

Application of a Nursing Quality Improvement Checklist in the Emergency Treatment of Trauma Patients

Lang Fan¹, Ling Zhang², Qiong Huang², Maolin Deng¹, Weijun Guo¹, Dan Chang¹, Yuan Yuan¹, Yan Zhou¹, Bo Bi¹, Yanhong Kang¹ 

¹Emergency Department, Changsha Hospital of Traditional Chinese Medicine (Changsha No.8 Hospital), Changsha, Hunan, 410100, People's Republic of China; ²Nursing Department, Changsha Hospital of Traditional Chinese Medicine (Changsha No.8 Hospital), Changsha, Hunan, 410100, People's Republic of China

Correspondence: Yanhong Kang, Nursing Department, Changsha Hospital of Traditional Chinese Medicine (Changsha No.8 Hospital), No. 22, Xingsha Avenue, Changsha, Hunan, 410100, People's Republic of China, Email 17373390807@163.com

Objective: To explore the value of applying a nursing quality improvement checklist in a pre-post quasi-experimental design in the treatment of emergency trauma patients.

Methods: A total of 779 trauma patients were admitted to the emergency department of Changsha Traditional Chinese Medicine Hospital from April 2024 to November 2024. Patients treated between April and July 2024 were assigned to the control group (417 cases), and those treated between August and November 2024 were assigned to the observation group (362 cases). The control group received routine treatment, while the observation group implemented a nursing quality improvement checklist management approach integrating traditional Chinese medicine (TCM) elements based on routine treatment. The study compared the emergency department length of stay (ED-LOS), time to CT completion, resuscitation success rate, incidence of nursing adverse events, and patient satisfaction between the two groups, analyzed using t-tests and chi-square tests.

Results: The observation group had a significantly shorter ED-LOS (reduced by 28.14 minutes) compared to the control group ($P < 0.01$). The occurrence of nursing adverse events was markedly lower in the observation group than in the control group ($P < 0.05$). Additionally, the resuscitation success rate was significantly higher in the observation group compared to the control group ($P < 0.05$). Patient satisfaction was also greater in the observation group than in the control group ($P < 0.01$).

Conclusion: Implementing a risk-based nursing quality improvement checklist for trauma patients was associated with reduced ED-LOS, decreased incidence of nursing adverse events, and enhanced both resuscitation success rates and doctor-patient satisfaction. Limitations include single-center design; future multicenter studies are needed.

Keywords: trauma patients, nursing quality improvement, emergency nursing, checklist management, emergency treatment

Introduction

Trauma has emerged as the leading cause of death among young adults under 45 years of age and children, contributing to nearly 8% of deaths and 10% of disabilities worldwide, representing a significant public health issue.^{1,2} The common etiological factors of trauma include traffic accidents, falls from high buildings, frequently affecting multiple anatomical regions involving the head, chest, and abdomen, and carrying a high risk of complications, posing a substantial threat to patient survival,³ and gaps such as frequent omissions in verification and communication failures.⁴ Particularly for severely trauma patients, there is a significantly high risk of mortality, shock, hypoxemia, and the likelihood of misdiagnosis. Delays in treatment critically contributed to the increased risk of a fatality.⁵

Improving the quality of trauma emergency care within the critical first hour post-injury (the “Golden Hour”) is crucial for reducing patient mortality and disability.⁶ Both emergency care and traditional Chinese medicine (TCM) nursing have been commonly employed for clinical care, which played a pivotal role in adjuvant therapy support.⁷ The

checklist-based management provides a structured approach to clarify workflows and mitigate potential risks, operationalized as identification of high-risk steps with time-critical milestones, verification prompts, and auditable accountability fields.⁸ Implementing a nurse-led quality improvement checklist standardizes resuscitation protocols, enhances interdisciplinary coordination, and elevates the standardization and specialization of emergency care, as demonstrated in prior studies on hospital checklists for general medical patients and high-reliability organizations.⁹ This ensures timely, accurate, and efficient interventions for trauma patients, and recent work on nursing quality improvement in adverse events.^{10,11} Existing literature shows checklists improve standardization in high-reliability settings, but gaps remain in trauma-specific, TCM-integrated approaches.¹² This study fills this by analyzing 779 trauma cases to explore the clinical applications of a risk-based nursing quality improvement checklist in emergency trauma management, aiming to establish new insights and methods for optimizing the efficiency and quality of emergency care for the trauma patient population.

