

Development of a Questionnaire for Measuring Trauma-Informed Care of Nurses Working with Traumatically Injured Patients

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Purpose: To develop a new questionnaire for assessing nurses' current situation of knowledge, attitude and practice related to trauma-informed care (TIC) for patients with traumatic injury.

Methods: By literature review, qualitative interview and Delphi consultation, the 46 preliminary items about trauma-informed care of nurses working with traumatically injured patients were selected. After that, the preliminary questionnaire was distributed to 293 Chinese nurses in relevant departments. The collected data were analyzed by internal reliability, split-half reliability, structural validity and content validity.

Results: The questionnaire was developed with a total of 30 items in 3 dimensions: 8 items in the TIC knowledge dimension, 10 items in the TIC attitude dimension and 12 items in the TIC practice dimension. The Cronbach's alpha coefficient was 0.939, and the content validity was 0.971.

Conclusion: This designed questionnaire shows acceptable reliability and validity, which could be used to assess the knowledge, attitude and practice of nurses in application of trauma-informed care for traumatically injured patients.

Keywords: trauma-informed care, traumatic injury, nurse, questionnaire

Introduction

Every year, traffic accidents, natural disasters, fires and other traumatic injury occur frequently around the world. Traumatically injured patients are the main population served by the healthcare system. Traumatic injury not only brings about the individual's physical injury, such as musculoskeletal injury, brain damage and organ function damage, but also it can cause a range of psychological stress reactions, such as fear, anger, anxiety, depression, sleep or eating disorders.¹ Risk factors, such as previous traumatic experiences, life stress, severe acute traumatic stress symptoms and poor social support could increase the likelihood of developing post-traumatic stress disorder (PTSD).²⁻⁴ Eventually, in the aftermath of traumatic injury, those psychological problems can seriously affect patients' treatment outcome, functional recovery,⁵ quality of life and survival beliefs. Therefore, it is necessary to raise the concern about the psychological problem of traumatically injured patients at the early stage.⁶ Early identification of patients' psychological problems and implementation of psychological traumatic care are of great significance in promoting patients' psychological rehabilitation. It can help to improve the patients' mood,⁷ increase compliance with treatment, promote physical recovery and reduce the length of hospital stay. However, in most cases, some nurses may feel physical injury is easier to identify and give treatments, or they do not transform their mind-set of traditional biomedical model. As a result, they are still inclined to focus more on physical injury, but less about the short-term or long-term psychological problems of the traumatic injured patients. In China, the importance of psychological trauma care for traumatic injured patients has been put forward; however, previous studies have demonstrated that nurses' knowledge, understanding and practice in the implementation

of psychological trauma care were not enough. One recent article noted that identifying the psychological characteristics and emotional needs of different trauma patients had always been a difficulty for nurses.⁸ Another study conducted in China pointed out that the medical providers should strengthen their understanding and emotional support for patients when they were in negative emotions.⁹ As reported by Leng et al, the nurses only did parts of the way such as soothing language, touching, massage or health education in the psychological trauma care.⁸ Carissa pointed out that the trauma screening had not been routinely done in the clinical practice.¹⁰ In these situations, it indicates the need for nurses to further their knowledge of trauma, understand the psychological reactions for traumatically injured patients, as well as the necessity of early screening and timely intervention.^{7,11}

There is a growing interest in trauma-informed care (TIC) methods to better respond to the needs of patients that have histories of various traumatic events. Recent advances in understanding how trauma can negatively affect long-term health outcomes have fostered a shift towards TIC as a method to decrease re-traumatization of patient in nursing practice.¹² TIC has been put forward as a model to help trauma patients to cope with psychological problem, enhance their resilience and self-efficacy, provide anticipatory guidance to prevent long-term traumatic stress reactions. The 4R key assumptions of TIC framework are defined by the Substance Abuse and Mental Health Services Administration (SAMHSA) as followed: a) realizing the trauma and its impact on health, b) identifying how trauma may affect patients, c) applying trauma-informed knowledge into practice and policy, d) preventing re-traumatization.¹³ Note that, in the definition of TIC, the trauma refers to psychological trauma rather than physical injury. So far, various researches have recognized the important role of TIC approach to guide medical staff to provide psychological support for patients and their families to cope with trauma and facilitate their recovery.

