Development and Psychometric Analysis of Supportive Care Needs scale for Pulmonary Tuberculosis Patients

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Research article

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Abstract

Background

Providing integrated patient-centred care based on the patient's needs has emerged as the first pillar of tuberculosis prevention and control strategies. However, a reliable and valid instrument is still lacking. Hence, the aim of this study was to develop and psychometrically test a new scale for assessing the supportive care needs of patients with pulmonary tuberculosis.

Methods

A methodological study involving item generation and psychometric evaluation was used. Based on the Supportive Care Needs Framework, the item-pool was drafted from a systematic review of the literature, expert consultations and feedback from a pilot study. A convenience sample of 518 patients was recruited from four hospitals in Shaan'xi Province from September 10, 2019, to January 20, 2020. Item reduction and scale validation were assessed for content validity, construct validity, Cronbach's alpha coefficient, half-split reliability, and test-retest reliability.

Results

The final scale encompasses 25 items in five domains: practical, psycho-emotional, social, information and physical. The item level content validity index ranged from 0.80 to 1.00, and the scale level content validity was 0.925. Five factors that explained 80% of the total variance were also identified in exploratory factor analysis and confirmed in confirmatory factor analysis. The CFA model fit indices were $\chi^2/df = 2.229$ ($p < 0.001$), GFI = 0.853, AGFI = 0.820, RMSEA = 0.069. All items had acceptable convergent and discriminant validity. Cronbach's α coefficient, the split-half reliability coefficient and the test-retest reliability coefficient were 0.884, 0.883 and 0.854, respectively.

Conclusions

This newly developed scale demonstrated acceptable reliability and validity, and it could be used to assess the supportive care needs of pulmonary tuberculosis patients in clinical settings.

Background

Pulmonary tuberculosis (PTB) is a significant burden on the health care system worldwide, especially in low- and middle- income countries [1]. Globally, an estimated 10.0 million people were newly infected with tuberculosis in 2018 [1]. Living with PTB often leads to a dramatic change in both lifestyles and habits. PTB patients often have a myriad of unmet needs when they typically experience a long treatment duration [2], adverse effects, psychological trauma [3], financial burdens [4] and overall health-related

quality of life impairment [5]. To provide effective and holistic services to patients with PTB and to enhance patient satisfaction, anticipating and intervening to meet patients' care needs is of central importance.

Patient-centred care (PCC) is pivotal for providing clinical healthcare services for PTB patients [6]. It also enables PTB patients to complete a full course of the prescribed treatment and empowers health-educated patients [7, 8]. A growing body of evidence indicates that efficient PCC could be evaluated by fulfilling patients' needs, expectations and preferences with individualized support [9–11]. Hence, providing targeted support care based on their clinical and psychosocial needs, which is grounded in the reality of patients' lives as they navigate the long pathway from symptoms to cure, becomes a vital component of TB clinical practice [8]. Furthermore, this measurement of patients' needs could also provide evidence-based guidance that can be used in clinical research [12]. However, despite its importance, a valid and reliable instrument to measure supportive care needs among PTB patients has not yet been developed. Hence, studies to fill this knowledge gap are essential.

Current research on PTB patients' needs mainly consist of qualitative studies [13–16]. In a few of the quantitative studies, questionnaires about needs were used. In 2014, Suryani and colleagues from Indonesia developed an instrument for assessing the psychosocial needs of patients with PTB [17]. This instrument was developed by modifying the Psychosocial Needs Inventory for patients with cancer. It was tested for content validity and with Cronbach's alpha reliability. However, it was only tested among 40 patients, and without the use of any construct validity index. Other instruments that have been used to indirectly assess PTB patients' preferences are satisfaction-related scales for healthcare service, including the QUOTE TB [18], 13-item Patient Healthcare Service Satisfaction questionnaire (PS-13) and the satisfaction with information about medicines scale (SIMS) [19]. Nevertheless, all of these instruments have more closely focused on perceived quality-of-care issues or are not designed with a strong theoretical underpinning. Therefore it is urgent to develop a scale under the guidance of a clear conceptual framework that covers broad aspects of patients' needs and to conduct a rigorous validity and reliability evaluation.

