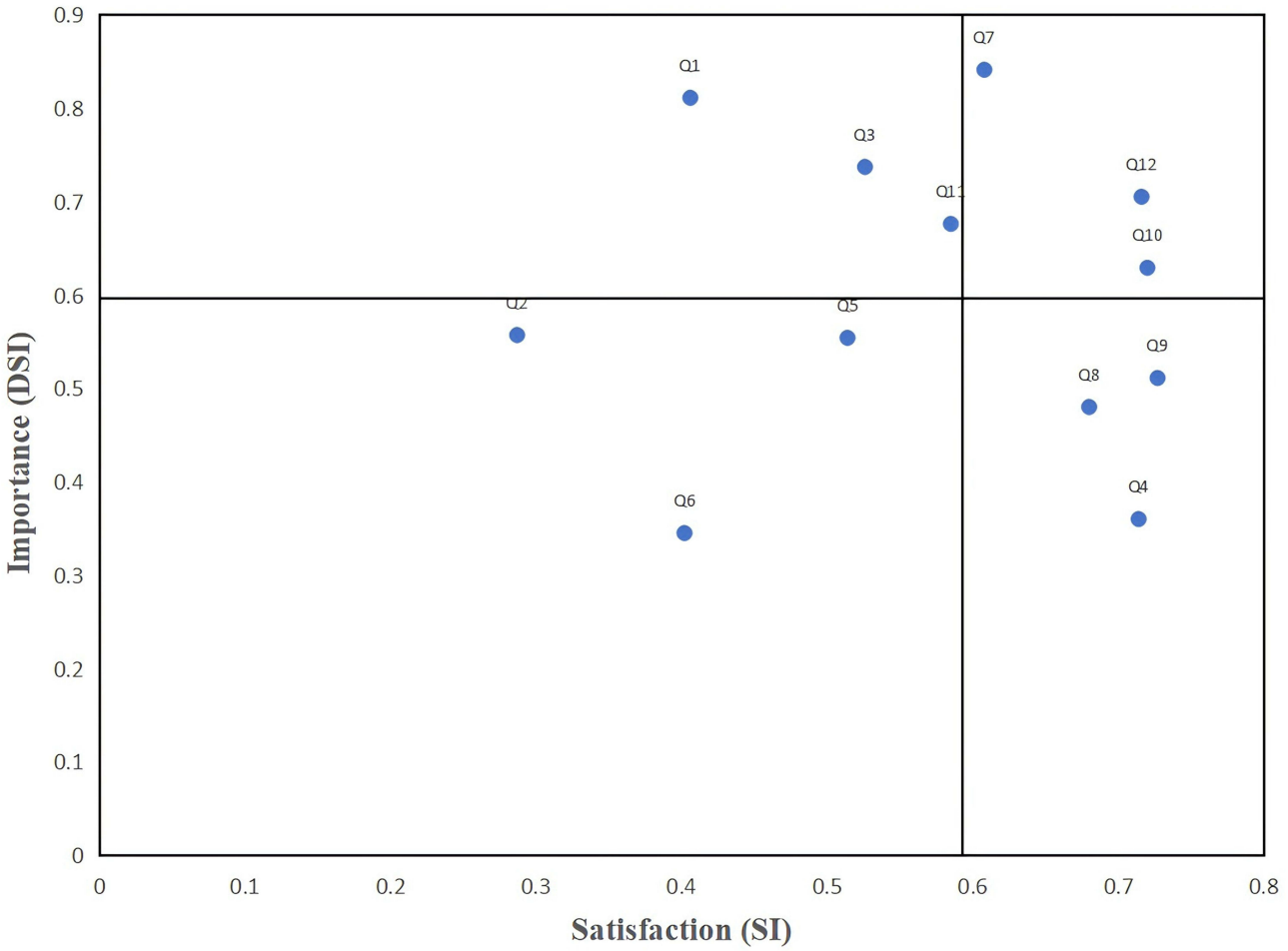

Figure 1 Importance-satisfaction matrix for health education needs of anal fistula patients.

