ORIGINAL RESEARCH

Nursing-sensitive Indicators for Quality Improvement for Patients with Traumatic Brain Injury

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ABSTRACT

Context • Traumatic brain injury (TBI) can result in lifelong cognitive, emotional, and motor impairments. The emergency department is the first stop for diagnosing and treating patients with acute TBI, and the quality of nursing care can greatly influence the prognosis and progression of a patient's condition. Currently, standardized evaluation tools are lacking in the world for assessment of the quality of nursing care.

Objective • The study intended to construct a nursing-sensitive indicator system for TBI patients, based on the scientific method of evidence-based nursing and the Delphi method, to provide a quantitative tool for emergency-nursing personnel to manage the quality of care for those patients.

Design • Based on the Joanna Briggs Institute's evidence-based healthcare model, the research team performed a literature search and consulted reference guidelines, conducted two rounds of consultations with experts. sensitive indicators for quality of care, and constructed the sensitive indicator system. The team then conducted a retrospective study.

Setting • The study took place in the department of emergency surgery at Shanxi Norman Bethune Hospital in Taiyuan, Shanxi, China.

Participants • Participants were 56 patients with TBI who had been admitted to the emergency department between January 2022 and December 2022 and 44 patients with TBI who had been admitted to the emergency department between January 2023 and December 2023.

Interventions • The research team assigned: (1) the 56 patients in the first group to the control group, who received routine nursing care and (2) the 44 patients in the second group to the intervention group, who received treatment using the sensitive indicator system for the quality of emergency care for TBI patients as well as routine care.

Outcome Measures • In the verification study, the research team compared the group's rescue effects and satisfaction with emergency care.

Results • In the first and second rounds of inquiries to experts, the research team distributed 25 questionnaires each time, with 25 valid questionnaires collected both times. The response rate for both rounds of inquiries was 100%. The expert authority coefficients for the first and second rounds of inquiries are 0.844 and 0.878, respectively. The sensitive indicator system's final construction included three primary indicators, seven secondary indicators, and 17 tertiary indicators. The AUC for the sensitive indicators was 0.8355882. The indicator system's use found that the intervention group had a shorter time to diagnosis ($P < .001$), emergency-department stay ($P < .001$), and emergency-department-to-surgery time ($P < .001$) compared to the control group. The intervention group also has a higher success rate for the emergency treatment ($P = .014$) and a higher nursing satisfaction with nurse-patient communications ($P = .003$), first-aid operations ($P < .001$), nursing attitudes ($P < .001$), and emergency environment ($P < .001$) compared to the control group.

Conclusions • The process of constructing quality-sensitive indicators for the nursing care of TBI patients was scientific. The constructed quality-sensitive indicator system for the care of patients with TBI covers key factors that influence the quality of care. It's highly practical and has the ability to transform certain indicators, which can better guide the management of quality of care for TBI. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Traumatic brain injury (TBI) refers to a disease in which a person's head is struck, causing damage to the brain-tissue structure and disruption of neurological function. It can result in lifelong cognitive, emotional, and motor impairments.[1,2] The severity of acute TBI ranges from mild to severe, with the prevalence of moderate to severe TBI being 20%.[3] Even with small absolute benefits from improved treatment strategies, new strategies could prevent thousands of TBI deaths each year.[4]

The emergency department is the first stop for diagnosing and treating patients with acute TBI. Treatment requires a series of emergency-care procedures, including emergency nursing care, management of common complications, and psychological care.

Triage

Simple trauma assessment and triage in emergency departments for TBI patients can effectively reduce the time of emergency care and improve patient satisfaction.[5-8] The implementation of emergency, pre-check triage is of great significance.

Muzzammil et al and Wang et al have already established a rigorous pre-check management system, but research on triage systems in China is still in the exploratory stage.[9,10] The establishment of this indicator can further standardize the emergency-treatment process for TBI patients.

