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Research Article

Current Situation and Influencing Factors of Vascular Access Decision-Making Conflicts Among Breast Cancer Chemotherapy Patients in China: A Multicenter Investigation Based on the Ottawa Decision Framework

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Objective: To explore the decision-making conflicts regarding vascular access devices in Chinese breast cancer patients undergoing chemotherapy and the influencing factors.
Design: A multicenter cross-sectional survey study.
Method: A total of 308 breast cancer patients undergoing chemotherapy were included. Questionnaires were conducted using a general information questionnaire, the Chinese version of the Decision Conflict Scale, the Decision Participation Expectation Scale, and the Decision Preparation Scale. Multivariate linear regression analysis was used to investigate the influencing factors of decision conflict regarding vascular access devices in breast cancer patients undergoing chemotherapy.
Result: The level of decision conflict in the patients was relatively high, with a score of 40.88 ± 9.64, significantly higher than the critical value of 37.5. During the decision-making process of the patients, 162 cases (52.6%) tended to share the decision with the doctor, but in the actual participation process, 105 cases (34.9%) made the decision passively. There were a negative correlation between patient decision conflict and decision preparation and a positive correlation between patient decision conflict and decision participation. Age, unmarried status, average monthly family income, understanding of the disease, understanding of vascular access, and decision preparation were the main influencing factors of decision conflict.
Conclusion: There is a discrepancy between the expected decision-making for vascular access devices among Chinese breast cancer chemotherapy patients and the actual participation. The level of decision conflicts is relatively high, and it is influenced by multiple factors. Medical staff should enhance communication with patients, respect their decision preferences, develop decision support tools, provide appropriate decision support to patients, reduce decision conflicts, and minimize decision regret.

Keywords: breast cancer chemotherapy; decision assistance; decision conflict; decision preparation; decision-making expectations; decision-making participation

1. Introduction

Breast cancer has become one of the malignant tumors with a rapidly increasing incidence worldwide [1]. According to the report [2], it is estimated that there were approximately 2.309 million new cases of breast cancer globally in 2022; among them, the number of breast cancer patients in China reached 357,000, accounting for 23.8% of all tumor cases among Chinese women, ranking second. Compared with the global peak age for breast cancer deaths being 60–74 years, the peak age for breast cancer deaths in China has shifted earlier to 45–59 years. In contrast, the age of breast cancer onset in China shows a trend of younger onset, and the disease burden is increasingly heavy.

With the advancement of medicine, the prognosis of breast cancer patients has significantly improved. At present, chemotherapy is one of the important systemic treatment methods for breast cancer patients, playing an extremely important role in preoperative neoadjuvant therapy, postoperative adjuvant therapy, and the treatment of patients with recurrence and metastasis [3]. Systemic chemotherapy can kill the residual tumor cells in the body and increase the cure rate of the surgical operation [4].

Intravenous administration is the main approach for implementing antitumor chemotherapy. Currently, the commonly used vascular access devices in clinical practice include peripherally inserted central catheter (PICC), implantable venous access port (PORT), central venous catheter (CVC), and peripheral short catheter [5]. The inherent advantages and disadvantages of different vascular access devices have been reported [6]; PICC catheterization is convenient and relatively economical in the short term. However, it requires frequent maintenance and the exposure of the catheter may affect the quality of daily life of the patient [7]. Compared with PICC, PORT has more advantages in terms of thrombosis and infection risks, and it does not require frequent maintenance. It is particularly suitable for cancer patients who need long-term treatment [8]. However, its low complication rate is closely related to the use of silicone catheters, strict aseptic procedures, the method of locating the catheter tip [9–13], and the surgical experience of the operator. CVC requires direct puncture through the internal jugular or subclavian vein, which causes significant trauma and has a short indwelling time. Therefore, it is only suitable for emergency chemotherapy or short-term treatment [14].

Breast cancer patients have long treatment cycles and diverse treatment plans [15–17], and the probability of changing the vascular access device is higher; breast cancer patients tend to be younger, and they are more concerned about quality of life, psychological state [18], and family and social needs [10]; in addition, newly diagnosed breast cancer patients often face decision-making conflicts due to fear of the disease, lack of relevant treatment knowledge, and insufficient understanding of vascular access devices [11]. Improper vascular access devices may lead to secondary catheterization, local tissue necrosis, limb dysfunction, and unreasonable waste of medical resources.