Supportive care needs (SCN) is a broad term for requirements for care that are related to the management of symptoms and side-effects, the enablement of rehabilitation and coping, optimization of understanding and minimization of functional deficits throughout the disease trajectory [20, 21]. A framework for assessing the SCN was coined by Fitch in 2008, the Supportive Care Need Framework (SCNF) [22]. The SCNF consists of seven domains of needs: practical, spiritual, social, psychological, informational, emotional, and physical needs [23, 30]. Since its development, it has been widely accepted and referred to across numerous studies investigating unmet SCNs of patients with malignant and non-malignant chronic diseases [23, 24]. Evidence has indicated that early identification and management of SCN may help to refer patients to appropriate healthcare resources and reduce the burden on the health system [25, 26]. Furthermore, researchers have also suggested that the SCNF should be revised in accordance with the characteristics of patients with a specific disease [20, 27]. As such, it was thought

the SCNF could be used as a framework to examine the needs of individuals who have been diagnosed with PTB.

Therefore, the aim of this study was to develop a Supportive Care Needs scale for Pulmonary Tuberculosis (SCN-PTB) patients and to investigate its psychometric properties.

Methods

The scale was developed in two phases: a) item generation and b) psychometric evaluation. The 'Strengthening the Reporting of OBservational studies in Epidemiology' (STROBE) guidelines for the reporting of observational studies were followed (see Supplementary file 1).

Phase 1: Item generation

1) Literature review

In this stage, we searched English and Chinese databases, including PubMed, Web of Science, Embase, Google Scholar, and the Cumulative Index of Nursing and Allied Health Literature (CINAHL), and the Chinese databases of China National Knowledge Infrastructure (CNKI), Wan Fang and VIP, with the keywords 'tuberculosis', 'pulmonary tuberculosis', 'supportive care', 'healthcare', 'practical', 'spiritual', 'social', 'psychological', 'informational', 'emotional', 'physical', 'support' and 'need'. This review was undertaken to identify existing knowledge regarding the supportive care needs of patients with pulmonary tuberculosis. Items were identified and categorized into one of the domain outlines in the SCNF.

2) Expert consultation

We organized a two-round expert consultation to examine the content validity of the SCN-PTB draft. To ensure heterogeneity, 15 experts were recruited from general hospitals, TB prevention and control centres, and universities in Xi'an (n=9), Beijing (n=1), Sichuan (n=1), Shanghai (n=1), Dalian (n=2) and Hunan (n=1). They were asked to rate the feasibility and relevance of each item on the draft scale from 1 (irrelevant) to 5 (highly relevant) [28]. The content validity index (CVI) for an item is the proportion of experts who rated it as 4 or 5. The CVI was calculated for each item and scale. The scale level content validity index (S-CVI) of the last round of the expert consultation was used to evaluate the content validity of the SCN-PTB. The S-CVI should be larger than 0.8, suggesting that the content validity of the scale is good. The experts were also required to evaluate each item's accuracy and clarity and then provide their specific suggestions regarding the item. Items with a mean score > 3.5, a coefficient of variation (CV) < 0.25, and an item level content validity index (I-CVI) > 0.8 were retained [29].

3) Pilot study

The content-validate items were designed as a self-administered scale with a 5-point Likert-type response format for each item. Each item asked patients to consider their level of need for help with the item by

choosing one of the following response options: 1=no need-not applicable; 2=no need-already satisfied; 3=low need; 4=moderate need; or 5=high need. No items needed to be reversed scored, and higher scores reflected a higher level of need.

We conducted the pretest of the scale on 50 patients to evaluate its clarity, understandability, and feasibility. Patients were recruited from Xi'an Chest Hospital using convenience sampling methods based on the following criteria: a) age ≥ 18 years, b) confirmed diagnosed of TB, c) able to read and understand Mandarin and d) willing to participate in this study. Patients who had cognitive deficits, a history of mental illness, or any other severe physical problems or serious organ injuries were excluded.

