Original Article
Model construction of nursing service satisfaction in hospitalized tumor patients

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Abstract: This study aims to construct a satisfaction model on nursing service in hospitalized tumor patients. Using questionnaires, data about hospitalized tumor patients' expectation, quality perception and satisfaction of hospital nursing service were obtained. A satisfaction model of nursing service in hospitalized tumor patients was established through empirical study and by structural equation method. This model was suitable for tumor specialized hospital, with reliability and validity. Patient satisfaction was significantly affected by quality perception and patient expectation. Patient satisfaction and patient loyalty was also affected by disease pressure. Hospital brand was positively correlated with patient satisfaction and patient loyalty, negatively correlated with patient complaint. Patient satisfaction was positively correlated with patient loyalty, patient complaints, and quality perception, and negatively correlated with disease pressure and patient expectation. The satisfaction model on nursing service in hospitalized tumor patients fits well. By this model, the quality of hospital nursing care may be improved.

Keywords: Hospitalized tumor patients, nursing service, satisfaction model, structural equation

Introduction

Patient satisfaction with nursing service refers to an evaluation of patients' experience about nursing service. The patient satisfaction about nursing service is an indicator of the quality of service (QOS) [1].

The satisfaction degree of patients with different diseases at different stages showed significant differences based on previous surveys [2-4]. How to adjust the evaluation system and how to improve service quality and hospitalized patient satisfaction about nursing service is a problem to be solved [5]. Therefore, this study aims to build a model of hospitalized tumor patient satisfaction with hospital nursing service. The relationship between quality perception, service expectation, disease pressure, patient satisfaction and patient loyalty was analyzed. Our results may help managers to understand the conditions of current quality of service and patient loyalty, and thereby to take measures to improve hospital nursing service [6-11].

Materials and methods

Satisfaction model construction on nursing service in hospitalized tumor patients

This study constructed a causal model of hospitalized tumor patient satisfaction with the hospital nursing service. The structural model diagram and pathways were used to propose a hypothesis and to verify the causal relationship between satisfaction and the seven latent variables, including quality perception, expectation, disease pressure, hospital brand, patient satisfaction, patient loyalty and complaint.

Quality perception is the difference between the expectation of service and the perception of actual service that patients received. It is a subjective experience which patients experienced during hospitalization, and it emphasizes the subjective evaluation position of the patients. Hospitals also have to consider both the quality of service (hardware quality) and perception of service (software quality). Based on previous relevant literature references around the world, and using hospitals as our
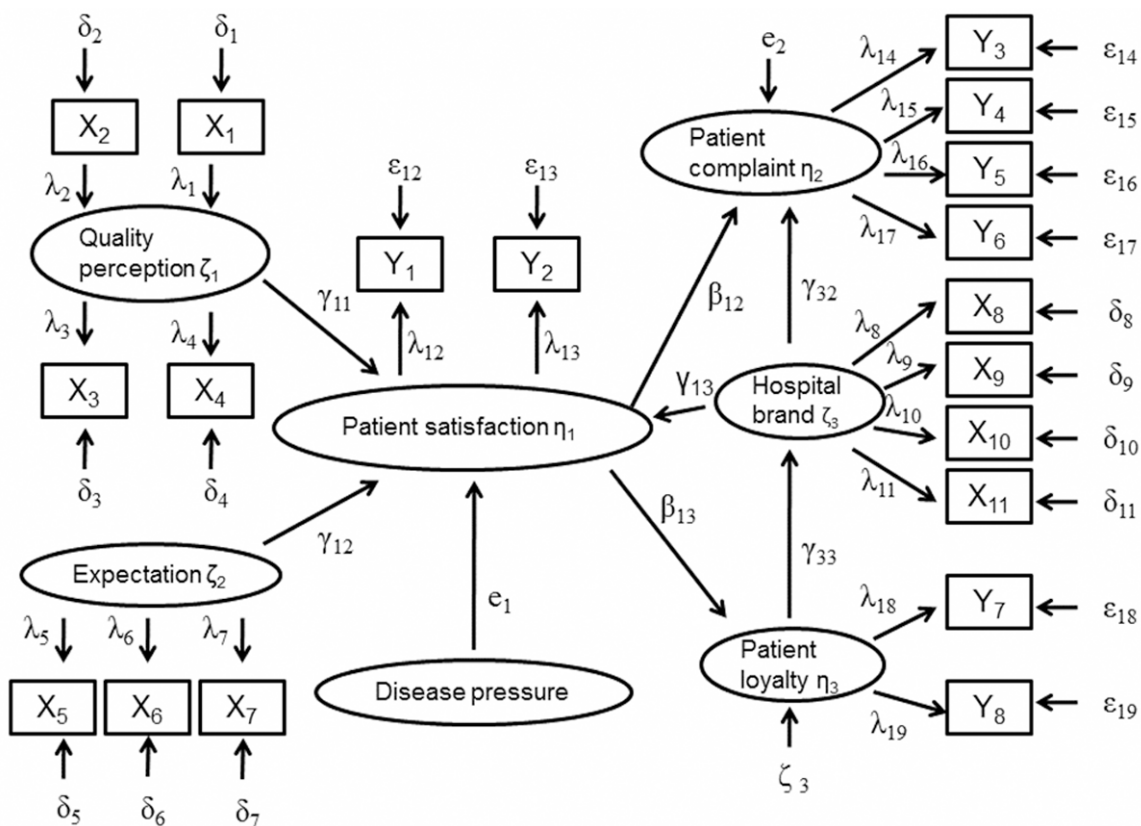
Figure 1. Correlation pathways of the tumor patient satisfaction about nursing service.