Barghiet al and et al indicate that clinicians should conduct re-assessment and triage before intrahospital transfer to reduce the occurrence of accidents during transportation and improve the quality of the transfer.[11,12] Li et al suggest that nurses should perform a Glasgow Coma Scale (GCS) assessment after a physician diagnoses TBI and record the results.[13]

Nursing Measures

Traditionally, emergency nurses still use the GCS as the grading standard for TBI.[14] Nurses should implement relevant nursing measures based on the assessment of consciousness disorders, and for patients with severe acute cranial injuries, GCS ≤ 8, nurses should repeat GCS scoring to promptly observe and detect changes in a patient's condition. However, GCS scoring can't quickly identify high-risk patients with TBI.

Computed tomography (CT) scanning is the most commonly used method for confirming cranial injuries.[15] CT scanning time is the time between the patient's arrival in the emergency department and the completion of the CT scan, reflecting the coordination of nursing staff during the CT scanning process for TBI patients.

Bergman systematic review found that emergency nurses providing comprehensive information on acute cranial-injury symptoms and self-management to emergency patients or their families could optimize the post-injury experience and prognosis of TBI patients.[16]

Due to changes in the medical environment in China, ward nurses often undertake patient-discharge education. Frie et al and Littman-Quinn et al recommend setting a health-education implementation rate, because health education can improve the quality of nursing care and patients' and families' satisfaction.[17,18]

Hypotension and hypoxemia are important factors associated with a poor prognosis for TBI patients.[19] Observing and monitoring the blood volume of critically ill patients is an important part of nursing work. Also, Huang et al found that elevating the head is beneficial for treating or preventing increased intracranial pressure.[20]

Restlessness occurs in approximately 30% to 40% of TBI patients.[21] Nurses should strengthen protective measures for restless patients, and appropriate restraint may be necessary to prevent self-harm or harm to others.[22]

The most easily overlooked aspect of TBI patients is temperature observation. Temporary central fever can occur due to the condition, and infections can also cause an increase in body temperature.[23] Nurses should give monitoring of body temperature more attention in patients with cranial injuries.

Standardized Evaluation Tools

The quality of nursing care can greatly influence the prognosis and progression of a patient's condition.[24-26] Currently, standardized evaluation tools are lacking in China for assessment of the quality of nursing care after a hospital has established standardized nursing processes.

Therefore, creation of a quantitative management tool for evaluating the quality of nursing care for acute TBI is necessary in the emergency department. Clinicians can use this tool to monitor and improve the quality of care, meet practical clinical needs, and work toward better implementation of standardized emergency processes at a national level.

The American Nurses Association (ANA) established 10 emergency, nursing-quality evaluation indicators under the Nursing Quality and Safety initiative in 1999.[27] To improve nursing quality, clinicians have developed an evaluation indicator system for nursing quality for certain diseases, including inflammatory bowel disease,[28] acute coronary syndrome,[29] acute myocardial infarction,[30] stroke,[31] postoperative lung cancer,[32] abdominal surgery,[33] and postpartum hemorrhage.[34] However, no research exists on the construction of nursing sensitivity indicators for TBI, and the existing sensitivity indicators aren't completely applicable for evaluating the nursing quality for treatment of TBI.

Countries other than China have clear procedures and standards for the management of TBI. Considering that the conditions of TBI patients change rapidly and are complex, it's necessary to establish nursing-sensitive indicators for acute TBI patients to quantitatively monitor and improve the quality of their care.

The basic steps of evidence-based nursing practice include the development of research questions, the formation of search terms, and the initial selection of sensitive indicators.[35,36] Due to the close association between quality-sensitive nursing indicators and clinical practice, the Delphi expert consultation method can further establish and construct indicators. In the Delphi method, experts are typically professionals with more than 10 years of experience in the field, and the number of consultants generally ranges from 15 to 50.[37]

Current Study

The current study aimed to construct a nursing-sensitive indicator system for TBI patients, based on the scientific method of evidence-based nursing and the Delphi method, to provide a quantitative tool for emergency-nursing personnel to manage the quality of care for those patients and to evaluate its clinical effectiveness.