Currently, research related to breast cancer mainly focuses on the decision-making regarding surgical methods [19–21]. However, the current situation of vascular access device decision-making for breast cancer patients undergoing chemotherapy in China is not clear. This study, based on the Ottawa Decision Support Framework (ODSF) [22], explores the current situation and influencing factors of decision conflicts in vascular access device selection for breast cancer patients undergoing chemotherapy in China, with the aim of providing an important basis for developing effective decision support tools and assisting patients in making high-quality decisions.

2. Method

2.1. Data Sources and Study Populations. From March 2025 to June 2025, using the convenience sampling method, patients who were diagnosed with breast cancer for the first time in the breast cancer departments of three tertiary Grade A hospitals in Xinxiang City and who were determined to undergo chemotherapy were selected as the research subjects. Inclusion criteria are as follows: ① patients who were diagnosed with breast cancer through biopsy for the first time and underwent chemotherapy; ② age ≥ 18 years, aware of the condition; ③ stable condition, with normal understanding and communication ability; and ④ voluntary participation in this study and signing the informed consent form. Exclusion criteria are as follows: ① severe mental illness disorders, cognitive disorders, and language disorders and ② complicated with other critical diseases, such as heart failure and metastasis of malignant tumors, and not suitable for participation in the investigation and research.

2.2. Theoretical Framework. This study is based on the ODSF [22], which guides the selection of research tools. The decision-making background and knowledge level of patients were evaluated through the general information questionnaire. The core dimensions of the decision-making process were evaluated, respectively, through the Decision Conflict Scale (DCS), the Decision Participation Expectation Scale, and the Decision Preparation Scale, thereby systematically identifying the decision support needs of patients in the selection of vascular access devices.

2.3. Research Tool

2.3.1. General Information Questionnaire. The questionnaire was designed independently by the researchers based on a literature review and discussions within the research group. It consists of 13 items, including patient's gender, age, place of permanent residence, educational level, marital status, average monthly family income, occupation type, payment method for treatment, whether the patient needs to work during the treatment period, the number of concurrent diseases, the patient's understanding of the disease, the patient's understanding of vascular access, and the degree of family participation in decision-making before catheterization.

2.3.2. DCS. This scale was developed by O'Connor et al. [23] and was translated into Chinese by Lu et al. [24] in 2019.

DCS is mainly used to assess the uncertainty of the patient's decision-makers when choosing treatment plans, the controllable factors causing the uncertainty, and their views on the quality of the decision. DCS consists of three dimensions: decision uncertainty, decision uncertainty factors, and perceived effectiveness of decision-making, with a total of 16 items. Each item is scored from "very agree" to "very disagree," ranging from 0 to 4. The standardized score for each dimension of the scale = (average score of items in the dimension × 25), and the total score = (sum of scores of each item × 16 ÷ 25), with a range of 0 to 100. The standardized total score < 25.0 indicates that the patient does not have decision-making conflicts, 25.0–37.5 indicates that the decision-making conflicts are at a medium level, and > 37.5 indicates a high level of decision-making conflicts. Cronbach's α coefficient of this scale was 0.886 [24]. In this study, Cronbach's α coefficient of this scale was 0.938.

2.3.3. The Chinese Version of the Decision Participation Expectation Scale (CPS). It was compiled by Degner et al. [25] in 1992 and was translated into Chinese by Xu [26] in 2010. The CPS is often used to assess the expected and actual types of participation in medical decision-making by individuals. The CPS consists of five options: A, B, C, D, and E. It classifies decision participation into three types: active decision-making type (choosing A or B), shared decision-making type (choosing C), and passive decision-making type (choosing D or E). The CPS is a scale used to measure the degree to which patients wish to participate in medical care decision-making and actually participate in the decision-making process. Cronbach's α coefficient of this scale is 0.899 [26]. In this study, Cronbach's α coefficient of this scale is 0.753.