subjects, we selected three factors as our hospital variables: hospital brand, popularity and loyalty. These three factors were described as follows: (1) This hospital has a good reputation among patients. (2) This hospital is highly popular. (3) This hospital is reliable.

And, these factors were scored as follows: score 1 represented "strongly disagree" and score 5 represented "completely agree". The greater the score, the better the hospital's image was in the minds of patients.

Design of the pathways for the satisfaction model

According to the core concepts of American Customer Satisfaction Index (ACSI) proposed by Professor Fornell et al. [12] and the Chinese customer satisfaction model, the causal model (a theoretical model) of hospitalized patient satisfaction in this study retained five core indicators, including customer expectation, perceived quality, customer satisfaction, customer complaints and customer loyalty. Additionally,

the factors of the hospital's image, disease pressure, quality factor 1 (soft indicators of hospital services, such as service attitude, etc.) and quality factor 2 (hospital environment) were also included in this study. Of them, quality factor 1 and quality factor 2 were included to the factor of quality perception. After setting the latent variables and observing the relation between those variables, we obtained a satisfaction model which contained seven latent variables and ten pathways. Latent variables correspond to a total of 28 observed variables (**Figure 1**).

Structural equation model and measurement model

According to the hypothetical pathways of the satisfaction model established in **Figure 1**, appropriate structural equation model was proposed. In the structural equation, ζ represented the vector of exogenous latent variables and η represented the vector of endogenous latent variables. Thus, the structural equation model was expressed as follows:

$$H = \beta\eta + \gamma\zeta + \zeta \qquad \text{(Equation 1)}$$

And,

$$\eta = \begin{vmatrix} \eta 1 \\ \eta 2 \end{vmatrix} \qquad \zeta = \begin{vmatrix} \zeta 1 \\ \zeta 2 \\ \zeta 3 \end{vmatrix} \qquad \text{(Equation 2)}$$

Expanded as:

$$\eta_1 = \gamma_{11}\zeta_1 + \gamma_{12}\zeta_2 + \gamma_{13}\zeta_3 + \zeta_1 \qquad \text{(Equation 3)}$$

$$\eta_2 = \beta_{21}\eta_1 + \gamma_{32}\zeta_3 + \zeta_2 \qquad \text{(Equation 4)}$$

$$\eta_3 = \beta_{31}\eta_1 + \gamma_{33}\zeta_3 + \zeta_3 \qquad \text{(Equation 5)}$$

In the measurement model, X represented the vector of exogenous observed variables and Y represented the vector of endogenous observed variables. The measurement model was expressed as follows:

$$x = \Lambda_x\zeta + \delta \qquad \text{(Equation 6)}$$

$$y = \Lambda_y\eta + \varepsilon \qquad \text{(Equation 7)}$$

In **Equation 6**, Λ_x was the factor loading matrix of exogenous latent variables and δ was the error term of exogenous observed variables. In **Equation 7**, Λ_y was the factor loading matrix of endogenous latent variables and ε was the error term of endogenous observed variables.