Phase 2: Psychometric evaluation

Sample and setting

A convenience sampling strategy was used to recruit PTB patients from four institutions (Shaanxi Province Tuberculosis Hospital, Xi'an Chest Hospital, Huashan Hospital, and the designated TB hospitals of the Baqiao District) in Shaanxi Province between 10 September 2019 to 20 January 2020. The inclusion criteria were: a) having a confirmed diagnosis of PTB; b) being 18 years of age or older; c) being conscious and able to answer questions, and d) willing to participate in this study.

The sample size was determined based on the number of items in the developed scale and the sample size requirements of factor analysis. In factor analysis, 5 participants per item are the minimum recommended sample size [30]. Since the initial number of items was 25, 125 participants were required. The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) samples should be two independent samples, with a size of at least 100 participants and 200 participants, respectively [31, 32], hence the minimum sample size required for factor analysis is 300. Considering the possibility of an invalid questionnaire, there is a need to increase the sample size by 20%, and thus the final sample size is $n \geq 360$. In consideration of the above, the sample size of this study should be no less than 360. Applying the inclusion and exclusion criteria, a sample of 518 participants was recruited.

Data collection

With the assistance of the healthcare providers of the target investigation site, questionnaires were distributed to the patients by two investigators. Potential participants were given a cover letter informing them about the purpose of the study, its voluntary nature, and anonymity concerning participation, along with instructions for completing the questionnaires. Those subjects who agreed to participate were asked to sign an informed consent form and filled out the questionnaires independently, and then the investigator collected them immediately.

Data analysis

Data were analysed using SPSS 25.0 (SPSS Inc., Chicago, IL, USA) for all statistical analyses except for CFA, where we used AMOS software. Continuous variables are presented in mean and standard deviation (SD). Categorical variables are presented as numbers and frequency. The psychometric properties of the SCN-PTB were tested by validity and reliability. Generally, the α level was 0.05.

Item analysis

Item analysis aims to determine whether each item is correlated with the total score. An item was eliminated if it met one or more of the following criteria: a) the mean of the item was extreme or its variance was zero; b) the critical ratio value of an item was found to be insignificant; or c) the item-total correlation coefficient was < 0.30 or > 0.70 .

Validity analysis

Content validity

The content validity index (CVI) calculated in the final round of the Delphi survey was used to evaluate the content validity of the scale.

Construct validity

We used EFA and CFA to examine the construct validity of the scale. The total sample was split into two subsamples using the SPSS random-assignment function. The first split half was used for EFA and the second was used for CFA. The cases included in each subsample ($n=259$) satisfied the requirement for the sample size for EFA and CFA, and their equivalence on demographic characteristics was examined through Mann-Whitney U tests (for continuous variables) and Chi-Square tests (for categorical data).

Exploratory factor analysis

Before conducting EFA, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test were used to check for the factorability of the data [33]. EFA using principal-components analysis with varimax rotation was performed to explore the underlying factor structure. The number of factors was determined by the eigenvalues and the scree plot. Factors with eigenvalue > 1 were extracted, and the result was considered good when at least 60% of the variance was explained by the identified factors [34]. According to the scree plot, the number of factors is indicated by the point at which the line indicating the slope begins to flatten [35]. Meanwhile, we assessed the best EFA solution based on multiple criteria as primary factor loadings > 0.40 [36], cross-loadings, the threshold for item communality (h^2) was > 0.40 [37], the interpretability of the factors structure and the theoretical sense of the factors [38].

Confirmatory factor analysis

CFA was performed to test whether the data fit the hypothesized measurement model, which was extracted by EFA. The maximum likelihood estimation method was used for CFA. The fit of the CFA model

was assessed using the following fit indices: the normed χ^2 ($\chi^2/\text{df} < 3$), the root-mean-square error of approximation (RMSEA < 0.08), goodness-of-fit index (GFI > 0.90) and adjusted goodness of fit index (AGFI > 0.90) [39]. Additionally, the average variance extracted (AVE), construct reliability (CR) and the correlation coefficients between factors were calculated to validate the discriminant validity and convergent validity of the sub-factors of the scale. The AVE > 0.70 , CR > 0.50 indicated good convergent validity, and the square root of AVE larger than the correlation coefficient between factors, indicated a good discriminant validity [40, 41].