2.3.4. Preparation for Decision-Making Scale (Prep-DMS). This scale was developed by Bennett et al. [27] and was translated and revised by Yu [28] for use in assessing the preparedness of patients or their families for decision-making. The scale is a single dimension and consists of 10 items. Each item is scored on a Likert 5-point scale, ranging from "not at all" to "very much," with scores ranging from 1 to 5, and the total score ranges from 10 to 50. A higher score indicates a higher level of preparedness for treatment decision-making by the subject. The overall Cronbach's α coefficient of this scale was 0.946 [28]. In this study, the Cronbach's α coefficient of this scale was 0.961.

2.4. Data Collection Methods. Contact was made with the heads of the hospital's nursing department and departments. After obtaining their consent, the investigation was carried out. A research team consisting of five master's degree students specializing in breast cancer care was established. Before the data collection begins, all members receive unified training. After obtaining the patients' informed consent, paper questionnaires are distributed onsite. The one-on-one investigation is conducted in a quiet and private consulting room or ward as much as possible, avoiding interference from others. The patients are guided to fill in the questionnaire using a unified instruction. For patients with lower educational levels or poor vision, the investigators help the patients read the questions and options word by word, and the patients make their own choices. The investigators draw the answers on behalf of the patients. Personalized explanations or summaries of the questions are strictly prohibited to ensure that the patients understand the original meaning of the questions. After filling out, the forms are collected and checked on the spot. If there are missing or omitted items, they are supplemented on the spot. During the research period, a research team meeting is held once a week to discuss the special situations and challenges encountered in the data collection process and to promptly unify understanding and handling plans to prevent cumulative deviations. This research has been approved by the ethics committee of the First People's Hospital of Xinxiang City (No. 2025011901).

2.5. Statistical Method. Data were entered by two people using Excel, and data processing and statistical analysis were conducted using SPSS 27.0 software. Counting data are presented in terms of frequency and percentage, whereas measurement data are expressed as mean ± standard deviation. Independent samples *t*-tests or one-way analysis of variance was used for intergroup comparisons. Variables with statistical significance in the one-way analysis were included in the multiple linear regression model to analyze the influencing factors of vascular access decisions in breast cancer patients undergoing chemotherapy. A difference was considered statistically significant when $p < 0.05$.

3. Result

3.1. General Information on the Research Subject. A total of 320 questionnaires were distributed, and 308 valid ones were retrieved, with an effective recovery rate of 96.25%. Among them, there were 302 female cases (98%); 202 patients were between the ages of 40 and 60 (65.6%); 41.6% of the patients had a junior high school education; the majority (90.3%) of the patients were married; 44.8% of the participants had a monthly family income of 1000 to 3000 yuan; 44.2% of the patients were farmers; only 24.7% of the participants had a very good understanding of the disease; and 48.1% of the participants had a general understanding of vascular access (Table 1).

3.2. Results of Single-Factor Analysis of Decision-Making Conflict of Vascular Access Device in Breast Cancer Patients Undergoing Chemotherapy. The results showed that there were statistically significant differences in the decision-making conflict scores of vascular access among breast cancer chemotherapy patients with different ages, education levels, marital status, family monthly income per capita (yuan), occupation types, payment methods, knowledge of the disease, knowledge of vascular access, permanent residence, and the number of coexisting diseases ($p < 0.05$) (Table 1).

Table 1: Univariate analysis of decision-making conflicts for vascular access devices in breast cancer patients undergoing chemotherapy ($N = 308$).