Settings for satisfaction scale

The first part of the questionnaire contained the basic information of the respondents, including gender, age, education level, medical payment situation, whether the first visit and so on. According to policy requirements of QOS, guidelines for hospital nursing service classification, questionnaire entries and dimensions of survey from previous studies, and based on deep investigation and communication with patients and their families, the specific content of the questionnaire was determined. After soliciting the views of patient representatives, the clarity of the questionnaire was tested. After a pre-test of 20 patients with various education backgrounds, the questionnaire was adjusted accordingly by on-site investigators. Finally, after testing the reliability and validity of pre-test questionnaire, the questionnaire was revised again to achieve better reliability and validity. The final questionnaire included 28 questions.

The questionnaire adopted Liker5 grade scale to evaluate the degree of patients' satisfaction. In the Liker5 grade scale, there were 5 scales, which represented "totally disagree", "disagree", "in general", "agree" and "totally agree". And, there were 20 scores in each scale. Thus, the total score was 100. The importance of each service factor was evaluated using "totally disagree", "disagree", "general", "agree" and "agree completely". ("1" represented "very unimportant", the lowest degree of importance, "2, 3, 4" represented increasing importance and "5" represented "very important").

Statistical methods

The scores of observed variables were obtained from the questionnaire score. Amos17.0 SPSS17.0 statistical analysis software was used for data analysis.

Results

The general information of subjects in this study

After finalization of the satisfaction questionnaire, we randomly distributed 250 copies of questionnaires to 250 tumor patients hospitalized in the Hunan Cancer Hospital at December 2011. A total of 229 copies of questionnaires were taken back, with a response rate of 91.6%. Among these 229 copies of questionnaires, 216 copies were valid, with an effective rate of 94.3%. Among the 216 patients from whom the effective questionnaires were collected, there were 105 males (48.9%), and 111 female (51.3%). Their average age ranged from 40 to 49 years.

Reliability analysis of the satisfaction scale

The Cronbach coefficient of the 28 items in this questionnaire was 0.879, indicating a high consistency of the various indicators of the questionnaire. The reliabilities of the 7 latent variables were between 0.716-0.879, which was all above 0.7 and at a high confidence level. This data suggest that the reliability of the questionnaire is acceptable (**Table 1**).

Validity analysis of the satisfaction scale

This study calculated the construct validities of each scale using factor analysis. It was found

Table 1. Patient satisfaction scale with Cronbach coefficients of latent variables

Latent variable	Cronbach's Alpha	n
Quality perception	0.850	10
Expectation	0.879	4
Hospital brand	0.732	2
Patient satisfaction	0.726	3
Patient complaint	0.754	4
Patient loyalty	0.716	3
Disease pressure	0.791	1
Total	0.879	28

Table 2. Validity analysis of latent variables

Latent variable	The initial eigenvalues		
	Total	Contribution %	Accumulative contribution %
Hospital brand	2.261	22.357	22.357
Patient complaint	2.243	12.136	34.493
Expectation	2.104	10.092	44.585
Quality perception	2.071	8.709	53.294
Disease pressure	1.679	7.423	60.717
Patient satisfaction	1.391	6.543	67.260
Patient loyalty	1.265	5.965	73.225

that the total eigenvalue of hospital brand, patient complaint, expectation, perceived quality, disease pressure, patient satisfaction and patient loyalty was greater than 1. Among them, hospital brand contributed 22.357%, the patient complaint 12.136%, the patient expectation 10.092%, the quality perception 8.709%, disease pressure 7.423%, patient satisfaction 6.543% and patient loyalty 5.965% (**Table 2**).