Methods

Study Population

Consecutive trauma patients admitted to the emergency department of Changsha Traditional Chinese Medicine Hospital were enrolled in this study. The control group comprised patients treated before the implementation of checklist management (April to July 2024; $n = 417$), while the observation group included patients treated after its implementation (August to November 2024; $n = 362$). The inclusion criteria were as follows: (1) trauma patients classified as Grade I or II during pre-test triage;¹³ (2) patients without communication barriers; (3) informed consent was obtained from patients and their legal families. The exclusion criteria were: (1) patients presenting with traumatic cardiac arrest or deceased upon admission; (2) patients with documented psychiatric disorders; (3) pregnant patients; (4) patients who left against medical advice. Ethics approval for this study was approved from the Ethics Committee of Changsha Traditional Chinese Medicine Hospital (Ethics No. 2023072002).

Methods

Conventional Management

The control group received treatment and care in accordance with the standard trauma treatment resuscitation protocol. Upon patient admission, an initial diagnosis was conducted, inhaling oxygen, followed by vital signs monitoring closely, including electrocardiography (ECG) monitoring closely. IV access was established, relevant examinations were performed, applying for specialty consultations. And Symptom-directed interventions were administered based on clinical findings. For patients requiring surgery, preoperative management included appropriate fluid replacement, key parameters such as blood pressure and respiration were monitored, and standard preoperative preparations such as urinary catheterization and routine skin preparation (Figure 1).

Checklist-Based Quality Improvement Management

The observation group received the treatment and care according to checklist quality improvement management in addition to the control group. During resuscitation, healthcare professionals followed the checklist procedures for treatment. The process of developing and implementing the checklist is detailed below.

Management Team Establishment

A 12-member of nursing quality improvement checklist management team consisted of emergency department (ED) clinical staff members, all of whom were bachelor's degrees or higher, possessed intermediate or senior professional titles, and had over five years of relevant work experience. The team composition includes: 1 chief physician, 1 associate chief physician, 1 chief nurse, 3 associate chief nurses, 6 nurse supervisors, 2 TCM experts, and 4 TCM nursing experts. Members were assigned tasks based on specialized knowledge and skills, such as literature review, checklist design, training programs, implementation, quality control, data collection, and management.

