Research on Evaluating the Comfort of Postoperative Orthopedic Patients' Clothing Based on TAM Model

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Abstract: This paper takes postoperative rehabilitation nursing of orthopedic surgery patients as the entry point to address the current problems of outdated style and single function of hospital patient clothing. Based on theoretical knowledge of rehabilitation nursing medicine, as well as the results of patient and doctor research, this study constructs a theoretical framework for the influence of consumers' consumption intention and forms a questionnaire through scale design. Through constructing a model from the perceived usefulness and perceived ease of use of the TAM model combined with the AISAS model and based on seven different postoperative demand analysis variables for the affected area, a design solution in structure and function is proposed, and the design practice of the ready-to-wear patient clothing series is completed.

Keywords: TAM model, Evaluating, Comfort, Postoperative Orthopedic Patients' Clothing

1 Introduction

Orthopedic diseases have been plaguing human life. Mechanical and strain-led bone injuries caused by work accidents and sports accidents, as well as degenerative diseases of bone and joint due to ageing, are on the rise year by year and impose a serious threat to people's health [1]. Traditional patient clothing is less compatible with the actual needs of postoperative rehabilitation nursing in orthopedic surgery, conventional dressing and undressing methods can increase physiological pain, and exposure to body privacy may bring psychological burdens [2]. As the clothing that patients need to wear close to their body during the whole treatment process, it is more important to improve the functional and humanized design of patient clothing to further enhance patients' treatment experience during admission [3].

The TAM model was first proposed by Davis in 1986 [4], which combines the expectancy theory model with self-efficacy theory and other theories, and the theoretical basis is the TRA model [5]. The TAM model was formed with attitudes, dependent motivation, and subjective norms being three constructs, perceived ease of use and perceived usefulness being exogenous variables, attitudes toward technology, behavioral intentions, and ultimate impact being the conduction process [6].Based on the above theoretical foundation, this paper will combine the patient clothing style and function, and establish a research model of the influence of willingness to wear and use orthopedic surgical patient clothing based on the TAM model and AISAS model [7].

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2 Materials and methods

Common orthopedic surgical treatments occur on the neck and shoulder, elbow and wrist joints of the upper extremity, knee and ankle joints of the lower extremity, spine, low back, and hip. The surgical approach and postoperative status vary greatly from one site to another, and rehabilitation nursing methods are also different, Early rehabilitation care is conducive to fracture healing and reduction of complications [8], which also places higher demands on the relevance of key elements of patient clothing design. As shown in Table 1.

Table 1. Summary of postoperative nursing requirements and design elements

Injury site	Postoperative symptoms	Pain degree	Nursing requirements	Design elements
Neck	Congestion accumulation Intra-articular adhesions Tissue swelling	Heavy	Observe the patient's vital signs; Wear collar support when the patient moves; Change dressing and disinfect wound surface regularly; Observe wound discharge, drainage tubes, etc.	Increase neckline circumference; Loose neck; Do not affect the wearing of collar support; Avoid chest exposure
Shoulder and upper extremity joints	Joint adhesions Joint spasm Joint stiffness	Moderate	Observe wound discharge and end-limb feeling; Prevent tissue ischemia and massage appropriately; Wear plaster, armrests, and other devices; Change dressing and disinfect wound surface; Conduct functional recovery training in a timely manner	Facilitate wound observation and dressing change; Set shoulder and arm openings; Avoid chest exposure; Facilitate recovery training; Increase the circumference of the injured limb
Lower extremity joints	Disuse decalcification Venous thrombosis Limb disuse atrophy	Moderate	Observe wound discharge and end-limb feeling; Prevent thrombosis, massage moderately; Wear a walking rehabilitation device, etc. for the patient; Change dressing and disinfect wound surface regularly; Conduct functional recovery training in a timely manner	Facilitate wound observation and dressing change; Set the disassembly point in the knee position; Avoid exposure of private parts; Facilitate recovery training; Increase the circumference of the injured limb
Spine	Respiratory dysfunction	Heavy	Assist the patient to turn his/her body;	

Lumbar and hip joints	Urinary dysfunction Body temperature abnormalities Intestinal dysfunction Hypostatic pneumonia Pressure sores Urinary dysfunction Cardiopulmonary abnormalities	Heavy	Observe wound discharge and recovery; Change dressing and disinfect wound surface; Observe and assist the patient to defecate Assist the patient to turn his/her body; Observe wound discharge and recovery; Change dressing and disinfect wound surface; Conduct functional recovery training in a timely manner	Facilitate wound observation and dressing change; Set opening in front and back pieces; Avoid chest exposure; Easy to clean Facilitate wound observation and dressing change; Set opening at waist position; Avoid exposure of private parts; Facilitate recovery training

The main subjects of this study were orthopedic surgery patients in three hospitals, involving seven different affected areas. 110 questionnaires were distributed and 98 were valid. A descriptive analysis of demographic variables was performed using SPSS 21.0 to obtain the sample structure. There were 110 subjects, with 60% being males and 40% being females. The questionnaire results corresponded with the interest of consumers in pop-up shops. The proportion of elderly aged 60-85 years was 50%; the proportion of middle-aged people aged 30-60 years was 35%; the proportion of young people aged 10-30 years was 15%. After a descriptive analysis of the 98 valid questionnaires collected, the following was finally derived. As shown in Table 2.