The factor loading of each latent variable, including hospital brand, patient complaint, expectation, quality perception, disease pressure, patient satisfaction and patient loyalty was all greater than 0.5, indicating that the measurements of this questionnaire explain the latent variables very well (**Table 3**).

Pathways of the structural model in nursing service satisfaction model

Our data was analyzed by structural equation in Amos17.0 software and the structural model pathways were shown in **Figure 2**. In this satisfaction model, hospital brand, disease pressure and quality perception directly impacted patient satisfaction. Among them, quality perception

had the most significant impact on patient satisfaction rate. Patient satisfaction had negative correlation with patient expectation. Patients who had higher expectations before receiving nursing service in hospitals showed greater disappointment after receiving nursing service. Thus the satisfaction was also lower. Disease pressure and patient satisfaction was negatively correlated, indicating that the greater pressure from sickness, the higher expectations on quality and effectiveness of services and the lower the satisfaction afterwards.

In addition, in the satisfaction model, antecedents of quality perception, disease pressure, expectations and hospital brands indirectly impacted patient loyalty by influencing satisfaction. The patient loyalty was negatively correlated with their expectation. The higher expectation they had before receiving hospital nursing service, the lower psychological and behavioral loyalty afterwards. Patient loyalty was positively correlated with the quality perception and quality perception showed the most obvious influence on patient loyalty. Disease pressure had an impact on patient satisfaction by influencing expectations and quality perception, and thus affected patient loyalty. Decrease in patient satisfaction may result in complaint, which inevitably led to loss of loyalty. Patient satisfaction and patient loyalty were positively correlated. Higher patient satisfaction with hospital services encouraged higher psychological and behavioral loyalty.

Fitting of nursing service satisfaction model

In this study, pathway coefficient was analyzed by LISRELS.70 and SPSS13.0, and the overall fit of the model was analyzed using the maximum likelihood estimation methods. The actual values of the fitting index were shown in **Table 4**.

Normed fit index (NFI) of our model was 0.97. The joint recommended values of existing models were all over 0.9. Non-Normed fit index (NNFI) was 0.97, the value of NNFI ranges between 0 and 1. The closer NNFI is to 1, the better a model will fit. The comparative fit index (CFI) was 0.99, which was above 0.9 and was acceptable. In this study, the values of NFI,

Table 3. Factor loading analysis of each latent variable

Observed indicators	Latent variable						
	Hospital brand	Patient complaint	Expectation	Quality perception	Disease pressure	Patient satisfaction	Patient loyalty
X1	-0.094	0.011	0.103	0.656	0.112	0.158	0.175
X2	0.291	-0.037	0.143	0.736	0.223	0.257	0.239
X3	0.057	0.128	-0.131	0.632	0.145	-0.226	-0.239
X4	0.063	-0.123	-0.121	0.596	-0.102	-0.123	-0.156
X5	0.243	-0.158	0.723	-0.104	-0.221	0.184	-0.179
X6	0.247	0.334	0.645	0.239	0.321	0.179	0.235
X7	0.373	0.176	0.578	0.258	0.265	0.254	0.346
X8	0.567	0.211	0.234	0.413	0.345	0.247	0.347
X9	0.763	0.212	0.256	0.157	0.419	0.235	0.369
X10	0.608	0.088	0.122	-0.228	0.256	0.329	0.341
X11	0.667	0.189	0.101	0.153	0.321	0.169	0.224
Y1	0.151	0.223	0.109	0.048	0.180	0.533	0.039
Y2	0.177	0.023	-0.065	0.033	0.230	0.563	0.046
Y3	0.109	0.567	-0.031	0.093	0.145	0.237	0.035
Y4	0.132	0.612	0.226	-0.030	0.326	0.356	0.037
Y5	0.008	0.713	0.146	0.063	0.189	-0.176	-0.003
Y6	-0.103	0.642	0.178	-0.051	0.187	-0.234	0.396
Y7	0.231	0.295	0.269	0.156	-0.124	0.264	0.533
Y8	0.401	0.178	0.113	0.232	-0.165	0.326	0.546

NNFI, CFI indices were all within the acceptable range, indicating that the model fits well.