Reliability analysis

Internal consistency reliability was tested using the Cronbach's alpha coefficients for the overall scale and each domain. The split-half reliability was used to divide the scale items of SCN-PTB into odd-even parts according to the number, and the correlations of the score between the two parts were computed. The Pearson relation coefficient was calculated between the scores of the 50 patients who completed the SCN-PTB twice at a two-week interval to determine the test-retest reliability. A statistically acceptable reliability coefficient of the total scale should be > 0.70 , and a statistically acceptable reliability coefficient of a domain should be > 0.60 .

Ethical considerations

This study was approved by the Ethics Committee of Xi'an Jiaotong University (No. 2020-1244), and written informed consent was obtained from all participants prior to filling out the survey. The investigation process adhered to the principles of confidentiality, with the questionnaires completed anonymously, and the research data were used only in this research.

Results

Phase 1: Item generation

Using the combined methods, we developed a pool of 49 items at the beginning. The response rate of 15 expert consultations was 100% in all rounds. The experts were mainly women (N=12; 80.00%), with an average age of 50.47 years ($SD 7.69$). Considering their work experience, they had an average of 27.93 years ($SD 8.91$) of experience. Experts with a title of senior professional post accounted for 93.33%. Seven of them had attained a PhD degree. In the first round, sixteen items were deleted as those all had mean ratings < 3.5 or CV > 0.25 . Eight items were merged into three items. Three items associated with spiritual needs were removed. In addition, 93.33% of the experts (14/15) suggested that the original SCNF should be modified to include only five domains, including practical needs, social needs, informational needs, physical needs, and psycho-emotional needs. Following the second round, a total of 25 items were selected to form the SCN-PTB: five items per domain. In the pilot study, all participants understood each

item and no adjustments had to be made to the survey. It took approximately 10-15 min to complete the questionnaire. A final version of the SCN-PTB was then created to evaluate its validity and reliability.

Phase 2: Psychometric evaluation

Sample characteristic

Thirty-two invalid questionnaires out of the total 550 questionnaires were excluded because of missing data, with an effective rate of 94.18%. The mean age of the included patients was 32.06 years (*SD* 6.89), and other characteristics of the subjects are shown in Table 1.

Item Analysis

The means of all items ranged from 3.09 to 3.86, and there were no items with a variance of zero. The critical ratio was significant for all items, and the item-total correlation was > 0.30 and < 0.70 . There were no items that met the elimination criteria mentioned above, so all 25 items were retained (see Table 2).

Validity Analysis

Content validity

In the final round of expert consultation, the CVI ranged between 0.80 and 1.00 for each item, and the average of the CVI for all items on the scale was 0.925, which indicated that the SCN-PTB has good content validity and was acceptable for further use.

Construct validity

Exploratory Factorial Analysis

The construct validity of the 25 items was analysed using principal components to extract factors. Bartlett's test of sphericity for appropriate assumptions was significant ($\chi^2=9147.604$, $p<0.001$), and the KMO value was 0.839, which is well above the recommended 0.50, indicating that it is acceptable to perform the EFA.

As a result, five factors were extracted based on eigenvalues ≥ 1 , and the scree plot yielded a five-factor solution as well (Figure 1), where the five factors accounted for 80.375% of the total variance. The results showed that the factor loading of each item was above 0.40 and without cross-loadings. As shown in Table 3, based on the factor loading results and the item contents, factor 1 (5 items) was named "physical need", factor 2 (5 items) was named "psycho-emotional needs", factor 3 (5 items) was named "information needs", factor 4 (5 items) was named "social needs" and factor 5 (5 items) was named "practical needs".

The CFA revealed an acceptable fit of the five-factor model, which was indicated by $\chi^2/df=2.229$, GFI=0.853, AGFI=0.820, RMSEA=0.069. The parameter estimates of the CFA model are shown in Figure 2. The standardized factor loadings of all items were statistically significant and greater than 0.40. The AVE of the five factors were 0.578, 0.734, 0.704, 0.713, and 0.633, respectively. The CR values of the factors were 0.872, 0.932, 0.921, 0.92, and 0.895, respectively. Additionally, the square root of AVE was greater than the correlation coefficients among the five factors (Table 4).