METHODS

System Development

The study took place in the department of emergency surgery at Shanxi Norman Bethune Hospital in Taiyuan, Shanxi, China. Based on the Joanna Briggs Institute's evidence-based healthcare model,[38] the research team performed a literature search and consulted reference guidelines, conducted two rounds of consultations with experts to select and revise the hospital's currently used sensitive indicators for quality of care, and constructed the sensitive indicator system.

Retrieval of relevant literature. The research team performed a narrative review by searching: (1) Chinese

databases—including the China biomedical literature service system, China National Knowledge Infrastructure (CNKI), Wanfang medicine, China journal full-text database, and VIP Chinese journal data service platform—and (2) English databases— including PubMed, Medical Literature Analysis and Retrieval System Online (MEDLINE), Excerpta Medica Database (EMBASE), and UpToDate. The team used: (1) the English key words traumatic brain injury/acute head injury/TBI/craniocerebral traumas/brain traumas, nursing care quality, and quality indicators/quality assessment/quality improvement/sensitive quality indicator and (2) the Chinese key words brain injury/brain injury, nursing quality/nursing safety, nursing quality/quality evaluation/quality indicators/sensitive indicators. The team screened the literature from January 2000 to December 2023.

Selection of sensitive indicators. Two members of the research team independently read the selected literature and extracted relevant information, such as the title, author(s), journal of publication, publication date, download method, and nursing indicators, within a time limit of 3 days. The researchers compared the extracted results, with a focus on checking for differences in nursing indicators. If the results were consistent, the two researchers considered them to be the final results. If inconsistencies existed, the two researchers read the corresponding literature together and extracted the indicators again.

Design of questionnaire for experts. The research team designed the questionnaire by referring to relevant literature and consulting with experts in the field. The questionnaire consisted of three parts: (1) an introduction, (2) an inquiry about the indicators' importance, and (3) an expert-information survey.

The introduction included the study's background and research objectives, instructions for filling out the questionnaire, and important notes.

The inquiry about the importance of indicators included all the selected indicators. The respondents rated the importance of each indicator on a five-point scale, ranging from 1= not important at all to 5= very important. The corresponding scores ranged from 1 to 5.

The expert-information survey included demographic information about the experts, their familiarity with the inquiry's content, and the basis for their judgments. The demographic information included educational level, years of work experience, professional title, job position, research direction, and experience in participating in inquiries.

The experts self-assessed their familiarity with the inquiry's content using a five-point scale, ranging from 1= not familiar at all to 5= very familiar. The basis for judgments included theoretical analysis, clinical experience, intuitive judgment, and domestic and foreign literature. The research team categorized the impact of each basis on the inquiry's evaluation into three levels: large, medium, and small.[39,40]

Selection of expert panel for the inquiry letter. The research team selected physicians and nurses from the trauma center, emergency department, and nursing department of a tertiary grade A hospital in Taiyuan, Shanxi, China to form an expert panel. The team screened the experts according to the criteria below.

The study included experts if they: (1) were working in the field of TBI treatment and nursing; (2) had more than 10 years of work experience; (3) held a bachelor's degree or above; (4) held a professional title of deputy senior or higher; (5) had an interest in the research topic and would be able to participate throughout the process; and (6) had experience with inquiries. The study excluded experts if: (1) the research team deemed the questionnaires to be invalid upon return, or (2) they withdrew from the study midway.

Organization of experts' correspondence. The research team determined that it would conduct the inquiry using email and conducted two rounds of inquiry.

In the preliminary stage, the team collected and organized the experts' email addresses and then uniformly distributed an electronic version of the inquiry's questionnaire, the first inquiry. The team gave the experts 2 weeks to respond.

The team then sorted the returned questionnaires, including the importance rating of indicators, calculation of the coefficient of variation, and organization of the experts' opinions.

The team selected at least three experts whose opinions were consistent, and based on their feedback, revised the indicators. The research team discussed and decided whether to revise the initially selected indicators and how to revise them based on the opinions of two experts.