The value of parsimony normed fit index (PNFI) and parsimony goodness-of-fit index (PGFI) was 0.88 and 0.86, respectively. They were all over 0.5, which suggests that PNFI and PGFI of the satisfaction model are within the acceptable range and that the satisfaction model passes validation. The value of goodness-of-fit index (GFI) was 0.92. The value of GFI ranges from 0 to 1 and 1 indicates a perfect fit. The closer the value of GFI is to 1, the better a model will fit.

Taken together, the fitting indexes of the satisfaction model on nursing service in hospitalized tumor patients all fit very well, suggesting that the model fit well and that this model can be used to evaluate patient satisfaction.

In addition, the pathway of disease pressure--patient satisfaction---patient complaint---customer loyalty pathway was also included in the satisfaction model. The fit indexes of them were greater than 0.9. This further suggests that the satisfaction model can be used in investigation and evaluation of satisfaction of hospitalized patients with nursing service.

Research hypothesis and verification

The hypothesis of this study was tested using the path coefficients (**Figure 2**). **Figure 2** showed the direct effects of latent variables in the satisfaction model. The numbers indicated the path coefficients and the direct effect of one variable to another variable. The larger the values of path coefficients are, the greater the impacts of latent variables on each other are. We proposed eight hypotheses when constructing the model. Then the hypotheses were tested and the results were shown in **Table 5**.

As in **Table 5**, the verified model confirmed the hypotheses numbered 1, 2, 3, 4, 5, 6, 7 and 8. This data further indicate that this satisfaction model constructed in this study is pretty good and do not need any adjustment.

Analysis of the satisfaction model on nursing service in hospitalized tumor patients

The model of hospitalized tumor patient satisfaction with nursing service should have specialist features. This study took the physical and mental pressures of tumor patients facing
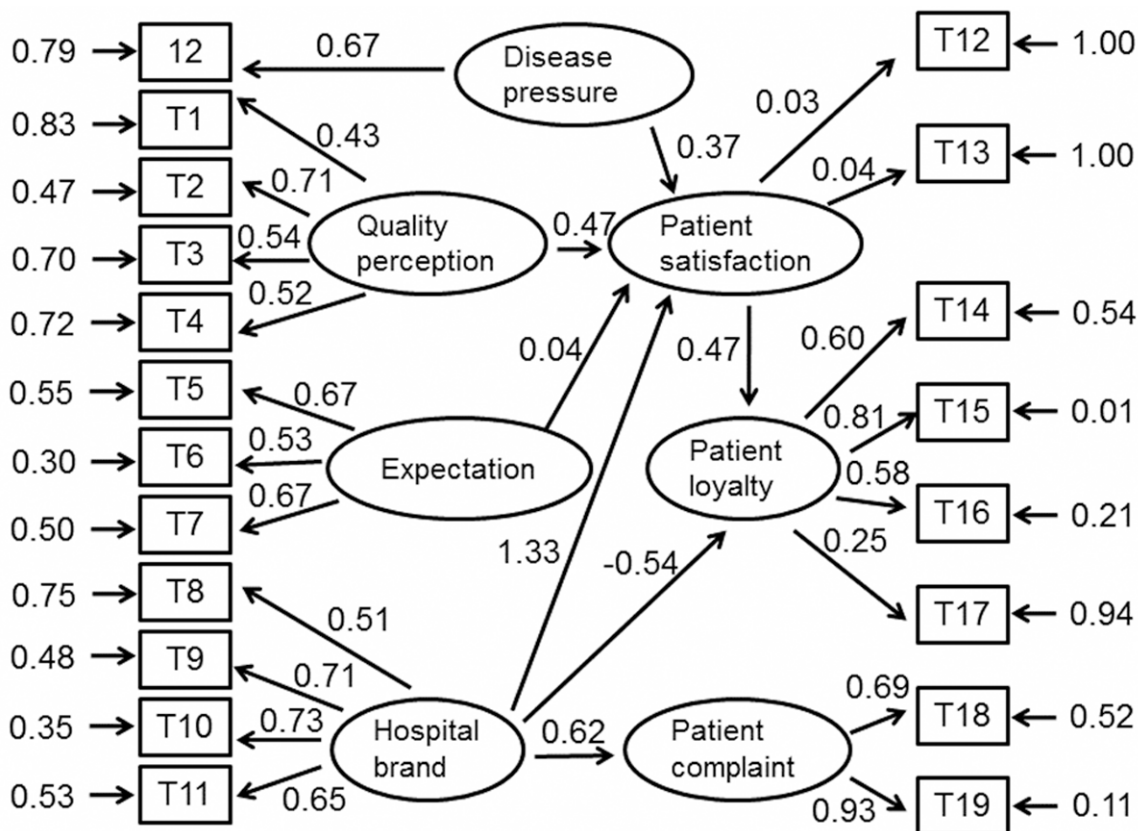
Figure 2. Standardized value of the tumor patient satisfaction about nursing service.