emotions such as fear and anxiety and build up their confidence in their recovery;[22] The inclusion of morbidity and causative factors in the education content can enhance patients' literacy of the disease, and the combination of a balanced diet, medication and other life skills can enable patients to better control the factors affecting recovery.[23,24] Therefore, in addition to the traditional educational methods, healthcare providers need to pay attention to the follow-up and health guidance of patients after discharge, and educate patients about disease pathology, postoperative diet development, postoperative medication guidelines, and other related education. The O-type requirements comprised Q3/Q6 (physiological needs) and Q9/Q11 (psychological needs) reveal that minor postoperative wound bleeding or exudate may not immediately impact patient recovery; however, prolonged neglect can lead to severe hemorrhage and potentially induce shock. Therefore, prompt intervention measures should be initiated upon detection of any bleeding;[25] systematic rehabilitation training serves as the foundation for further pain alleviation and restoration of bowel function, demonstrating significant clinical value;[26] Furthermore, the anatomically sensitive location of surgical wounds exacerbates psychological distress due to privacy concerns during self-care, substantially impacting patients' quality of life—a critical consideration in clinical nursing practice.[27] To address these clinical concerns, healthcare providers need to take immediate wound care interventions when the patient's wound oozes blood and fluid, and strengthen the systematic postoperative rehabilitation training, and actively address the negative psychology arising from daily life challenges, so as to promote the recovery of their physical and mental health.

The A-type requirements comprised Q4 (education methods) and Q8/Q9 (education content) in **Health Education Needs** reveal that based on the traditional health education model, one-on-one guidance enables patients to better understand the knowledge related to anal fistula, and their in-depth individualized psychological demands can be satisfied; the addition of