Increasing the nursing staff's knowledge, attitude, and practice (KAP) towards TIC has been documented and closely attributed to improve the quality and safety of care provided for trauma patients.¹⁴ From the conceptual core of "knowledge, attitude and practice" model,¹⁵ we knew that knowledge could lead to positive attitudes, while attitude in turn lead to practice change. Consistent with this, literatures have also suggested that inadequate knowledge of TIC is a key factor to trauma awareness and trauma recognition.^{13,16,17} Knowing the aspects of providers' understanding trauma impact, recognizing trauma signs and symptoms in TIC are important to enhance their competency in managing psychological problem and promoting psychological recovery in cohorts of traumatic injured patients.¹⁸ Baker et al reported that providers' attitudes are critical in the delivery of TIC.¹⁹ As providers' hold positive attitudes toward trauma-informed practice, they are more likely to commit in change-agent behaviors. Various researches shew that it was important to ensure providers could use trauma-informed specific skills to help patients or their family to cope with trauma.^{14,20,21} Hence, as a crucial first step, healthcare organizations need to effectively assess the learning needs of nursing staff to address gaps in KAP to serve as a foundation for informing our educational intervention and implementing a TIC approach that meets the needs of the traumatic injured patients. The theory model of KAP is widely accepted for examining health-related behavior and understanding specific constructs so as to inform further education and intervention strategies in various studies.^{22,23} As such, we wanted to use the KAP model to construct the three dimensions of questionnaire to access the current state and find out the needs for further TIC trainings among nurses working with traumatically injured patients.

From literature review, we find that studies investigating TIC in different health settings increased in those years, but the current available tools are not appropriate for evaluating the extent to which nurses are accepting and implementing TIC specific in traumatic injury setting. For the existing tools, a lot of tools are used to measure the TIC system in the organizational level,²⁴ which are not appropriate in examining the individual level. In regard to the trauma providers, some tools are bound to particular settings such as pediatric physical injury, childhood welfare, neonatal abstinence syndrome or domestic violence,^{20,25,26} which are not applicable for adult patients with traumatic injury specifically. For instance, the items of Knowledge, Attitudes, and Practices Related to Trauma-Informed Care were developed for measuring the TIC of adverse childhood experience, which was not aligned with our survey.²⁷ Besides, several tools are utilized across disciplines that do not accurately measure for nurses working in traumatic injury-related departments. For example, the tool of foundational knowledge about trauma-informed care were used in assessing the diverse range of trauma knowledge,¹⁶ the Attitude Related to Trauma-Informed Care scale (ARTIC) was used in education or various human service organizations.^{19,28} Currently, it seemed necessary to design a validated tool meant to evaluate the nurses'

trauma knowledge, attitude and effectiveness to integrate the trauma-informed approach into practice towards TIC in the field of traumatic injury.

Methods

Design

The study was conducted in three phases (see Figure 1). In the first phase, we developed the preliminary items by literature analysis and qualitative interview. In the second phase, we invited 15 experts to access the items and corresponding