Reliability

The Cronbach's alpha for the total 25 items was 0.884 and ranged from 0.794 and 0.906 for each of the domains. The split-half coefficient of the SCN-PTB was 0.883 and ranged from 0.712 to 0.877 for each of the domains (see Table 5). The test-retest reliability coefficient of the total scale over a two-week interval for the 50 patients was 0.854 and ranged between 0.820 and 0.900 for each of the domains.

Discussion

Providing necessary supportive interventions to meet PTB patients' care needs are currently an important issue in healthcare settings. This study was designed to develop a scale to evaluate the supportive care needs of patients with PTB, that is, SCN-PTB. The SCN-PTB covers broad aspects of patients' needs, consisting of 25 items in five domains. The main contribution of this study is providing evidence of the validity and reliability of the SCN-PTB.

The SCN-PTB was developed based on a comprehensive literature review, two-round expert consultation, and a pilot study. Instrument development requires a strong theoretical basis [42], and we used the SCNF as conceptual base to guide the development of the item-pool. Domains and items in the SCN-PTB were modified to suit the characteristics of the TB patients.

First, the spiritual-related needs of the SCNF-PTB were deleted in the final framework. Spiritual needs were defined by Fitch as a way of finding meaning in life, a faith or willingness to practice religious belief. Through the in-depth literature review, spiritual-related needs scarcely appeared in the literatures. Recently an integrative review found that an association between whether spiritual-related needs are satisfied and the individual's quality of life was inconsistent. Existing research has concentrated on minority patients from western countries [43, 44], which is quite different from China patients. The differences among the studies might be related to different cultural backgrounds and medical environments [45]. In addition, the majority of experts in this study also suggested that there are few professional groups and limited personnel to provide TB patients with spiritual care in the clinical settings. Hence, in order to improve the content validity of the SCN-PTB, the spiritual needs were discounted based on the above considerations.

Second, emotional needs items and psychological needs items are highly relevant and often used interchangeably [46], and they both describe patients' feelings during disease treatment [47]. To reduce the irritation of negative psychological-related text to patients and to express clearly what patients need, we decide to merge the emotional needs and psychological items into a psycho-emotional needs domain based on the experts' recommendations and the research-group discussion. The final version of the SCN-PTB had 25 items with five domains.

In the SCN-PTB, the practical needs are mainly about the requirements for direct assistance to accomplish a task or activity; the social needs are related to family relationships, community acceptance, and involvement in relationships. The informational needs include information needed by the patients to reduce their confusion and anxiety, and to inform their decision-making. The physical needs reflect the need for physical comfort and freedom from pain, optimum nutrition, and the ability to carry out one's usual daily functions. The psycho-emotional needs concentrate on patients' requirements for basic psychological functioning and well-being. In this study, the S-CVI was 0.925, and the I-CVI ranged from 0.80 to 1.00. The results met the criteria of acceptability, indicating that the SCN-PTB can accurately measure the true content of the supportive care needs of PTB patients.

The Cronbach's alpha coefficient and split-half reliability coefficient for the total scale were 0.884 and 0.883, respectively, and for each domain, these values ranged from 0.794 to 0.906 and from 0.712 to 0.877, respectively. The reliability validation results fulfilled the requirement of satisfactory internal consistency. The overall test-retest reliability coefficient was 0.854, and the correlation coefficient of each domain was between 0.841 and 0.900, indicating that the SCN-PTB has acceptable stability over time.

Construct validity was evaluated by EFA and CFA. The EFA generated a clear five-factor solution consistent with the revised conceptual framework. The five factors accounted for 80.38% of the total variance, which was higher than the criterion of 60%, indicating that the common factors extracted were reliable. The factor loading for each item was greater than 0.40 and without cross-loadings, suggesting a tight relationship between the items and factors. In general, these five factors represent the overall structure of the scale.