Variables	N (%)	Decision conflict score	t/F	p
Gender			−0.695	0.487
Male	6 (2%)	38.17 ± 14.47		
Female	302 (98%)	40.93 ± 9.55		
Age (years)			13.524	< 0.001
≤ 40	46 (14.9%)	34.96 ± 11.31		
40~60	202 (65.6%)	41.22 ± 9.34		
≥ 60	60 (19.5%)	44.27 ± 7.05		
Degree of education			5.900	< 0.001
Primary school and below	46 (14.9%)	43.80 ± 4.51		
Junior high school	128 (41.6%)	42.34 ± 9.77		
Senior high school	50 (16.2%)	39.80 ± 9.83		
College degree, bachelor's degree, or above	84 (27.3%)	37.70 ± 10.53		
Marital status			3.994	0.019
Married	278 (90.3%)	41.09 ± 9.60		
Spinsterhood	6 (1.9%)	47.83 ± 5.64		
Divorced/widowed	24 (7.8%)	36.67 ± 9.64		
Per capita monthly income of the family (yuan)			12.024	< 0.001
< 1000	34 (11%)	42.47 ± 3.54		
1000~3000	138 (44.8%)	43.47 ± 9.05		
3000~6000	104 (33.8%)	39.17 ± 8.93		
6000 and above	32 (10.4%)	33.65 ± 13.53		
Occupation type			8.159	< 0.001
Peasant	136 (44.2%)	43.35 ± 8.72		
Worker	66 (21.4%)	36.83 ± 10.73		
Retire	60 (19.5%)	41.48 ± 8.33		
Individual household	10 (3.2%)	31.70 ± 14.33		
Liberal professions	36 (11.7%)	40.53 ± 7.73		
Payment method of fees			3.166	0.014
Medical insurance	18 (5.8%)	38.78 ± 11.10		
Self-paying	10 (3.2%)	36.50 ± 14.99		
Worker with medical insurance	112 (36.4%)	40.03 ± 9.77		
Medical insurance for urban residents	62 (20.1%)	39.45 ± 9.08		
New rural cooperative medical insurance	106 (34.4%)	43.39 ± 8.55		
Degree of understanding of the disease			35.333	< 0.001
Know a lot about	76 (24.7%)	34.46 ± 9.09		
Know generally	166 (53.9%)	40.74 ± 8.32		
Not very familiar with it	54 (17.5%)	47.63 ± 7.17		
Know very little about	12 (3.9%)	53.08 ± 9.64		
Understanding of vascular access			63.250	< 0.001
Know very well	38 (12.3%)	28.79 ± 8.35		
Know generally	148 (48.1%)	38.95 ± 7.65		
Not very familiar with it	96 (31.2%)	46.14 ± 7.45		
Know very little about	26 (8.4%)	50.12 ± 6.68		
Do I need to go to work during the treatment period?			−1.618	0.107
Need	62 (20.1%)	39.11 ± 9.39		
Don't need	246 (79.9%)	41.33 ± 9.67		
Habitual residence			2.830	0.005
Village	144 (46.8%)	42.52 ± 9.27		
City	164 (53.2%)	39.44 ± 9.76		
Number (types) of coexisting diseases			6.654	0.001
Nothing	214 (69.5%)	39.61 ± 10.71		
1	68 (22.1%)	44.62 ± 5.84		
≥ 2	26 (8.4%)	42.50 ± 5.04		
The extent to which family members participate in decision-making before catheterization			0.647	0.629
The family members fully participate on behalf of the patient	20 (6.5%)	40.30 ± 7.17		
Family members are more involved than patients	32 (10.4%)	42.53 ± 7.03		
Family members and patients should participate equally	192 (62.3%)	40.38 ± 10.58		
The participation of family members is less than that of patients	18 (5.8%)	40.28 ± 6.17		
The family members did not participate	46 (14.9%)	42.30 ± 9.17		

Table 2: Scores of decision conflict, decision participation, and decision preparation for indwelling venous access in breast cancer patients undergoing chemotherapy ($N = 308$).

Project	Score
Decisional conflict	40.88 ± 9.64
Decision-making uncertainty	7.59 ± 2.15
Decision-making uncertainty factors	23.85 ± 5.43
Perceptual validity	9.44 ± 2.69
Decision-making participation	5.82 ± 1.80
Look forward to participating	2.81 ± 0.91
Actual participation	3.01 ± 1.11
Decision preparation	32.10 ± 8.06

Table 3: Results of decision-making participation of vascular access devices in breast cancer patients undergoing chemotherapy ($N = 308$).