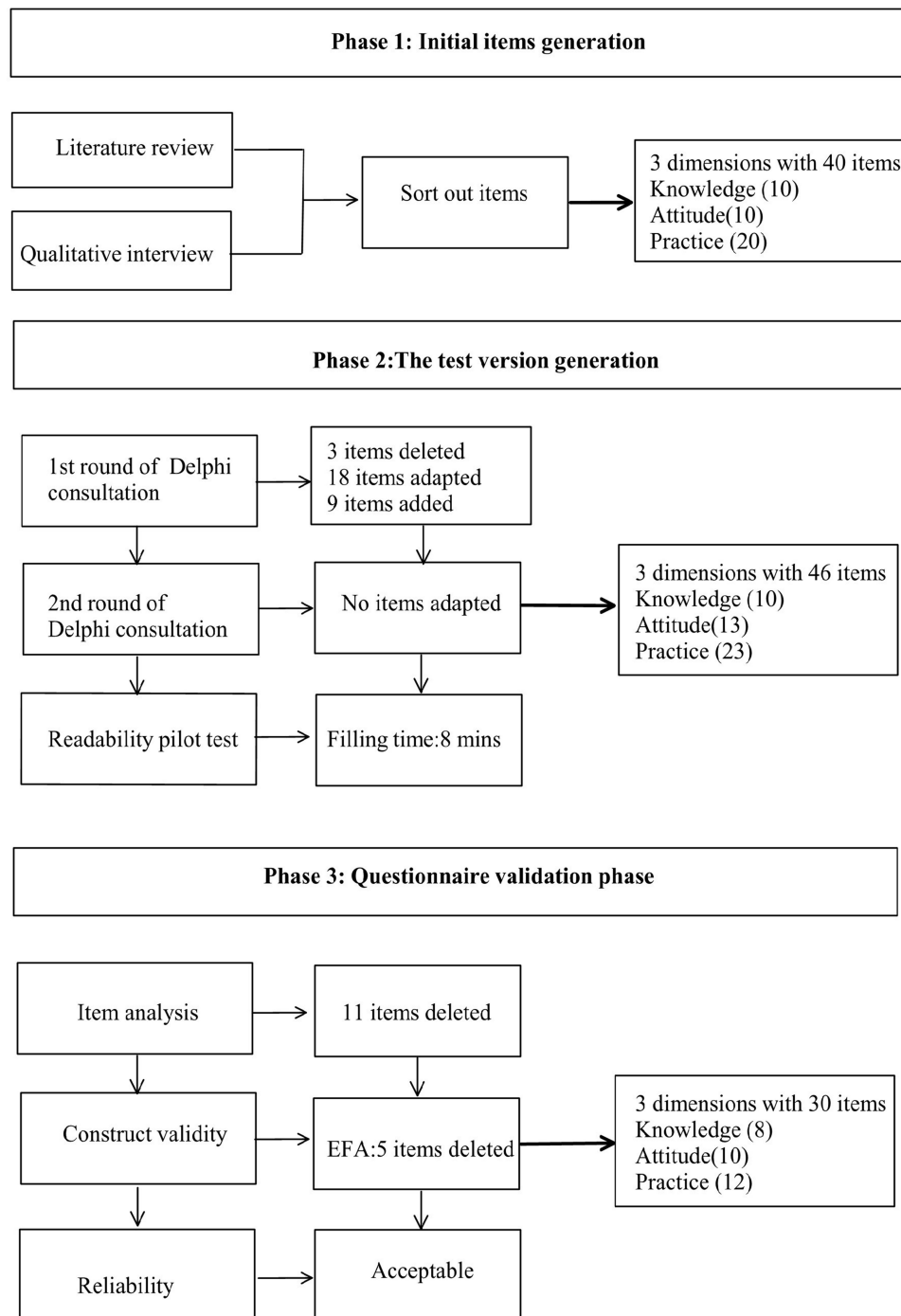


Figure 1 The process of questionnaire development.

dimensions. In the third phase, a pilot survey was conducted among nurses in China to evaluate the reliability and validity of the questionnaire.

Study Procedure

Phase 1: Initial Items Generation

Theoretical Phase

We did the literature review of the theoretical framework, the relevant researches, tools of TIC, as well as the psychological trauma problems of traumatically injured patients and its impacts, which provided the reference and theoretical basis for the items' development of the questionnaire. Based on the literature review, we found the demands for nurses to further learn about trauma knowledge, understand trauma patients and put TIC into their daily practice. Consistent with the theory of KAP, we divided our designed questionnaire into three constituent components: TIC knowledge, TIC attitude, and TIC practice.

Qualitative Interview

On the basis of literature researches, we conducted in-depth interviews with nurses in Chinese public hospitals. A total of 16 Chinese nurses were invited to participate in qualitative interviews on a voluntary basis. Inclusion criteria: (1) More than 3 years of clinical nursing work; (2) From Orthopedics, Brain surgery, Rehabilitation departments working with traumatically injured patients; (3) Informed consent and voluntary participation. Exclusion criteria: nurses were not in departments due to vacation or outside trainings. Each interview lasted about 30~60mins. After each interview, the data were transcribed and analyzed by three researchers in time. Content analysis was used to analyze the data.²⁹ The nurses' needs and opinions in application of TIC were extracted. Finally, the item pool of the questionnaire was generated from the codes.

Phase 2: The Test Version Generation

The Initial Items of Questionnaire Reviewed by Experts

Fifteen experts were invited to evaluate the importance and feasibility of the proposed items of trauma-informed care for nurses working with traumatically injured patients, so as to provide professional guidance and evaluation for the questionnaire formulation. The inclusion criteria were as follows: (a) intermediate title or above; (b) doctors, nursing managers, nursing educators, psychological counselors engaged in taking care of traumatically injured patients; (c) at least 10 years working experience; (d) bachelor degree or above; (e) volunteer to participate in this study. Experts were invited to rate the importance of the initial items and the dimensions according to a 5-point Likert scale: 5 = very importance; 4 = relatively importance; 3 = general; 2 = unimportance; 1 = very unimportance. Experts were also given the chances to write their comments for revising and adding items or dimensions in the designed column of "Revision Suggestions". After we gathered the feedbacks from every round of experts, the collected data of experts were analyzed by using 3 indicators, including the mean value, standard deviation, full score ratio and the coefficient of variation (CV). If the item was over the corresponding threshold value, that is, the mean value > 3.50, CV < 0.25, full score ratio \geq 0.5, it meant this item could be included, otherwise excluded. What's more, referred to the experts' suggestions, those items with similar semantics or inaccurate expression were deleted or adjusted, and the missing contents were added.