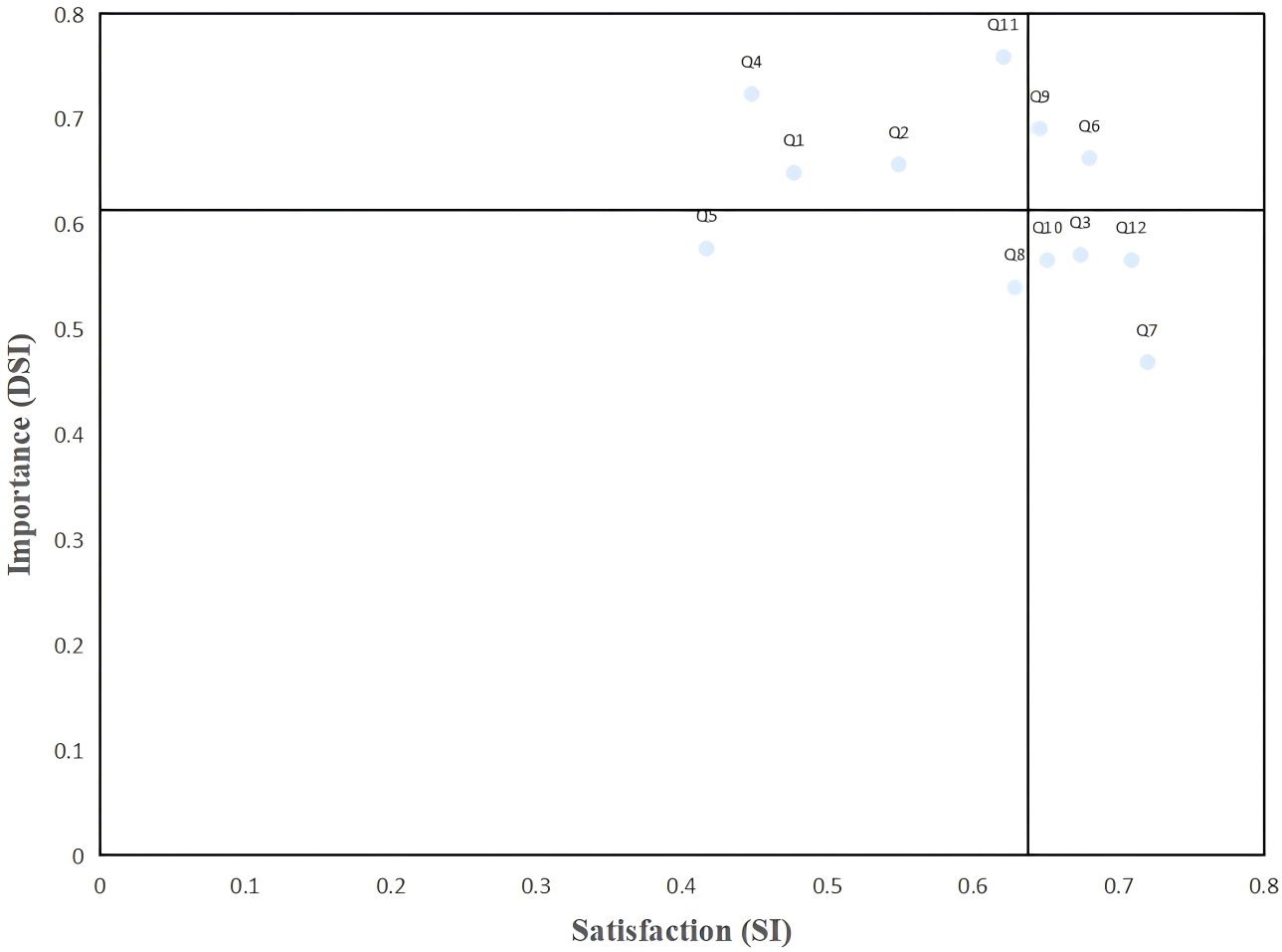

Figure 2 Importance-satisfaction matrix for nursing care needs of anal fistula patients.

postoperative rehabilitation process and guidelines for dressing and changing of medicines into the education content can promote the patients' adherence in the postoperative supportive care process.[28] To enhance disease literacy and improve treatment adherence in anal fistula patients, we recommend implementing personalized one-on-one health education sessions that incorporate the factors affecting postoperative recovery and effective prevention strategies. The A-type requirements mainly included Q7/Q8/Q10/Q12 (psychological needs) in **Nursing Care Needs** and demonstrate that improving the positive attitude of fistula patients and reducing their negative emotions caused by many factors such as life, work, social discomfort and family worries can enhance their satisfaction with the supportive care. In this regard, healthcare providers should talk to fistula patients regularly, perceive their psychological problems and take targeted measures to encourage them to overcome the emotional trough and adopt a positive attitude to face life and improve the quality of life.

The A-type requirements included only Q6 (education methods) in **Health Education Needs**, indicating that although the "Internet+" health education method is prevalent, patients have more ways to obtain health knowledge, but they did not feel that the establishment of QQ and WeChat group could enhance the efficiency of health education, coupled with the fact that the majority are senior citizens who used QQ and Wechat group in low frequency and failed to notice the health education literature uploaded therein.

Analysis of Importance-Satisfaction Matrix for Anal Fistula Patients' Supportive Care Needs

The ISM analysis reveals an equal distribution across quadrants (3 items each in Advantage, Basic Requirement, Improvement, and Low-Priority Zones). The Advantage Zone (Q7, Q10, Q12) and Basic Requirement Zone (Q4, Q8,

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Q9) require continuous innovation while preserving current efficacy, including developing adaptive one-to-one education frameworks tailored to individual's clinical details, to enhance patient's acceptance of related health knowledge, encompassing adverse reaction management, complication prevention protocols, postoperative dietary optimization, self care and medications. The results of Improvement Zone (Q1, Q3, Q11) and Low-Priority Zone (Q2, Q5, Q6) identify that the monotonous formats of health lectures and paper manuals obstruct patients to absorb educational content; the delayed guidance of telephone follow-up visits is inefficient for their own recovery; and the content overload from patient exchanges and social platforms make it impossible for patients to effectively extract learning materials related to health knowledge. Therefore, the next-phase optimization plan is to improve the needs of the Improvement Zone and the Low-Priority Zone to complete the existing supportive care program.

In the questionnaire of nursing cares needs, the Advantage Zone (Q6, Q9) and the Basic Requirement Zone (Q3, Q7, Q10, Q12) validate the effectiveness of our institution's postoperative rehabilitation programs and mental health support systems. Future enhancements will focus on the interests of postoperative rehabilitation and the learning of cutting-edge methods in psychology to help patients better improve their negative postoperative emotions and return to family life as soon as possible. The Improvement Zone (Q1, Q2, Q4, Q11) and Low-Priority Zone (Q5, Q8) reveal that patients were dissatisfied with the current wound management and were concerned about the timeliness of the management of adverse reactions and complications; the results also reflect that patients hoped that psychological interventions could mobilize their positive emotions for recovery and prevent them from suffering from the inconvenience of daily life. This is an area that healthcare providers need to consider and improve in the design of future supportive care programs.

This Kano model-based study qualitatively categorized postoperative care needs for anal fistula patients, identifying critical clinical service requirements. Our institution will maintain and enhance O-type (One-dimensional) requirements and strategically develop A-type (Attractive) requirements through staff competency training programs and smart medical device integration. The single-center design may constrain the generalizability of the findings, given potential variations in patient demographics and clinical practices across different institutions; thus, future research should incorporate multi-center studies with larger, more diverse cohorts.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Informed Consent

All patients included in the study have signed informed consent forms. Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Ethics Approval

The research plan and data collection have been reviewed and approved by the Ethics Committee of the Fourth West China Hospital of Sichuan University.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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