Decision-making participation	Active participation	Shared decision-making	Passive participation
Expect to participate	94 (30.5)	162 (52.6)	52 (16.9)
Actual participation	93 (30.2)	110 (35.7)	105 (34.1)

3.3. The Decision-Making Conflict Score for Patients With Breast Cancer Undergoing Chemotherapy Who Have Indwelling Venous Access Devices. The total score of decision conflict for venous vascular access devices in breast cancer patients undergoing chemotherapy was 40.88 ± 9.64. Above the cutoff value of 37.5 points, it indicates that the vast majority of patients experience high decision conflict when making decisions. Decision uncertainty is the main source of decision conflict. The decision-making conflict mainly stems from the difficulty in weighing the specific advantages and disadvantages of PICC, PORT, and other devices (Table 2).

3.4. The Outcome of the Decision-Making Process Regarding Vascular Access Devices for Breast Cancer Patients Undergoing Chemotherapy. The total score for patient decision-making participation was 5.82 ± 1.80, among which the score for expected participation was 2.81 ± 0.91 (Table 2). In the expected participation category, "shared decision-making" accounted for the highest proportion (52.6%, 162 cases), and this indicates that most patients are eager to establish a cooperative relationship with their doctors. However, in the actual participation, "passive participation" accounted for the highest proportion (34.1%, 105 cases) (Table 3). The significant difference between expectation and actual participation suggests that the current clinical decision-making model fails to meet the participation expectations of more than half of patients, which may lead to alienation of patients from the medical process and decreased satisfaction with decision-making.

3.5. The Correlation Between Decision-Making Preparation, Decision-Making Participation, and Decision-Making Conflict Among Breast Cancer Patients Undergoing Chemotherapy. The research results show that the total score of decision conflicts for breast cancer patients with indwelling venous access was negatively correlated with decision preparation ($r = -0.614$, $p < 0.01$). The total score of decision conflict was positively correlated with decision participation ($r = 0.304$, $p < 0.01$) (Table 4).

3.6. Multivariate Linear Regression Analysis of Decision Conflicts Regarding Vascular Access Devices in Breast Cancer Patients Undergoing Chemotherapy. Taking the total score of decision conflicts as the dependent variable, and including the variables with statistical significance in the single-factor analysis, as well as decision preparation and decision participation as independent variables, a multiple linear regression analysis was conducted. The assignment of independent variables in the multiple linear regression is shown in Table 5. The results indicate that age, being unmarried, family per capita monthly income, understanding of the disease, understanding of vascular access, and decision-making readiness are the influencing factors of the decision conflict regarding vascular access devices for breast cancer chemotherapy patients ($p < 0.05$) (Table 6).

4. Discussion

Based on the ODSF, this study evaluated the current status of decision-making conflicts in the selection of vascular access devices in Chinese breast cancer patients undergoing chemotherapy. The result shows that the overall decision conflict of the patients is at a relatively high level and there is an obvious decision-making predicament. This finding is similar to the results of a study on the decision-making conflict in breast cancer surgery methods [29]. The scores of each dimension showed that the decision-making conflicts of patients mainly stemmed from the "uncertain factors" in the selection of vascular access devices. This finding is consistent with the results of a systematic review by Robinson A et al. [6]. When choosing the best vascular access strategy for patients, it is necessary to comprehensively consider factors such as vascular access infection, thrombosis, and other related complications [30–33], catheterization method [34], long-term maintenance burden, and impact on quality of life [30]. PICC, PORT, and CVC have significant differences in operation process, complication risk, and maintenance requirements: PORT needs to be surgically implanted, and the catheter tip needs to be accurately located at the junction of the superior vena cava and

Table 4: Correlation among decision-making readiness, decision-making participation, and decisional conflict in breast cancer patients undergoing chemotherapy ($N = 308$).

	Decisional conflict	Decision-making uncertainty factors	Decision-making uncertainty	Perceptual validity	Decision-making participation	Decision preparation
Decisional conflict	1					
Decision-making uncertainty factors	0.964**	1				
Decision-making uncertainty	0.904**	0.798**	1			
Perceptual validity	0.915**	0.799**	0.832**	1		
Decision-making participation	0.343**	0.348**	0.357**	0.241**	1	
Decision preparation	−0.614**	−0.575**	−0.581**	−0.575**	−0.245**	1

**$p < 0.01$.

Table 5: Independent variables in the regression analysis of factors influencing decision-making conflict ($N = 308$).