Readability Pilot Testing

In order to assess the clear and readable statement of the items, a small sample test was conducted. The ambiguous contents were revised according to the participants' suggestions.

Phase 3: Questionnaire Validation Phase

Participants

From July 2022 to August 2022, we recruited the nurses from three Chinese public hospitals in Shanghai and Jiangsu Province via convenience sampling. The inclusion criteria were as followed: (a) registered nurses with professional qualification certificate; (b) working in Orthopedics, Brain surgery, Rehabilitation departments in the care of traumatic

injured patients; (c) Informed consent and voluntary participation. Exclusion criteria: nurses were not in the working departments due to vacation or outside training.

Data Collection and Procedure

Self-designed online questionnaire was used to conduct the survey. After we contacted the head nurses of each department, we informed them about the purpose of the study and the instructions for filling in the questionnaires. After getting the voluntary consents of each participant, the head nurses helped us to share the online questionnaires with the nurses in their departments.

Statistical Analysis

IBM SPSS Statistics Version 25.0 program was used to analyze the collected data in the survey. The critical ratio (CR) method, Pearson's correlation coefficient reliability, Cronbach's α value, split-half reliability, exploratory factor analysis (EFA) and content validity were used to assess the psychometric feature of the questionnaire.

Item Analysis. As for results obtained from 293 participants, the total score of each item was ranked from lowest to highest score. Then, we compared the first 27% and the last 27% of the total score in each item. Item analysis was carried out through independent sample *t*-test, then the differentiation of each item was judged according to CR value. If the compared items had no statistically significant difference, it needed to be omitted. If the CR value was less than 3, it meant that this item differentiation was poor, which also needed to be eliminated. In this study, Pearson's correlation analysis was used to measure the correlation level between two variable factors. The correlation analysis was evaluated between the score of each item and the total score of the overall questionnaire. If the absolute value of Pearson's correlation coefficient was more than 0.4 ($P > 0.05$), it indicated that this item was poor correlation with the overall questionnaire, which need to be omitted. After that, we checked if the overall Cronbach's α value got any change after a certain item deletion. If the overall Cronbach's α value was found increasing, it meant this item should be deleted.

Content Validity. Fifteen experts were invited to evaluate the relevance between each item of the questionnaire and the dimension in which it was located. Four-point ordinal rating scale (1=not relevant; 2=somewhat relevant; 3=relevant; 4=very relevant) was used to evaluate the relevance of each item to the tool. After collecting the data from all the experts, the content validity (I-CVI) and the average content validity (S-CVI) of the questionnaire entries were calculated. I-CVI is the number of experts who scored ≥ 3 score divided by the total number of experts.³⁰ S-CVI was the mean value of all the I-CVIs. If the CVI was over 0.79, it meant acceptable.³¹

Construct Validity. In this research, the construct validity of the questionnaire was evaluated by the exploratory factor analysis (EFA). In the EFA, the Kaiser–Meyer–Olkin (KMO) test, Bartlett's sphericity test, principal component analysis (PCA), scree plot, varimax rotation were used to choose the qualified items to describe the main concept. First, we did the KMO and Bartlett's sphericity test. If KMO was over 0.7 along with the significance of Bartlett's sphericity test less than 0.05, it indicated that the questionnaire was suitable for EFA. Next, PCA was used for the selection and extraction of the common factor. As suggested in previous study, a factor could be extracted while its eigenvalue was over 1.³² As for the cumulative percentage of variance, the total of selected factors need reach at least 50%.³³ Following this, we used the approach of maximum variation method (Varimax) in orthogonal rotation to delete the unreasonable items. Items were retained or removed based on the maximum factor loading. The criteria for the factor loading of retained item need to maintain no less than 0.4 with the communality > 0.4 .³² Furthermore, the scree plot was performed to judge the relative important factors and the number of retained factors in the questionnaire as well. From "the turning point" in the scree plot that the curve started to become smooth, we could determine how many common factors could be extracted in the questionnaire.