Table 2. Age and etiology of orthopedic patients

Age	Proportion	Reason	Proportion
65-85 years old	50%	Trauma caused by degenerative bone disease	45%
		Accidental trauma	40%
		Bone trauma caused by other diseases	15%
30-60 years old	35%	Accidental trauma	85%
		Bone trauma caused by other diseases	15%
10-30 years old	15%	Accidental trauma	75%
		Congenital bone disease	25%

3 Results&discussion

The Cronbach's alpha coefficients (Cronbach α) for the nine variables – patient clothing style, color, material, size, tops' function, trousers' function, wound opening, patient comfort, and nurses' feedback were 0.857, 0.913, 0.845, 0.802, 0.957, 0.905, 0.823, 0.933, and 0.897, respectively, which were calculated by SPSS21.0. The variable values were all greater than 0.7. The reliability of the variables in this study was good, and the results are shown in Table 3.

Table 3. Results of the internal reliability analysis of each construct

Variable	Cronbach α
Style of patient clothing	0.857
Color of patient clothing	0.913
Material of patient clothing	0.845
Size of patient clothing	0.802
Function of patient's tops	0.957
Function of patient's trousers	0.905
Opening at the wound	0.823
Patient comfort	0.933
Feedback from nurses	0.997

The test on the validity is divided into content validity test and construct validity test. The items in this paper are taken from well-developed scales. The scales are tested via previous studies and exploratory factor analysis (EFA). When designing the questionnaire and the scale, items were adapted accordingly to this research. Therefore, the content validity is good.

This research does factor analysis to examine the construct validity of the questionnaire. The first step is to test the feasibility of factor analysis. SPSS23.0 is used as the test tool, which calculates the KMO value and performs Bartlett's test. The KMO value is employed to test the partial correlation between variables. The purpose of Bartlett's test is to verify the correlation between variables and extract common factors. Social studies require a KMO value of at least 0.5, and the data passes Bartlett's test. If the P-value is greater less than 0.05, it implies that the questionnaire data are appropriate for factor analysis. As shown in Table 4.

Table 4. Global KMO and Sphericity tests

KMO		0.823
Bartlett Sphericity test	The approximate chi-square	10356.181
	df	3007
	Sig.	0.000

Table 5. Validity test of each factor

Variable dimension	**KMO**	**Sig**	**Load range**	**The cumulative**
Style of patient clothing	0.732	0	0.556~0.832	74.266%
Color of patient clothing	0.710	0	0.545~0.877	75.365%
Material of patient clothing	0.756	0	0.656~0.887	71.355%
Size of patient clothing	0.726	0	0.721~0.865	67.533%
Function of patient's tops	0.708	0	0.598~0.910	70.237%
Function of patient's trousers	0.823	0	0.767~0.837	70.221%
Opening at the wound	0.736	0	0.712~0.920	73.102%
Patient comfort	0.845	0	0.578~0.878	75.754%
Feedback from nurses	0.776	0	0.532~0.901	68.325%

As can be seen from the above table 5 ,The KMO test yielded a KMO value of 0.897, which is greater than the minimum standard value of 0.7, as shown in the table above. In addition, the probability of the significant level of the result is 0.000, which is less than 0.001, therefore, the sample data is eligible for factor analysis. Principal component analysis (PCA) is mostly utilized

in this study to extract factors with eigenvalues greater than 1. After doing factor analysis on the items corresponding to each variable, a factor is extracted from each variable, and the cumulative proportion of the extracted factors is greater than fifty percent, which adequately explains the variable. The factor loadings of all items are greater than 0.5, indicating that the sample data is appropriate for factor analysis.

The entropy method can calculate the weight of each index, demonstrating the varying degrees of influence of each indicator on the consumption intention. Initially, data normalization should be performed. This study includes 298 samples and 10 indicators. The weight of each index can be determined by computing the information entropy value and the information utility value using SPSS software, as shown in Table 6.

Table 6. Results of the entropy method of analysis for each indicator.