Independent variable	The way of assigning independent variables
Age	≤ 40 = 1; 40~60 = 2; ≥ 60 = 3
Degree of education	Primary school and below = 1; junior high school = 2; high school = 3; college and bachelor's degree or above = 4
Marital status	Set dummy variables with "married" as the reference category: unmarried (1, 0); divorced/widowed (0, 1).
Per capita monthly income of the family	< 1000 = 1; 1000~3000 = 2; 3000~6000 = 3; ≥ 6000 = 4
Position type	Set the dummy variable with farmers as the reference, workers (1, 0, 0, 0); retirement (0, 1, 0, 0); individual business owner (0, 0, 1, 0), freelancing (0, 0, 0, 1)
Payment method of fees	Set a dummy variable with medical insurance as the reference and pay out of pocket (1, 0, 0, 0); employee medical insurance (0, 1, 0, 0), urban resident medical insurance (0, 0, 1, 0), New Rural Cooperative Medical Scheme (0, 0, 0, 1)
Degree of understanding of the disease	Very familiar with = 1; general understanding = 2; not very familiar = 3; I don't understand at all = 4
The degree of understanding of vascular access	Very familiar with = 1; general understanding = 2; not very familiar = 3; I don't understand at all = 4
Habitual residence	Rural areas = 0; city = 1
The number of coexisting diseases	Nothing = 1; one kind = two; ≥ 2 types = 3

Table 6: Multiple linear regression analysis of decision-making conflicts for vascular access devices in breast cancer patients undergoing chemotherapy ($N = 308$).

Independent variable	β	SE	β'	t	p
Constant term	45.157	4.913	—	9.191	< 0.001
Age	1.775	0.850	0.108	2.088	0.038
Unmarried	6.443	3.167	0.092	2.035	0.043
Per capita monthly income of the family	−1.427	0.618	−0.122	−2.312	0.022
Degree of understanding of the disease	1.852	0.672	0.146	2.757	0.006
The degree of understanding of vascular access	3.054	0.737	0.255	4.146	< 0.001
Decision preparation	−0.445	0.055	−0.372	−8.090	< 0.001

Note: $R^2 = 0.581$; after adjustment, $R^2 = 0.554$; $F = 21.049$; $p < 0.001$.

the right atrium [10]. The thrombosis rate of PORT is about 2.5% [6], which can reduce the risk of thrombosis caused by catheter malposition. Although PICC can be placed through peripheral vein puncture, the positioning of the catheter tip depends on ultrasound or X-ray verification. If the positioning is not correct, the risk of thrombosis will increase to 9.3% [6].

The essence of decision-making conflict was the superposition of insufficient cognition of technical characteristics and concern about clinical outcome. 48.1% of the patients only had a general understanding of vascular access, and they were not clear about the advantages of low complications caused by PORT surgical implantation and accurate positioning, or the maintenance burden after convenient PICC catheterization, so they could only rely on superficial information such as cost and operation when making decisions. At the same time, patients' perception of the risk of complications may further exacerbate the conflict [35]. Even if the medical staff informs them that a study shows that the PORT infection rate is only 2.1% [32], some patients may still have a fear of infection due to the implantation surgery and worry that thrombosis may cause arm swelling after choosing PICC. Such vague cognition of technical risks puts patients in A dilemma for decision-making, which is consistent with the research conclusion of Abou-Mrad A et al. [8] that PORT safety should be delivered in combination with technical details. In addition, the difference between patients' expectation and actual participation in decision-making is also closely related to the lack of technical information transmission. In clinical practice, doctors often recommend vascular access devices based on the summary conclusion that PORT is safer and PICC is more convenient, without explaining the safety technical basis and convenient operation restrictions to patients, resulting in patients being unable to balance their treatment cycle and life needs. Finally, they were forced to accept passive decision-making.