Reliability Analysis. Cronbach's alpha coefficient and Split-half reliability were both used to evaluated the reliability of the questionnaire. When Cronbach's alpha coefficient was less than 0.6, it meant the reliability was low, and it was necessary to consider re-compiling the questionnaire or screening the disputed indicators. If the reliability was higher than 0.9, it meant the results of the questionnaire were very stable. If Cronbach's alpha coefficient was 0.7~0.8, it meant the result of the tool was relatively stable.³⁴ Split-half reliability value could also be used to see if the score was consistent after splitting the overall questionnaire into two halves.

Results

Phase I

During Phase I, the concept and principles of TIC model provided theoretical guidance for the construction of the item pool. By literature review, a total of 36 articles were included, and the content related to each item in this study was extracted. Finally, the total number of items was 38, including 10 items in TIC knowledge dimension, 9 items in TIC attitude dimension and 19 items in TIC practice dimension. Next, after qualitative interview, a total of 11 items were extracted, of which nine were consistent with the items content in the literature review. After merging the duplicate contents, 40-items encompassing 3 dimensions were produced eventually: TIC knowledge (10 items), TIC attitude (10 items) and TIC practice (20 items).

Phase II

Expert Consultation

Fifteen experienced experts (six nursing managers, four nursing educators, three psychological counselors, one psychiatrist, one non-psychiatrists) were invited for reviewing the items and dimensions independently in two rounds. After the first round, 3 items were eliminated due to not meeting the criteria (the mean value > 3.50 , $CV < 0.25$, full score ratio ≥ 0.5). In addition, 9 items were added and 18 items were revised based on expert advice. For the second round, no revision was proposed by the experts and all the items met the criteria. Finally, 46 items in 3 dimensions of the questionnaire were created, including TIC knowledge (10 items), TIC attitude (13 items) and TIC practice (23 items).

Readability Pilot Testing

A total of 35 questionnaires were distributed and 32 questionnaires were collected, with an overall response rate of 91.4%. One item was proposed by the respondents for difficulty in understanding. Therefore, we revised the expression of this item to make it easier for reading.

Phase III

Sample Size

According to the estimation method of sample size, the sample size in this study could be 5~10 times of the variable number.³⁵ A total of 46 items were included in the questionnaire, so the sample size range could be 230~460. Besides, the 20% loss rate of sample size was also taken into account. In the end, 320 questionnaires were distributed, and 293 valid questionnaires were obtained, with an effective rate of 92%.

Item Analysis

Item analysis was performed by independent sample *t*-test. Among 46 items, four items were deleted as the CR values were less than 3. Afterwards, the CR values of the other 42 items were greater than 3 and the significant level was less than 0.001 ($P < 0.001$), which presented good differential validity. Seven items had Pearson's correlation coefficient of less than 0.4 and were therefore omitted. The Pearson's correlation coefficients of the remaining 35 items were 0.406~0.670 with a significant difference ($P < 0.01$). We found the Cronbach's alpha coefficient of the questionnaire was significantly increased after 6 items deletion, so we removed those items and finally got the total Cronbach's alpha coefficient of the questionnaire was 0.939.

Content Validity

Totally, 15 experts evaluated each item of the questionnaire in relation to its dimension. The content validity (I-CVI) value was 0.867~1.00, and the average content validity (S-CVI) value was 0.971.

Exploratory Factor Analysis

For a total of 35 items, in the result of EFA, KMO was 0.918 which was over 0.7, and the significance level of Bartlett's sphericity test was less than 0.001 (See Table 1), indicating that the questionnaire was suitable for EFA. Next, the EFA was done twice through the method of PCA and varimax rotation so as to verify the loading structure and factors of selected items. In the primary EFA, five factors could be extracted, which presented the cumulative percentage of

Table 1 Kaiser–Meyer–Olkin (KMO) and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling		0.918
Bartlett's test of sphericity	Approx. Chi-Square Sig.	9055.549 0.000

variance reached 70.144% and the eigenvalue of each factor presented above one. As for conducting the rotated component matrix, five items indicated poor classification for spanning two factor loadings. To further validate the common factors, the inspection of the Scree Plot was produced. As it was shown in the Scree plot (See Figure 2), the eigenvalue no longer changed much after three factors. As a result, it indicated three common factors were more suitable for extracting from this questionnaire. In the next step, the remaining 30 items did the secondary EFA, which shew three common factors with the cumulative percentage of variance up to 68.413% and the eigenvalue of more than one. Besides, the factor loading of each item was demonstrated to be more than 0.45 (see Table 2). Consequently, the result of secondary EFA met all the standards and no need to remove any items. The final questionnaire of 30 items in three dimensions was confirmed to have a good structural validity.