CFA was performed to confirm the structure of the scale for the other sample. The results revealed that χ^2/df was 2.229, which met the criterion of less than 3. The RMSEA was 0.069, which met the criterion of less than 0.08, indicating a reasonable model fit. The GFI and AGFI of this sample were below 0.90 but within the acceptance range, as the GFI and AGFI are known to be affected by sample size [48]. Overall, the CFA showed that the fitting effect of the model was acceptable and the structure of the scale was consistent with the modified conceptual framework. In addition, the AVE and CR values indicate good convergence validity and discriminatory validity according to the criteria of $AVE > 0.50$, $CR > 0.70$, and the square root of the AVE > correlation coefficients between factors. Overall, the results showed an acceptable model fit in the tested sample of Chinese TB patients. The results of the EFA and CFA supported the construct validity of the SCN-PTB.

Limitations

This study has some limitations. First, the participants in the study were all recruited from Shaan'xi Province, and further studies need to be conducted in different national settings to determine the generalizability of the SCN-PTB. Second, due to the lack of literature that identifies and explores needs in this population as a primary objective, concurrent validity was not tested, suggesting the need for further validation. Third, since the PTB patients' expectations and preferences area has already been well explored by using qualitative methods, the items pool was designed without extensive qualitative research. Future studies could use the SCN-PTB to test whether it covers all of the potential needs issues of TB patients.

Application value of the SCN-PTB

The SCN-PTB could be useful in clinical education and research. Based on the needs assessment, healthcare professionals can develop tailored patient-centred interventions and examine the effect of care on various aspects of PTB patients' needs. In addition, researchers might use the SCN-PTB to empirically correlate PTB patients' needs with clinical outcomes in clinical care and to explore the mechanism to optimize intervention outcomes. Overall, this study will aid healthcare professionals by providing a clearer direction on where to focus future efforts to improve the delivery of patient-centred supportive care.

Conclusions

The SCN-PTB developed and validated in this study comprises a total of 25 items scored on a 5-point Likert scale. It exhibits good psychometric properties for validity indexes and reliability indexes. This scale can help healthcare professionals identify PTB patients' needs. The data may be used as the basis to improve TB clinical care.

Abbreviations

PTB: Pulmonary Tuberculosis; PCC:Patient-Centred Care; WHO:World Health Organization; SCN:Supportive Care Need; SCNF:Supportive Care Need Framework; CINAHL:Cumulative Index of Nursing and Allied Health Literature; CNKI:China National Knowledge Infrastructure; CFA:Confirmatory Factor Analysis; CVI:Content Validity Index; S-CVI:Scale-level Content Validity Index; I-CVI:Item-level Content Validity Index; EFA:Exploratory Factor Analysis; KMO:Kaiser-Meyer-Olkin; RMSEA:Root-Meta-Square Error of Approximation; GFI:Goodness-of-Fit Index; AGFI:Adjusted Goodness of Fit Index; AVE:Average Variance Extracted; CR:Construct Reliability; SD:Standard Deviation

Declarations

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Authors' contributions

JR conceived and designed the study, created study protocol, implemented the study, performed the data collection, data analysis and drafted the manuscript. XML supervised the study development, helped to review the manuscript and made critical revision to the paper. JJZ, YLW and QQH performed data collection and helped to review the manuscript. DFH and TT participated in the data coding and analysis. All authors read and approved the final manuscript.

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Availability of data and materials

The data will not be shared in order to protect the participants' anonymity but are available from the corresponding author or reasonable request.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Xi'an Jiaotong University and relevant institutions, and it was conducted according to the principles of the Declaration of Helsinki. The written informed content were obtained from all participants prior to the investigation.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1 General characteristic of the study participants (N=518)					
Variable	Total (n=518) n (%) or mean (<i>SD</i>)	EFA (n=259) n (%) or mean (<i>SD</i>)	CFA (n=259) n (%) or mean (<i>SD</i>)	χ^2/z	<i>P</i>
Sex				0.629	0.481
Male	279	135	144		
Female	239	124	115		
Age (range: 18-60 years)	32.03 (6.89)	32.43 (6.75)	31.69 (7.03)	1.498	0.221
Ethnicity				1.734	0.188
Han Nationality	478	235	243		
Others	40	24	16		
Education				8.322	0.080
Primary School or below	106	46	60		
Junior High School	188	91	97		
Senior High School	126	61	65		
Junior College	59	38	21		
Bachelor's degree or above	39	23	16		
Marriage				1.362	0.506
Unmarried	149	74	75		
Married	298	145	153		
Others	71	40	31		
Treatment period				1.887	0.389
< 2 months	264	125	139		
2-6 months	173	89	84		
> 6 months	81	45	36		
Treatment site				2.570	0.109
Hospital	353	168	185		
Home	165	91	74		
Family monthly income				0.804	0.848

< 1999 yuan	162	77	85
2000-4999 yuan	235	118	117
> 5000 yuan	121	64	57

Abbreviation: *SD*, standard deviation.