The results of this study indicate that age is positively correlated with decision-making conflict; that is, the older the age, the higher the score of decision-making conflict. This is consistent with the research results of Berith Hedberg et al. [36] and Jia et al. [37]. From the technical point of view, the implantable operation and tip positioning method of PORT are unfamiliar medical technologies for elderly patients, and their concerns about surgical trauma and anesthesia risk may be greater than those of young patients. At the same time, elderly patients may have an amplification effect on the risk perception of complications [38]. Even if the medical staff explains that the thrombosis rate of PORT is only 2.5% [6], elderly patients may still worry excessively

because people around them have a history of thrombosis and tend to choose PICC without surgery. However, they are worried about mobility due to frequent maintenance of the PICC, which leads to decision-making difficulties. The study of Marano et al. [10] also confirmed that the technical details of catheter tip positioning can significantly reduce the risk of complications. However, due to the weak ability of information acquisition, elderly patients find it difficult to understand the clinical value of accurate positioning and may only focus on the superficial issue of whether surgery is needed, which further aggravates the decision-making conflict. Therefore, before making a decision, healthcare professionals can provide decision assistance tools suitable for the elderly [39–42]. For instance, they can use illustrated manuals, with large fonts and charts replacing textual descriptions or video explanations; they can invite family members to participate in the decision-making process, have the healthcare professionals explain to the family members, and then have the family members relay the information in a language familiar to the patient, ensuring that the information is accurately conveyed; they can also organize patients over the age of 60 who have completed the selection of vascular access devices to share their decision-making process, reducing the fear of "new technologies" among their peers.

The results of this study indicate that the decision-making conflicts among unmarried patients were significantly higher than those of married patients, which is consistent with the findings of Han Tang et al. [29] and Zhang Duo et al. [43]. This might be due to the fact that in the cultural context of China, marital support plays a crucial role in medical decision-making. Married patients can involve their spouses in information discussions and share the pressure of decision-making, whereas unmarried patients lack such emotional and practical support and are more prone to experiencing uncertainty when facing complex options alone. However, in Chinese culture, parents are often the most core source of family support for the unmarried group. Therefore, it is necessary to actively invite the parents of unmarried patients and married patients with breast cancer who have received vascular access devices to participate in the discussion on the selection of vascular access devices. They should jointly analyze and make decisions on the impact on social life, work, and marriage and love and provide strong external support to reduce the decision-making conflicts of unmarried breast cancer patients undergoing chemotherapy.

The results of this study show that the per capita monthly income can negatively predict the decision-making conflicts; that is, the lower the income, the higher the decision-making conflicts. This is consistent with the results of A. Friselly et al. [44] and Zhang Duo et al. [43]. From the perspective of technical cost, the initial cost of PORT is the highest, but the long-term maintenance cost is low. PICC has a low initial cost but a high maintenance cost. CVC has the lowest total cost due to its short indwelling time, but it is not suitable for long-term chemotherapy [14]. Some of the patients in this study had a per capita monthly household income of 1000 to 3000 yuan, and 49.3% of them were covered by the new rural cooperative medical insurance. The nature of their decision-making conflict may be an economic trade-off between technical cost and maintenance convenience. However, in clinical practice, patients are only informed that the initial cost of PORT is high and the initial cost of PICC is low, and no comprehensive calculation of technical cost and maintenance cost is provided. As a result, low-income patients only pay attention to the initial cost and then regret the time and economic cost of frequent maintenance after choosing PICC, which aggravates the decision-making conflict. Therefore, medical staff need to provide technical and economic adaptation programs for low-income patients. Hospitals can cooperate with township hospitals to provide vascular access device maintenance services and reduce transportation costs to the city. A medical insurance reimbursement and technical cost calculator was developed to automatically generate the total out-of-pocket cost comparison of PORT, PICC, and CVC after inputting the patient's medical insurance type, treatment cycle, and other information, to help patients choose technically suitable vascular access devices within the economic range.