The team then created a new inquiry letter and continued the inquiry process, performing the second inquiry. If the expert opinions tended to be consistent, the team concluded the inquiry.

Participants

The research team conducted a retrospective study. The study also took place in the department of emergency surgery at Shanxi Norman Bethune Hospital in Taiyuan, Shanxi, China. Participants were patients with TBI who had been admitted to the emergency department between January 2022 and December 2022 and patients with TBI who had been admitted to the emergency department between January 2023 and December 2023.

The study included prospective participants if they: (1) had TBI and (2) were ≥18 years of age. The study excluded prospective participants if they: (1) had either type 1 or 2 diabetes; (2) had severe cardiovascular or cerebrovascular diseases, hypertension, hepatorenal insufficiency, or severe hyperthyroidism or hypothyroidism; (3) had a malignant tumor, systemic infection, or autoimmune disease; or (4) were pregnant or lactating females.

All participants signed the informed consent voluntarily. The hospital's Ethics Committee approved the study's protocols. The study comply with the Helsinki Declaration.

Procedures

Interventions: The research team assigned: (1) the 56 patients in the first group to the control group, who received routine nursing care and (2) the 44 patients in the second group to the observation group, who received treatment using the sensitive indicator system for the quality of emergency care for TBI patients as well as routine care.

Outcome measures. In the verification study, the research team compared the group's rescue effects and satisfaction with emergency care.

Interventions

Sensitive indicator system. For participants receiving treatment using the sensitive indicator system, (1) the nurses conducted a self-assessment of nursing quality and (2) based on the system that the research team had created, developed a self-assessment form for nursing quality for TBI patients, which included five dimensions: trauma condition assessment. specialized emergency operations, safety management, and health education, with a total of 22 items. The research team evaluated each item on a scale from 1 = completely noncompliant to 5= completely compliant, with a score range of 1 to 5. The form also included a section for additional comments after each item, and if the evaluation score was lower than four, the respondents had to provide the reasons.

The research team distributed the self-assessment form to the nurses in the emergency department, explaining the form's usage. The team required that the nurses review the emergency nursing process and conduct a self-assessment after completing emergency nursing care for each critically injured patient. The team held a weekly summary meeting to identify existing nursing problems and determine nursing improvement measures, such as standard training for specialized nursing and optimization of emergency nursing procedures, and to supervise the implementation of improvement measures.

The team developed a nursing optimization checklist, based on the three-level indicators of the sensitive indicator system. This checklist covered five aspects: (1) the emergency nursing system for first aid in critical trauma, (2) the first-aid nursing process, (3) the nursing team's construction, (4) first-aid nursing services, and (5) a first-aid nursing evaluation.

The team identified deficiencies in the first-aid nursing system, issues with the first-aid nursing process, problems with the nursing team's construction, insufficiency of first-aid nursing services, and deficiencies in the first-aid nursing evaluation.

The team created a Nursing Optimization Checklist for Brain Injury Patients, which included optimization projects, optimization goals, and optimization implementation. The head nurse led the establishment of the nursing optimization team and conducted monthly optimization activities for first-aid nursing of TBI patients.

The team evaluated patient's first-aid nursing and nursing management, developed an optimization checklist, set optimization goals, and supervised optimization implementation to achieve continuous improvement in first-aid nursing and nursing management for TBI patients.

Outcome Measures

Rescue effect. Evaluation indicators for rescue effectiveness for patients with cranial and brain injuries included: (1) the time to diagnosis, (2) the length of the emergency-department stay, (3) the time between admission to the emergency department and surgery, and the success rate for the emergency treatment.

The nursing staff could access patients' in-hospital diagnosis, treatment, and nursing records to obtain the above-mentioned indicator information. The shorter the time to diagnosis, the length of the emergency-department stay, and the time from admission to the emergency department to surgery, and the higher the success rate for the emergency treatment, the better the rescue effectiveness.[41,42]

Nursing satisfaction. The research team conducted the evaluation of patients' satisfaction with emergency care using a self-made satisfaction questionnaire. The questionnaire included four dimensions with 20 items: (1) emergency operations, (2) nursing attitudes, (3) emergency environment, and (4) nurse-patient communication. The team used a five-point rating scale, ranging from 1= very dissatisfied to 5 = very satisfied, with scores ranging from 1 to 5. The total score ranges from 20 to 100, with higher scores indicating higher nursing satisfaction. The Cronbach's alpha coefficient for the questionnaire is 0.872.