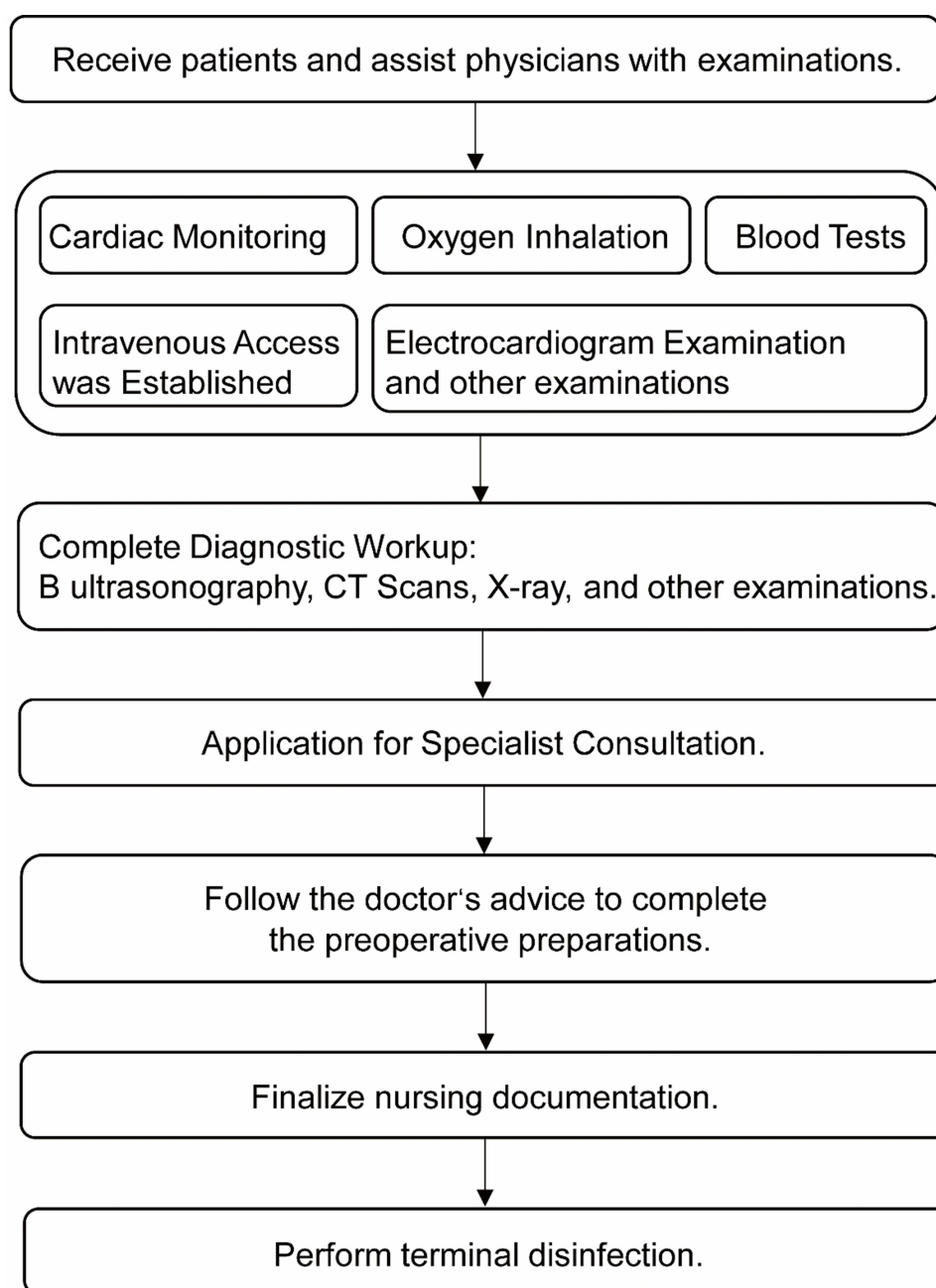


Figure 1 Conventional emergency protocol implementation, illustrating step-by-step workflow from admission to preoperative preparation, including initial diagnosis, oxygen administration, vital signs monitoring, IV access, examinations, consultations, and symptom-directed interventions.

Checklist-Based Quality Improvement Development Process

The team developed an initial draft checklist about the trauma emergency nursing quality improvement checklist from a risk perspective. They conducted a comprehensive review of current guidelines and literature related to this study, integrating institutional practices and evidence on trauma emergency care quality improvement, such as the effectiveness of high-quality nursing interventions.^{14–17}

After finalizing the draft, we consulted extent 10 specialists via email. The average age of these specialists was (47.53 ± 6.89) years, with an average work experience of (26.20 ± 7.52) years. Among them, 2 doctoral degrees, 8 master's degrees, 4 intermediate, and 6 senior titles. Additionally, 2 TCM experts and 3 TCM nursing experts participated in the consultation. The integrated authority coefficient of all experts was 0.83.¹⁸ The final checklist was determined based on

expert feedback. Further optimization occurred through preclinical experiments and clinical applications (50 cases): (1) the Nursing Quality Improvement Checklist V2.0 added columns for timelines, executors, and execution timelines for auditability based on V1.0; (2) To facilitate the discrimination of high-risk omission items, such as wearing the wristband as first-step verification, V3.0 implemented colour differentiation (yellow highlights) based on V2.0. The finalized V3.0 checklist and workflow (Figures 2 and 3) demonstrated operational feasibility and were implemented for this study.