Reliability

The Cronbach's alpha coefficient of the overall questionnaire was 0.939, and the range of Cronbach's alpha coefficient in each dimension was 0.918–0.962 (See Table 3), indicating that the questionnaire was reliable. The 30 items were divided into two parts, which shew the split-half reliability of the 15 items in the first part was 0.942 and in the second part was 0.940. For the overall questionnaire, the split-half reliability was 0.655 (See Table 4).

Discussion

The traumatic injuries create an enduring impact on patients' physical and emotional health. Acute stress disorder and posttraumatic stress disorder are common sequelae of all forms of injuries.¹² Researches have identified multiple circumstances in which the provision of TIC has underpinned care of physical injuries.^{7,11} Previous study also demonstrated that nurses in clinical settings were uniquely positioned to integrate aspects of TIC principles into their daily practice so as to minimize patients' traumatic symptom and promote recovery.³⁶ It reinforces the need to increase nurses' competence in responding to the trauma-exposed patients in a trauma-informed manner. The knowledge, attitude and practice were the important parts of individual competency in the delivery of TIC. Currently, nursing educators and administrators want to evaluate and monitor the degree to which nurses have been understood, accepted TIC and

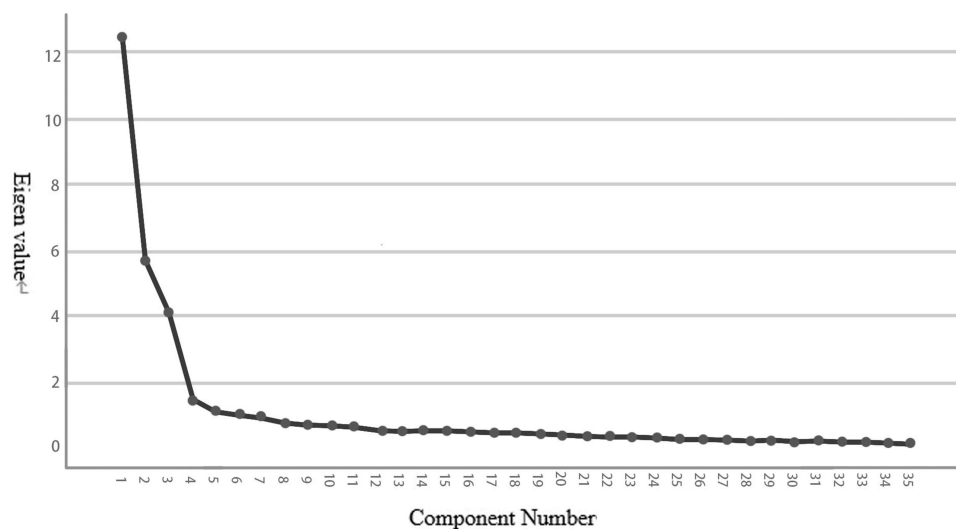
**Figure 2** Scree plot.