Statistical Analysis

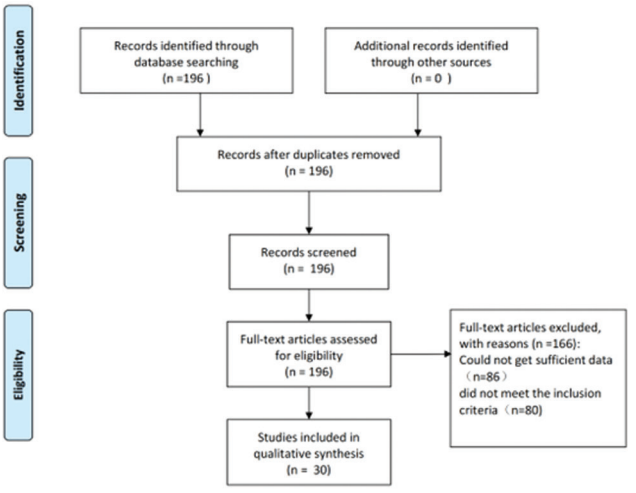
The research team analyzed the using the SPSS 23.0 software (IBM SPSS Statistics for Windows, Version 23.0). The team: (1) expressed continuous data as means ± standard deviations (SDs) and compared the groups using *t* tests, (2) expressed categorical data as numbers (Ns) and percentages (%s) and compared the groups using chi-square (χ^2) tests, (3) evaluated the experts' positivity using the questionnaire response rate, and (4) evaluated the experts' authority using coefficients of familiarity with the inquiry's content and the basis for judgment. $P < .05$ indicated statistically significant differences.

RESULTS: SENSITIVE INDICATOR SYSTEM

Literature Search

Initially, the literature search found 196 unique records (Figure 1). The research team excluded 166 articles that didn't have sufficient data and three that didn't meet the inclusion criteria, with 30 articles remaining.

Figure 1. Flow Diagram of Literature-search Process



Experts' Demographics

Of the 25 consulting experts (Table 1): (1) 20 were male (80%), and five were female (20%); (2) seven were 36-40 years of age (28%), 12 were 40-50 years of age (48%), and six were ≥50 years of age (24%); (3) for professional titles, five were supervisory nurses (20%), 11 were deputy chief nurses (44%), four were chief nurses (16%), two were chief physicians (8%), and three had other titles (12%); (4) for education, seven had undergraduate degrees (28%), 13 had master's degrees (52%), and five had doctorates (20%); (5) for graduate supervisors, 12 had a master's supervisor (48%), five had a doctoral supervisor (20%), and eight had other supervisors (32%); and (6) for work experience, seven had 10-20 y (28%), 12 had 20-30 y (48%), and six had ≥30 y (24%).

The experts' mean working experience was 23.21 ± 6.83 y. They represented emergency nursing, nursing management, and clinical-medicine experts from different provinces and cities.

Table 1. Experts' Demographic Characteristics (N=25)

Characteristics	Group	n (%) Mean ± SD
Gender	Male	20 (80)
	Female	5 (20)
Age, y	30-40	7 (28)
	40-50	12 (48)
	≥50	6 (24)
Professional Title	Supervisory nurse	5 (20)
	Deputy chief nurse	11 (44)
	Chief nurse	4 (16)
	Chief physician	2 (8)
	Other	3 (12)
Education	Undergraduate degree	7 (28)
	Master's	13 (52)
	Doctorate	5 (20)
Graduate Supervisor	Master's supervisor	12 (48)
	Doctoral supervisor	5 (20)
	Other	8 (32)
Work Experience, y		
Mean		23.21 ± 6.83
Range	10-20	7 (28)
	20-30	12 (48)
	≥30	6 (24)

Experts' Enthusiasm

The first and second rounds of inquiries distributed 25 questionnaires each, with 25 valid questionnaires collected for each. The response rate for both rounds of inquiries was 100%. The rate of problem identification for the first and second rounds was 43.40% and 26.38%, respectively (data not shown).