The results of this study indicate that the patients' understanding of the disease and vascular access can positively predict decision conflicts, and their understanding of the vascular access devices has a greater impact. The central reason for this result may be the fragmentation of technical information transfer. The commonly used information transmission method in clinical practice is usually oral explanation, which only informs patients of technical differences but does not explain the technical principles behind the differences, the actual impact on patients, and the technical suitability in combination with chemotherapy regimens [45]. This fragmented information may lead to patients with a higher level of knowledge being more likely to perceive technical contradictions. This indicates that if patients are only given simple information infusion without structured decision support, they may be trapped in more complex information conflicts. The systematic review by Robinson A et al. [6] also pointed out that vascular access device decision-making needs to integrate three-dimensional information of technical characteristics, clinical outcomes, and patient needs and only convey single-dimensional information, which may lead to increased decision-making conflicts. Therefore, patients can be educated through stratified methods to enhance their understanding of diseases and vascular access devices; they can be shown the maintenance processes of various vascular access devices, as well as their appearance after implantation; a "disease-vascular access device correlation manual" can be developed, clearly indicating the matching relationship between different chemotherapy regimens and recommended vascular access types, helping patients directly associate their knowledge of diseases with the selection of vascular access devices. Ensuring that patients of different levels of understanding can grasp the key information helps reduce decision-making conflicts caused by insufficient cognition.

The results of this study show that the level of decision preparation can negatively predict the level of decision

conflicts. That is, the higher the decision preparation score, the lower the decision conflict. This is consistent with the research results of Jia et al. [37] and Zhu et al. [46]. This suggests that decision preparation is the key to reducing conflicts. When patients can clearly sort out core demands such as length of treatment cycle, lifestyle convenience requirements, and economic affordability, they are more likely to find matching options among the choices and reduce hesitation. Therefore, in clinical practice, it is necessary to develop decision preparation tools that match technology and needs: For example, the needs list is designed to let patients rank by importance, and the technical information sheet of vascular access devices (including catheterization method, tip positioning requirements, complication rate, maintenance frequency, etc.) is designed to guide patients to achieve precise matching between needs and technology through a mind map, so as to reduce patient decision regret.

5. Limitation

This study adopted a cross-sectional design, which can only reveal the correlations between variables but cannot determine the causal relationships between them. The study selected patients from three tertiary hospitals in Xinxiang City, Henan Province, China. The sample was concentrated in the northern part of Henan Province, and all were tertiary Grade A hospitals. This may introduce selection bias and limit the generalizability of the results. Patients in primary hospitals or rural areas may face more severe resource constraints, and the influencing factors of their decision-making conflicts may be more complex. In addition, this study did not directly measure patient risk perception of complications. Future studies can clarify the causal relationship through prospective cohort studies, increase the variables related to risk perception, and improve the universality of the conclusions by expanding sample diversity and focusing on hierarchical comparison, to provide more accurate decision support strategies for breast cancer patients undergoing chemotherapy in different regions and different levels of medical institutions and effectively reduce decision-making conflicts in the selection of vascular access devices.

6. Conclusion

Breast cancer patients undergoing chemotherapy have obvious decision-making conflicts in the selection of vascular access devices, and there is a discrepancy between their decision expectations and actual participation. Among them, age, being unmarried, family per capita monthly income, understanding of the disease, understanding of vascular access devices, and decision preparation level are significant influencing factors for the decision-making conflicts of breast cancer patients regarding vascular access devices. Therefore, it is recommended that medical staff first develop and implement a structured decision aid tool for vascular access devices in breast cancer chemotherapy patients, integrating device-related complication data, quality-of-life evidence, and economic cost information. Secondly, patient education with decision preparation as the core was implemented, and a value clarification method was used to help patients clarify their personal preferences. Finally, a decision discussion model of multidisciplinary collaboration was established to ensure that doctors, nurses, patients, and family members made decisions together under the premise of symmetrical information, to improve the quality of patient decision-making and reduce decision regret.

Data Availability Statement

The datasets generated and/or analyzed during the current study are not publicly available to protect the anonymity of participants but are available from the corresponding author upon reasonable request.

Ethics Statement

The study adhered to the principles outlined in the Declaration of Helsinki and received approval from the relevant local clinical research ethics committee. Informed consent for participation in the study was obtained before the survey.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Jialu Sun: writing–review and editing, writing original draft, methodology, and data collection.

Pengli Chen and Shouxun He: writing–review and editing, and data collection.

Mengzhu Jiang and Jinhong Lü: data collection and methodology.

Lina Wang: writing–review and editing, supervision, and conceptualization.

Hongru Wang: writing–review and editing, supervision, funding acquisition, data collection, and conceptualization

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