Table 4. Fitting index of the satisfaction model

Index	df	x^2	RMESA	GFI	AGFI	NFI	NNFI	CFI	PNFI	PGFI
value	151	235	0.061	0.92	0.93	0.97	0.97	0.99	0.88	0.86

Note: RMESA, root mean square error of approximation. GFI, goodness-of-fit index. AGFI, adjusted foodness-of-fit index. NFI, normed fit index. NNFI, nonnormed fit index. CFI, comparative fit index. PNFI, parsi-mony normed fit index. PGFI, parsimony goodness-of-fit index.

**Table 5.** Verification of hypotheses in satisfaction model

Number	Hypotheses	verification	results
1	Quality perception is positively correlated with patient satisfaction	$\gamma_{11} > 0$	$\gamma_{11} = 0.05$
2	Patient expectation is negatively correlated with patient satisfaction	$\gamma_{12} < 0$	$\gamma_{12} = -0.05$
3	Hospital brand is positively correlated with patient satisfaction	$\gamma_{13} > 0$	$\gamma_{13} = 0.21$
4	Hospital brand is positively correlated with patient loyalty	$\gamma_{33} > 0$	$\gamma_{33} = 0.11$
5	Hospital brand is negatively correlated with patient complaints	$\gamma_{32} < 0$	$\gamma_{32} = -0.12$
6	Patient satisfaction is positively correlated with patient loyalty	$\gamma_{31} > 0$	$\gamma_{31} = 0.10$
7	Patient satisfaction is positively correlated with patient complaints	$\gamma_{21} < 0$	$\gamma_{21} = -0.02$
8	Disease pressure is negatively correlated with patient satisfaction	$\gamma_{17} < 0$	$\gamma_{17} = -0.32$

the disease into consideration and added disease pressure into the pathway. This validated model had specialist characteristics. See **Figure 3**.