The Kendall's harmony coefficient W for expert-opinion coordination in the first and second rounds of inquiries were 0.455 (χ^2=44.028, $P < .001$) and 0.587 (χ^2=0.591, $P < .001$), respectively (data not shown).

Experts' Authority

The familiarity coefficients for the content of the first and second rounds of inquiries were 0.833 and 0.898, respectively, while the judgment basis coefficients for the inquiries were 0.924 and 0.954, respectively. The expert authority coefficients for the first and second rounds of inquiries were 0.844 and 0.878, respectively

Sensitive Indicators

The first round of inquiries found three secondary indicators and eight tertiary indicators, and seven revised indicators were deleted. In the second round, the team deleted two secondary indicators, four tertiary indicators, and seven revised indicators. Finally, the team established a sensitive indicator system. The three primary indicators were: (1) structural indicators, (2) process indicators, and (3) result indicators, with importance ratings of 4.67 ± 0.41, 4.64 ± 0.65, and 4.47 ± 0.87, respectively (Table 2).

The secondary structural indicators were: (1) nursing normative system, and (2) nursing team building. respectively. The secondary process indicators were: (1) trauma assessment, (2) specialized first-aid operations, and (3) humanistic concern, with importance ratings of 4.35 ± 0.64, and 4.24 ± 0.25, respectively. The secondary result indicators were: (1) nursing quality and (2) service effectiveness, with importance ratings of 4.47 ± 0.87 and 4.65 ± 0.33.

Table 2. Sensitive Indicators of Emergency-nursing Quality (N=25)

Primary Indicators	Secondary Indicators	Tertiary Indicators	Importance Rating Mean ± SD	Coefficient of Variation
Structural Indicators				
	Nursing normative system	Degree of perfection of nursing system	4.64 ± 0.65	0.74
		Multidisciplinary collaboration system	4.87 ± 0.34	0.54
	Nursing team building	Number of vocational nurses	4.67 ± 0.41	0.76
		Number of experienced nurses	4.57 ± 0.62	0.30
Process Indicators	Trauma assessment	Injury classification rate	4.87 ± 0.34	0.04
		Glasgow Rating Scale	4.87 ± 0.41	0.01
		Pupil examination rate	4.95 ± 0.34	0.34
	Specialized first-aid operations	Selection rate of suitable, large blood vessels	4.76 ± 0.54	0.22
		Observation rate of signs of elevated intracranial pressure	4.67 ± 0.54	0.24
		Continuous blood-oxygen monitoring rate	4.68 ± 0.57	0.21
	Humanistic concern	Provision of comfort to patients' family members	4.85 ± 0.52	0.41
		Patients' needs assessment and intervention	4.67 ± 0.59	0.21
		Implementation rate of health education at discharge	4.27 ± 0.31	0.64
Result Indicators	Nursing quality	Fall incidence rate	4.63 ± 0.21	0.31
		Oral-infection incidence rate	4.37 ± 0.33	0.14
	Service effectiveness	Patients' or their family's satisfaction with care	4.87 ± 0.54	0.21
		Multidisciplinary collaboration satisfaction	4.67 ± 0.66	0.24

The tertiary structural indicators for the nursing normative system were: (1) degree of perfection of nursing system and (2) multidisciplinary collaboration system, with importance ratings of 4.64 ± 0.65 and 4.87 ± 0.34, respectively, and for nursing team building were: (1) number of vocational nurses and (2) number of experienced nurses, with importance ratings of 4.67 ± 0.41 and 4.57 ± 0.62, respectively.