Prehospital Emergency Care

Effective prehospital trauma emergency management requires rapid identification of injury mechanisms and anatomical involvement, coupled with immediate assessment of consciousness and physiological status, implement urgent resuscitative measures. Critical interventions include: (1) perform primary survey using the ABCDE approach (Airway, Breathing, Circulation, Disability, Exposure) for rapid injury stratification and emergent care; (2) concurrently, nursing staff collect patient identification and emergency contacts while ensuring compassionate communication; (3) before transport, a secondary assessment should be completed, with a thorough detection of occult injuries of the spinal, pelvic, or concealed trauma in axillae, gluteal regions, and skin folds; (4) we should activate institutional trauma emergency response systems immediately and establish a green channel to minimize door-to-provider time when notifying in-house trauma teams upon patient identification. And maintain point-of-care equipment (defibrillator, rapid-sequence intubation equipment) in standby mode before pre-hospital care.

In-Hospital Trauma Treatment

Conduct a comprehensive assessment of patients using TCM four-diagnostic assessment and individual risk stratification, such as children, elderly patients, underlying diseases, and multiple trauma, and screening for asphyxia, shock, or multi-organ failure. Conduct a detailed assessment to evaluate the risk level and promptly administer emergency resuscitation procedures to high-risk patients, following a systematic quality improvement checklist, while continuously providing patient-focused, humanistic care throughout the entire emergency process.

The team executed the following interventions. One nurse secured airway patency, promptly clearing oral blood or vomit, preventing asphyxia, completing inhaled oxygen within 2 minutes (assisting intubation if indicated) to secure airway oxygenation targeting SpO₂ >90%. And subsequently facilitating the doctor in systematic physical examination, a computed tomography (CT) scan, complemented by targeted imaging for secondary assessment within 30 minutes of admission. A second nurse established at least one IV access (dual IV access if indicated) and backup peripheral access. And then rapidly collected blood within 5 minutes, administering rapid fluid resuscitation to ensure prompt hemodynamic support as the physician orders. For patients with major bleeding, after blood typing and cross-matching were completed, immediately administered blood transfusion therapy according to the physician orders.

A third nurse was responsible for monitoring vital signs and delivering TCM nursing care. These included completing blood oxygen saturation (SpO₂) within 3 minutes and ECGs within 5 minutes. The nurse also provided emotional regulation therapy to patients and their families, maintains detailed condition records, performs catheterization, and manages the resuscitation environment. Furthermore, the nurse arranged for specialist consultations, assisted in wound debridement, and ensured all preoperative preparations were completed within 60 minutes of admission.

Post-Resuscitation Care

During inter-unit transfers, the nurse conducting handoffs ensured continuity, provided personalized rehabilitation guidance, ensured patterns, and scheduled follow-ups. To guarantee the quality of emergency therapy and care, the resuscitation process should be periodically assessed and continuously improved and optimized based on the assessment results.

TCM Treatment and Care

a) TCM Four-Diagnostic Procedure: a) we synthesized four diagnostic processes in TCM—inspection, auscultation and olfaction, interrogation, and palpation with modern medical diagnostics to rapidly identify critical cases through tongue/pulse analysis.¹⁹ We should focus on both localized pathology and overall condition. b) Herbal hemostasis: applying topical herbal medications in external application, such as Sanqi (Radix Notoginseng, *Panax notoginseng*) extracts, enhances hemostasis by promoting blood clotting and vasoconstriction. c) TCM injections: based on the patient's