Table 2 Results of the Item Analyses				
No.	Item	Mean (SD)	Critical Ratio Value	Item-Total Correlation
q1	Help me to have a rational diet and to improve nutrition during illness	3.09(1.16)	19.24*	0.66*
q2	Provide me a comfortable, clean, and ventilated ward environment	3.07(1.18)	16.42*	0.64*
q3	Help me to prevent or manage side effects (e.g., joint pain, decreased hearing, and sight, etc.)	3.19(1.09)	14.98*	0.58*
q4	Teach me to relieve physical discomfort (e.g., fever, cough, night sweat, etc.)	3.30(1.09)	14.11*	0.60*
q5	Remind me to take medicine on time and in the right amount	3.21(1.26)	20.65*	0.70*
q6	Help me to protect privacy during treatment	3.25(1.17)	15.73*	0.65*
q7	Help me to cope with the negative emotions (e.g., anxiety, fear, sadness, etc.) and psychological stress	3.23(1.21)	17.88*	0.70*
q8	Help me to get care and encouragement from healthcare providers	3.23(1.02)	10.38*	0.48*
q9	Help me to build a positive attitude towards future life	3.26(1.22)	17.89*	0.70*
q10	Teach me to cope with sexual-related issues (e.g., getting married and having children, etc.)	3.32(1.17)	16.60*	0.68*
q11	Help me to get information about PTB (e.g., symptoms, transmission routes, etc.)	3.52(1.19)	10.70*	0.53*
q12	Help me to understand my condition and test results for my disease	3.40(1.24)	12.88*	0.58*
q13	Help me to grasp the name of the medication, ways of taking and precautions, etc.	3.40(1.24)	11.17*	0.52*
q14	Help me to get information about the schedule of treatment after discharge (e.g., time and content of regular return visits)	3.39(1.27)	11.38*	0.53*
q15	Help me to know about the treatment protocol and prognosis of the disease	3.37(1.22)	11.95*	0.56*
q16	Help me to communicate with patients who have similar experiences	3.21(1.23)	16.67*	0.64*
q17	Teach me how to obtain understanding and support from family and friends	3.33(1.84)	17.82*	0.67*
q18	Help me to participate in health support groups and related activities	3.27(1.23)	18.75*	0.70*

q19	Teach me to cope with changes in social interactions after diagnosis	3.23(1.28)	20.14*	0.69*
q20	Teach me to take effective isolation and protection measures to protect others from being infected	3.30(1.28)	19.22*	0.67*
q21	Help me to get information about the TB policy of treatment fee decrease or waiver	3.84(1.10)	7.57*	0.43*
q22	Help me to know the expenses of treatment	3.78(1.14)	7.90*	0.37*
q23	Give me timely and professional medical services when I need help	3.47(0.87)	7.24*	0.44*
q24	Teach me to get access to follow-up services after discharge	3.77(1.20)	10.55*	0.50*
q25	Help me to establish a stable, long-term connection with healthcare providers	3.86(1.12)	9.32*	0.48*
Note: * $P < 0.001$				
Abbreviation: <i>SD</i> , standard deviation.				