The tertiary process indicators for trauma assessment were: (1) injury classification rate, (2) Glasgow rating scale, and (3) pupil examination rate, with importance ratings of 4.87 ± 0.34, 4.87 ± 0.41, and 4.95 ± 0.34, respectively. The tertiary process indicators for specialized first-aid operations were: (1) selection rate of suitable, large blood vessels, (2) observation rate of signs of elevated intracranial pressure, and (3) continuous blood-oxygen monitoring rate, with importance ratings of 4.76 ± 0.54, 4.67 ± 0.54, and 4.68 ± 0.57, respectively. The tertiary process indicators for humanistic concern were: (1) provision of comfort

Figure 2. ROC Curve

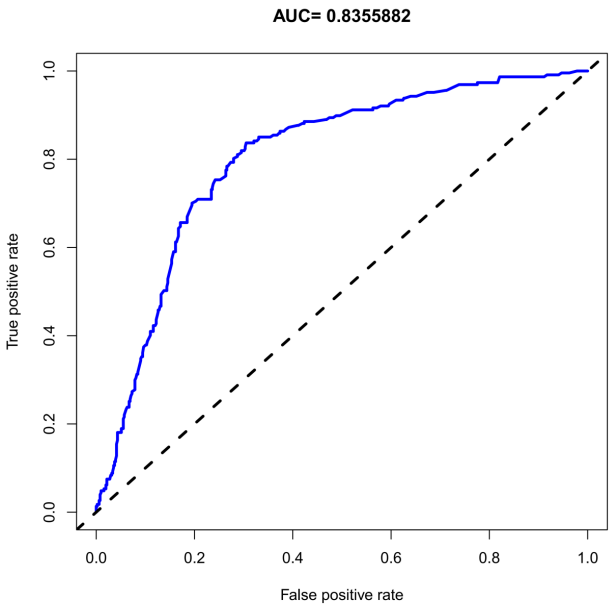


Table 3. Comparison of Rescue Effects Between the Control and Intervention Groups (N=100)

Group	Diagnostic Time, h Mean ± SD	Emergency-stay Time, h Mean ± SD	Emergency-to-surgery Time, h Mean ± SD	First-aid Success Rate n (%)
Control group, n=56	38.12 ± 4.56	27.54 ± 3.54	74.65 ± 9.32	47 (83.93)
Intervention group, n=44	33.87 ± 5.84	23.71 ± 2.54	47.51 ± 7.98	42 (95.45)
t/χ^2 value	4.644	5.884	17.541	5.974
P value	<.001[b]	<.001[b]	<0.001[b]	0.014[a]

[a]$P < .05$, indicating that the observation group's first-aid success rate was significantly higher than that of the control group
[b]$P < .001$, indicating that the observation group's diagnostic, emergency-stay, and emergency-to-surgery times were significantly shorter than those of the control group

Table 4. Comparison of Nursing Satisfaction Between the Control and Intervention Groups (N=100)

Group	First-Aid Operations	Nursing Attitudes	Emergency Environment	Nurse-Patient Communications
Control group, n=56	22.38 ± 3.54	22.12 ± 2.34	23.98 ± 2.64	11.54 ± 3.01
Intervention group, n=44	28.64 ± 1.84	24.64 ± 0.67	26.14 ± 3.84	13.54 ± 1.34
t/χ^2 value	5.641	6.021	3.412	3.641
P value	<.001[b]	<.001[b]	.001[b]	.003[a]

[a]$P < .01$, indicating that the observation group's satisfaction with nurse-patient communications was significantly higher than that of the control group
[b]$P < .001$, indicating that the observation group's satisfaction with first-aid operations, nursing attitude, and the emergency environment was significantly higher than those of the control group

to patients' family members, (2) patients' needs assessment and intervention, and (3) implementation rate of health education at discharge, with importance ratings of 4.85 ± 0.52, 4.67 ± 0.59, and 4.27 ± 0.31, respectively.