Specific indicators	Corresponding weights	
Perceived usefulness(47%)	Style of patient clothing	22.3%
	Material of patient clothing	14.4%
	Size of patient clothing	10.3%
Perceived trust(42%)	Function of patient's tops	11.2%
	Function of patient's trousers	12%
	Patient comfort	8.8%
Perceived ease of use(11%)	Opening for wound observation	10%
	The way different components are combined	5%
	Nurses' feedback	6%

4 Design of postoperative patient clothing

4.1 Postoperative patient clothing design for neck and shoulder area

The top of the neck injury patient clothing is designed with a flat-shoulder elastic neckline structure, which can be adjusted according to the changes in the circumference of the patient's neck, facilitating the installation and removal of the postoperative neck protector and related stable bone support, reducing the foreign body feeling of the wearing patient, improving the fit of the clothing and enhancing the wearing comfort. The shoulder structure of postoperative shoulder injury patients has changed, and they need to remove their upper body clothing during the rehabilitation nursing stage, which causes unnecessary physiological pain due to frequent dressing and undressing. The loose quantity of the shoulder part of the patient's clothing is expanded by 4cm-6cm to meet the needs of the external fixator, and the functional zipper opening is increased to form an open structure, so that patients can directly undergo rehabilitation nursing and medical examination through the shoulder opening during the postoperative rehabilitation nursing phase, facilitating therapeutic nursing and patients' postoperative exercise rehabilitation activities [6].As shown in Figure 1-2.

Figure 1. Design of postoperative patient clothing for the neck

Figure 2. Design of postoperative patient clothing for the shoulder

4.2 Design of postoperative patient clothing for upper limb joint

Figure 3. Design of postoperative patient clothing for upper limb (elbow) joint

Figure 4. Design of postoperative patient clothing for upper limb joint

In view of the physical functional characteristics of patients with upper limb, elbow, and wrist injuries, as well as the postoperative rehabilitation nursing model, the sleeve of the patient clothing was designed in sections, with a functional zipper opening on the sleeve to facilitate the installation of postoperative elastic bandages, medical casts, and related external stabilizers. The zipper head was fixed at the middle seam line of the inner sleeve to avoid the stress point, reduce the foreign body feeling when wearing, and enhance wearing comfort. The design is functional and aesthetically pleasing, and convenient for dressing and undressing. The sleeve in the elbow and wrist joint is an open structure and is fixed by buttons, which facilitates daily rehabilitation nursing of the affected area and exercise of the patient after surgery [9].As shown in Figure 3-4.

4.3 Design of postoperative patient clothing for lower limb joints

The design of patient trousers for patients with lower limb bone injury adopted a split structure, with a horizontal zipper design above the knee joint, which allows for the removal of trousers and facilitates the dressing and undressing when the circumference of the knee and ankle joints increases after surgery. The lower part of the trousers has a longitudinal button fixation opening at the lateral position of the outer mid-seam and a lined catheter storage area was added to the trousers to provide privacy protection for patients with postoperative motor function loss and relieve psychological pressure [10].As shown in Figure 5.

Figure 5. Design of postoperative patient clothing for lower limb joints

4.4 Design of postoperative patient clothing for spine

The design of the patient clothing for spinal injury focused on the need for complication prevention and nursing, and the mid-back seam of the patient clothing was set as an open structure, which can be adjusted according to the spinal injury site and rehabilitation nursing needs to facilitate the installation of postoperative spinal stabilizers and the intervention of drainage tubes. Also, patients can be checked for complications and other conditions through the mid-back seam while they are in bed, reducing their emotional agitation due to unnecessary dressing and undressing and movement, and facilitating daily body cleaning of patients. As shown in Figure 6.

Figure 6. Design of postoperative patient clothing for spine

4.5 Design of postoperative patient clothing for waist and hip

Based on the characteristics of postoperative rehabilitation nursing of the waist, back, and hip, the design of the lower part of the patient clothing used at this stage was improved. In the design of the style, the front piece and the back piece adopted a split structure with a zipper on the outside, and the front and back waist were connected with elastic ties, which can facilitate examination and dressing change for bedridden patients by simply unzipping the zipper based on the needs during morning and evening nursing, dressing and undressing, bed cleaning and body turning, avoiding the leakage of patients' privacy and reducing the physiological pain caused by frequent dressing and undressing. It also facilitates patients' use of exercise rehabilitation equipment in the perioperative period, enhances the patient experience, and promotes patient recovery. As shown in Figure 7.

Figure 7. Design of postoperative patient clothing for waist and hip

5 Conclusion

In this study, the structure design of the orthopedic surgery postoperative patient clothing was improved after the research of current orthopedic surgery patients and nurses and the analysis of the postoperative treatment of different affected areas, combined with modern rehabilitation nursing theory, based on the actual clinical needs, and through the summary of targeted design elements. By using the perceived usefulness and perceived ease of use of the TAM model, and the AISAS model, the design model of the patient clothing was constructed based on seven different postoperative demand analysis variables for the affected area, and the finished clothing was produced and the actual trial and feedback were completed.

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