Table 3 Factor loadings and items communalities by EFA							
No.	Abbreviate item description	F1	F2	F3	F4	F5	h^2
q1	Help me to a have rational diet and to improve nutrition during illness	0.920	0.236	0.192	0.051	0.165	0.948
q2	Provide me a comfortable, clean, and ventilated ward environment	0.919	0.206	0.184	0.041	0.163	0.612
q3	Help me to prevent or manage side effects (e.g., joint pain, decreased hearing, and sight, etc.)	0.916	0.227	0.196	0.059	0.157	0.968
q4	Teach me to relieve physical discomfort (e.g., fever, cough, night sweat, etc.)	0.915	0.225	0.187	0.073	0.161	0.954
q5	Remind me to take medicine on time and in the right amount	0.552	0.227	0.384	0.258	0.205	0.956
q6	Help me to protect privacy during treatment	0.193	0.893	0.149	0.093	0.053	0.861
q7	Help me to cope with the negative emotions (e.g., anxiety, fear, sadness, etc.) and psychological stress	0.214	0.884	0.114	0.110	0.098	0.789
q8	Help me to get care and encouragement from healthcare providers	0.213	0.878	0.154	0.118	0.036	0.869
q9	Help me to build a positive attitude towards future life	0.153	0.810	0.196	0.174	0.202	0.855
q10	Teach me to cope with sexual-related issues (e.g., getting married and having children, etc.)	0.182	0.782	0.195	0.195	0.151	0.744
q11	Help me to get information about PTB (e.g., symptoms, transmission routes, etc.)	0.225	0.214	0.906	0.008	0.146	0.804
q12	Help me to understand my condition and the test results for my disease	0.190	0.202	0.895	0.071	0.200	0.901
q13	Help me to grasp the name of the medication, ways of taking and precautions, etc.	0.188	0.224	0.876	0.072	0.208	0.426
q14	Help me to get information about the schedule of treatment after discharge (e.g. time and content of regular return visits)	0.275	0.176	0.817	0.073	0.159	0.923
q15	Help me to know about the	0.046	0.045	0.576	-0.012	0.299	0.939

	treatment protocol and prognosis of the disease						
q16	Help me to communicate with patients who have similar experiences	0.100	0.100	-0.001	0.946	0.026	0.916
q17	Teach me how to obtain understanding and support from family and friends	0.115	0.143	0.023	0.916	0.033	0.669
q18	Help me to participate in health support groups and related activities	0.104	0.103	0.122	0.857	0.078	0.529
q19	Teach me to cope with changes in social interactions after diagnosis	0.012	0.028	-0.023	0.801	0.160	0.776
q20	Teach me to take effective isolation and protection measures to protect others from being infected	-0.033	0.235	0.079	0.660	0.175	0.875
q21	Help me to get information about the TB policy of treatment fee decrease or waiver	0.117	0.136	0.137	0.124	0.910	0.711
q22	Help me to know the expenses of treatment	0.163	0.212	0.187	0.124	0.864	0.895
q23	Give me timely and professional medical services when I need help	0.033	0.210	0.162	0.195	0.786	0.577
q24	Teach me to get access to follow-up services after discharge	0.275	-0.011	0.341	0.067	0.717	0.727
q25	Help me to establish a stable, long-term connection with healthcare providers	0.306	-0.045	0.329	0.052	0.609	0.869
Eigenvalue		10.124	3.445	2.694	2.099	1.732	
Percentage of the variance		40.496	13.778	10.777	8.395	6.929	

Note: h^2 represents item communalities.

Factor loadings exceeding 0.45 are in boldface.

Table 4 Results of the CFA					
Factors	F1	F2	F3	F4	F5
F1	0.76*				
F2	0.657	0.857*			
F3	0.260	0.076	0.839*		
F4	0.492	0.348	0.097	0.844*	
F5	0.421	0.252	0.138	0.206	0.796*
Note: * Represents the square root of the AVE of five factors, the others represent the correlation coefficients between five factors.					

Table 5 Reliability of the SCN-PTB			
Domains	Cronbach's α	Split-Half Reliability	Test-Retest Reliability
Physical needs	0.794	0.712	0.820*
Psycho-emotional	0.882	0.842	0.854*
Informational needs	0.856	0.877	0.841*
Social needs	0.906	0.835	0.900*
Practical needs	0.850	0.794	0.843*
Total	0.884	0.883	0.854*
Note: *Correlation is significant at the 0.001 level (2-tailed)			

Figures

Scree Plot

Figure 1

Cattell's scree plot (n=259)

Figure 2

The standardized path diagram of the CFA. Note: q1 to q25 represent the items of the SCN-PTB. F1 to F5 represents the five domains of the SCN-PTB.

Supplementary Files

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