Table 2 Factor Analysis of the Items

Items	Description	Factors		
		1	2	3
K1	Traumatic injured events can affect an individual's emotional regulation, such as uncontrollable crying, anger, fear, numbness, etc.			0.771
K2	Traumatic injured events can affect individual's behavior, such as temper tantrums, impulsiveness, compulsivity, social withdrawal, etc.			0.854
K3	Traumatic injured events can affect cognitive function, such as memory loss, lack of concentration, confusion, negative self-concept, and inability to make decisions.			0.754
K4	Traumatic injured events can affect individual values, such as the prioritization of life's important events.			0.769
K5	Severe traumatic injured events can trigger acute stress response, manifesting as psychomotor arousal (eg, intense fearful experiences) or psychomotor inhibition (eg, stupor).			0.806
K6	The symptoms of acute stress response are often short-lived, usually resolving within a few days or a week, and have a good prognosis, which are normal individual response to stress events.			0.838
K7	A severe traumatic injured event may trigger a traumatic stress disorder (PTSD) characterized by persistent flashbacks, avoidance, persistent anxiety, and hyper-vigilance. Some individuals may also have addictive behaviors, aggressive behavior, self-harm, or suicide attempts.			0.729
K8	After traumatic injured events, some individuals can quickly recover their psychosocial functioning or even achieve post-traumatic growth, but some individuals may experience long-term adverse effects on their psychosocial functioning.			0.736
A1	I should care for traumatic injured patients, relieve their mental stress, and help them to gain a sense of psychological security.		0.781	
A2	I should respect the cultural needs, ethnicity, gender, age, religious beliefs, and values of traumatic injured patients.		0.766	
A3	I should have the trauma information as much as possible so as to provide the appropriate medical care for the traumatic injured patient.		0.78	
A4	For the psychological problems of traumatic injured patients, I believe it need the collaboration of nurses, doctors, psychiatrists, counsellors, social workers and family members.		0.786	
A5	Hospital needs to provide nurses training or education related to trauma-informed care for traumatically injured patients.		0.774	
A6	I want to learn and master the psychological trauma assessment and screening tools for traumatically injured patients.		0.825	
A7	I want to get the latest evidence and researches related to the trauma-informed care for traumatically injured patients.		0.856	
A8	I believe that the traumatically injured patients have the potential to cope with the traumatic event.		0.869	
A9	I want to master psychological trauma interventions for traumatically injured patients.		0.865	
A10	I understand the traumatically injured patients' emotional reactions.		0.751	
P1	I learn from patients or families about their trauma experiences in a respectful and professional manner without re-traumatizing them.	0.777		
P2	I assess whether the traumatically injured patient has the past trauma history, mental disease, substance abuse, or other potential risk factors for post-traumatic stress disorder (PTSD).	0.83		
P3	After the traumatic injury, I assess the patient's psychological state by observation, talking or psychological scales to access the psychological impact.	0.816		
P4	As taking care of traumatically injured patients with psychological trauma, I avoid irritate them with inappropriate words and behaviors.	0.807		
P5	In a propriate time, I instruct the traumatically injured patients or their family members how to seek professional services such as psychiatric consultation, psychotherapy, psychological counselling, etc.	0.798		
P6	I help traumatically injured patients to get peer support (face-to-face, internet, symposium).	0.824		
P7	I teach traumatically injured patients relaxation techniques to relieve their negative emotions (eg, deep breathing, muscle relaxation, meditation).	0.836		
P8	I give instructions for the traumatically injured patients or their family about the symptoms and recovery process of traumatic stress reactions.	0.905		

(Continued)

Table 2 (Continued).

Items	Description	Factors		
		1	2	3
P9	I assess the cultural needs of traumatically injured patients and provide culturally sensitive care.	0.746		
P10	I avoid denying or blaming the traumatically injured patient's emotions.	0.829		
P11	I explore and acknowledge the positive resources of the traumatically injured patients, such as important person in life, will to survive, strong character traits, resilient character, hobbies, etc.	0.855		
P12	I collaborate with professionals, such as counselors, psychiatrists, social workers, and help provide necessary referrals for traumatically injured patients as needed.	0.871		

Notes: K=TIC knowledge, A=TIC attitude, P=TIC practice.

Table 3 Internal Consistency: Cronbach's Alpha Coefficients

Dimensions	Numbers of Expression	Cronbach's Alpha Coefficients
The first factor (TIC knowledge)	8	0.918
The second factor (TIC attitude)	10	0.948
The third factor (TIC practice)	12	0.962
Total score	30	0.939

Table 4 Split-Half Reliability

Variable	Numbers of Expression	Split-Half Reliability
The first part	15	0.942
The second part	15	0.94
Guttman's half coefficient	/	0.655

translated TIC principles into everyday practice, so as to find out the areas of relative strength and weakness in caring for traumatically injured patients. This study used the KAP model including knowledge, attitude and practice as the composition of dimensions. Based on literature analysis, theoretical framework and qualitative interviews, the initial items were developed to measure the TIC level of knowledge, attitude and practice among clinical nurses working for patients with traumatic injury. With reference to the protocol of data analysis for the questionnaire development, the designed questionnaire presents good internal consistency reliability, content validity, as well as construct validity.

After iterative and rigorous testing, it turned out that the final version of questionnaire contained 30 items, which were divided into 3 domains. The 3 domains, including TIC knowledge (8 items), TIC attitude (10 items), TIC practice (12 items), also were in line with those findings in the literature review regarding nurses' need to improve the KAP to understand, recognize, and cope with traumatically injured patients' psychological problem. For previous studies, it had shown that the TIC could start from learning the knowledge.¹⁶ Management was encouraged to strengthen the training to improve the knowledge of medical providers such as traumatic stress, so as to improve their willing and confidence in providing TIC.³⁷ What's more, the attitude towards TIC has been indicated by Baker et al as another important driving force for the implementation of TIC.¹⁹ Typically, acquiring a positive TIC attitude could provide much impetus for the change of individual's TIC behavior. Besides, researches had demonstrated that medical staff were lacking of skills in helping injured patients to cope with emotional reaction and promote psychological recovery by using the TIC approach.^{20,21} Some literature reported that nurses had difficulty in understanding how to transform TIC ideas into medical care.^{38,39} Therefore, to which extent the nurses addressing TIC model into daily practice to provide appropriate treatments for patients is an important aspect of assessment.