The tertiary process indicators for nursing quality were: (1) fall incidence rate and (2) oral-infection incidence rate, with importance ratings of 4.63 ± 0.21 and 4.37 ± 0.33, respectively, and for service effectiveness were: (1) patients' or their family's satisfaction with care and (2) multidisciplinary collaboration satisfaction, with importance ratings of 4.87 ± 0.54 and 4.67 ± 0.66, respectively,

The sensitive indicators' mean importance scores ranged from 4.24 ± 0.25 to 4.98 ± 0.64, with a coefficients of variation from 0.01 to 0.76. The AUC for the sensitive indicators was 0.8355882 (Figure 2).

RESULTS: VERIFICATION

Rescue Effects

The control group's mean diagnostic, emergency-stay, emergency-to-surgery times were 38.12 ± 4.56 h, 27.54 ± 3.54 h, and 74.65 ± 9.32 h, respectively, and the group's first-aid success rate was 83.93% for 47 out of 56 participants (Table 3).

The intervention group's mean diagnostic time, emergency-stay time, emergency-to- surgery time were 33.87 ± 5.84 h, 23.71 ± 2.54 h, and 47.51 ± 7.98 h, respectively, and the group's first-aid success rate was 95.45% for 42 out of 44 participants.

The intervention group's mean diagnostic ($P < .001$), emergency-stay ($P < .001$), and emergency-to-surgery ($P < .001$) times were significantly shorter than those of the control group. Moreover, the intervention group's success rate was significantly higher than that of the control group ($P = .014$).

Nursing Satisfaction

The control group's mean satisfaction with first-aid operations, nursing attitudes, emergency environment, and nurse-patient communications were 22.38 ± 3.54, 22.12 ± 2.34, 23.98 ± 2.64, and 11.54 ± 3.01, respectively (Table 4).

The intervention group's mean satisfaction with first-aid operations, nursing attitudes, emergency environment, and nurse-patient communications were 28.64 ± 1.84, 24.64 ± 0.67, 26.14 ± 3.84, and 13.54 ± 1.34, respectively.

The intervention group's mean satisfaction with first-aid operations ($P < .001$), nursing attitudes ($P < .001$), emergency environment ($P < .001$), and nurse-patient communications ($P = .003$) was significantly higher than those of the control group.

DISCUSSION

The 25 consulting experts selected for the current study had an average working experience of 23.21 ± 6.83 years; furthermore, the study also showed that the experts' opinions on the sensitive indicators of nursing quality for acute cranial injury were unified and coordinated, making the consultation results reliable.

The current study showed that the quality-sensitive indicators for cranial brain injury care can improve the emergency-care system for trauma, optimize the emergency-care process for trauma, standardize emergency care, improve rescue outcomes, and enhance patients' nursing satisfaction. The use of quality-sensitive indicators for emergency care for trauma patients covers nursing systems, nursing processes, nursing operations, and nursing evaluations. By implementing nursing management based on these indicators, it's possible to improve the current emergency care system for trauma, optimize the emergency-care process for trauma, enforce standardized emergency care, comprehensively and effectively evaluate nursing outcomes, provide feedback and adjustments to improve rescue outcomes, and enhance nursing satisfaction.

The current research team can't deny the potential bias in the experts' selection and the questionnaire bias in the study. To address this potential bias, the team could perform the following steps: (1) ensure that the pool of experts is diverse in terms of demographic characteristics, expertise, and perspectives; (2) use objective criteria for expert selection, instead of relying solely on subjective judgments or personal connections; (3) to further reduce bias in expert selection, consider implementing blind review processes where the team conceals the experts' identities from those making the selection; (4) before distributing questionnaires, conduct a pilot test with a small group of individuals to identify any potential biases or issues; and (5) when distributing questionnaires, consider using random sampling techniques to ensure that the sample is representative of the population of interest.

CONCLUSIONS

The process of constructing quality-sensitive indicators for the nursing care of TBI patients was scientific. The constructed quality-sensitive indicator system for the care of patients with TBI covers key factors that influence the quality of care. It's highly practical and has the ability to transform certain indicators, which can better guide the management of quality of care for TBI.

AUTHORS' DISCLOSURE STATEMENT

The authors declare no conflict of interest.

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