Discussion

The satisfaction degree of hospitalized tumor patients with nursing service is one of the crite-
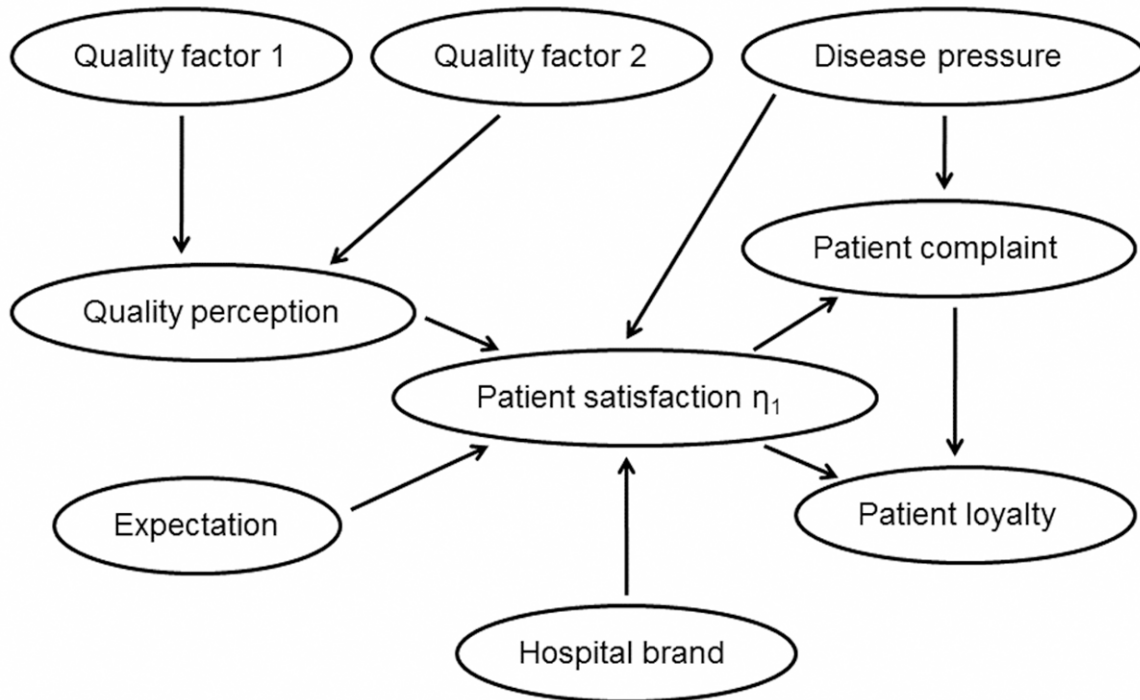
Figure 3. Model of the tumor patient satisfaction about nursing service.

ria to evaluate the quality of nursing service [13]. And, establishment of a satisfaction model is one of the major measures to improve the managing abilities of hospital [8]. Currently, the surveys on hospitalized tumor patients' satisfaction with nursing service are confusing. On one hand, patients with different diseases and different conditions may have different opinions about nursing service. On the other hand, unfaithful reports of the mass media may affect patients' feelings about nursing service [14]. Thus, it is very important to establish effective satisfaction models in hospitalized tumor patients with nursing service.

As previously reported, the parameters of quality perception [15], patient expectation [16], patient satisfaction [17], patient loyalty and complaint [18], hospital brand and disease pressure [19, 20] are all important factors that affect patients' satisfaction. In our model, quality perception, hospital brand, expectation and disease pressure all had direct impacts on patient satisfaction. Comparatively, the quality perception had the greatest impacts on patient satisfaction. Expectation was negatively correlated with patient satisfaction, indicating that higher expectations of hospital care before

receiving any care lead to greater disappointment afterwards, and the greater disease pressure patients face, the higher expectation the patients has on hospital services. And higher expectation would further lower satisfaction.

It is reported that quality perception, expectation and hospital brand were three variables that affected patient loyalty [21]. Among them, quality perception had a greater influence on patient loyalty. And, the quality perception and patient loyalty were positively correlated, indicating that better patient perception of the effectiveness of hospital care leads to higher hospital loyalty. Expectation and patient loyalty were negatively correlated, meaning that higher expectation before patient hospital care experience results in lower psychological and behavior loyalty. Patient satisfaction had a positive impact on patient loyalty, indicating that higher patient hospital care satisfaction about hospital care service promotes higher loyalty.

Patient satisfaction and hospital brand also had direct impacts on patient complaints [22]. Comparatively, hospital brand had bigger effects on patient complaint. The hospital brand had a negative correlation with patient

complaint, indicating that better psychological perception of the fairness of hospital care service, and personal and professional qualities of hospital staffs after experiencing hospital care cause less hospital distrust and psychological and behavioral complaint. A negative correlation was also found between patient satisfaction and patient complaints, suggesting that higher patient satisfaction directly reduces patient complaining behaviors.

In this study, the model of hospitalized tumor patient satisfaction with nursing service fit well. And, our results provide theoretical basis for patient satisfaction with nursing service. In addition, the application of the satisfaction model on nursing service in hospitalized tumor patients may help to master the patient desire of nursing care, the degree of patient satisfaction, patient complaint and patient loyalty on the nurse quality, and help to improve the quality of nursing services on time.

Disclosure of conflict of interest

None.

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