Validity refers to the degree to which the questionnaire can accurately reflect the desired measurement concept. It was suggested that content validity was one of the common and important methods to evaluate the validity of the tool. The content validity of this questionnaire was based on literature review, qualitative interviews and two rounds of Delphi expert consultation. The content validity was evaluated by 15 experts, which shew the S-CVI value was 0.971 and I-CVI value was 0.867~1.00. The results indicated that the actual contents measured by the designed questionnaire about TIC of nurses working with traumatically injured patients had a good fit with what to be measured. In addition, we also conducted the EFA, which was the most general way used in health-related professions to test whether the constructs of the tool were in line with the theoretical and conceptual intent. The connotation effectively measured by this questionnaire could be learned through extracting common factors. In the second time of EFA, the composing factors and attributes in regard to TIC of clinical nurses working with traumatically injured patients were confirmed. The cumulative percentage of variance met the acceptance criteria in multidimensional scale. This indicated that this designed questionnaire provided good coverage in assessing the level of TIC among nurses working with traumatically injured patients.

Reliability is an evaluation indicator of the reliability and stability reflected by the tool. In this study, the reliability of the developed questionnaire in relation to TIC of nurses working with traumatically injured patients was evaluated on the basis of internal consistency reliability and split-half reliability. For the overall questionnaire, the Cronbach's alpha coefficient value was 0.939 and the split-half reliability was 0.655, which indicated good internal consistency.

The self-report survey tool developed in this study was confirmed to have good reliability and validity. Notably, the tool focused on measuring specific knowledge, attitude and skills related to identifying, understanding and supporting traumatic injured patients experiencing distress, which incorporated the TIC principles such as safety, trustworthiness, collaboration, peer support and empowerment into designed items. By examining trauma-related knowledge levels, attitude towards TIC, use of trauma-informed practices, it could assist in assessing the current weakness of TIC among nurses working with traumatically injured patients, so as to set a foundation for designing future training curriculums. By knowing the weakness, our educators could include more information for training to meet the participants' learning needs. In this way, it helps to cultivate nursing staff to be aware, sensitive and responsive in the application of TIC for patients with traumatic injured patients. Subsequently, this structured questionnaire could also be used to reevaluate any behavior change in clinical setting after education. Importantly, the findings of the questionnaire can identify areas that require attention for nursing administrators. Ultimately, it can provide reference to formulate the relevant guidelines and assessment criterion so as to increase the quality of care provided to traumatic injured patients.

Conclusion

This research finally developed a reliable and valid questionnaire with 30 items in 3 dimensions to measure nurses' KAP towards TIC for traumatically injured patients. From provider level, this questionnaire can point to the gaps in nurses' KAP related to TIC for traumatically injured patients, so as to improve related knowledge and skills by trainings or self-learning. From system level, nursing administrators can use the questionnaire for checking the nurses' quality of TIC for traumatically injured patients, which helps to provide interventions to promote the TIC culture.

Limitation and Practical Implications

While this research contributes to the literature in the field of TIC measurement, some limitations and suggestions for future research should be considered. First, the current scope of this questionnaire is only used in regions of Jiangsu and Shanghai, of which are the medically developed areas in China. As for other regions of China or different countries, the values of the three dimensions may change. In the future, cross-cultural researches in other regions or countries are expected. Secondly, this tool is only tested by nurses from the Orthopedics, Neurosurgery and Rehabilitation departments. Therefore, it is strongly suggested that this questionnaire should be retested to include nurses from more departments in the future researches. Last but not least, this designed tool is self-evaluation which is not in combination with other evaluation questionnaires to achieve an overall assessment, so whether it could reflect the nurses' actual TIC level need to be further examined.

Data Sharing Statement

The data collected supporting this research are not available in this article due to privacy or ethical restrictions.

Ethical Approval

The study protocol was approved by the Ethics Committee of Pudong New Area Mental Health Center (PDJWLL2022006). After listening to the purpose and procedures of this study, all subjects signed an informed consent form to participate in this study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation. They have given final approval of the version to be published, agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

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Disclosure

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