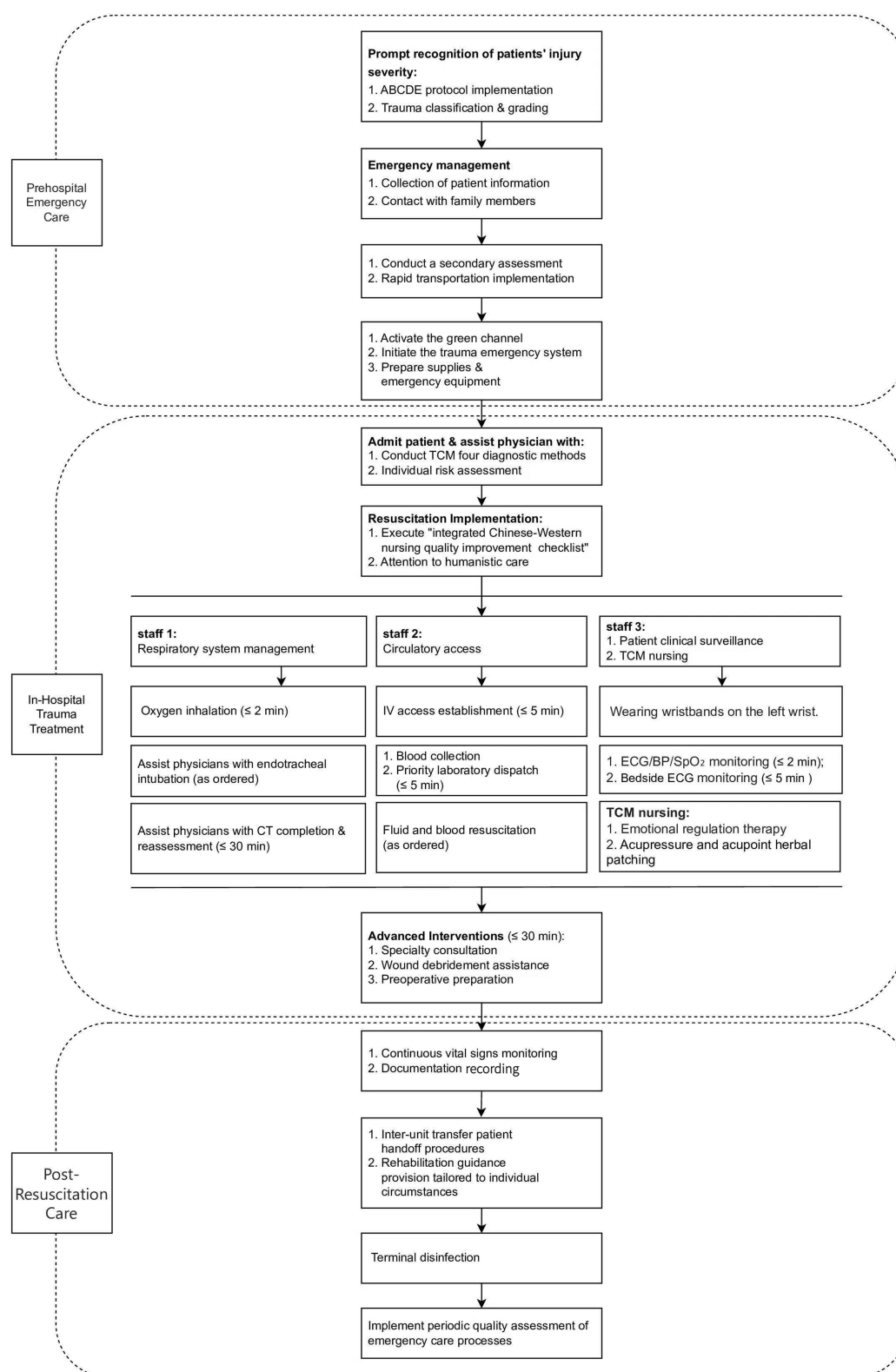


Figure 2 Nursing quality improvement process, depicting the sequential steps from team establishment to checklist development, training, and implementation. Bold text indicates key steps in the quality improvement process for emphasis.

Patient Basic Information							
Name: _____		Admission No.: _____		Gender: Male / Female Age: _____ years		Admission Time: _____	
Admission Information							
Physician: _____		Primary Nurse: _____		Preliminary Diagnosis: _____		Trauma Level: _____	
Vital Signs							
BP: _____ mmHg		P: _____ bpm		R: _____ rpm		T: _____ °C SPO ₂ : _____ % FBS: _____ mmol/L	
Item	Perform with Humanistic Care				Compliance		Signature Time / Name
					Yes (√)	No (×)	
Assessment (within 10 min of admission)	1. Consciousness:	Alert ☐	Confused ☐	Comatose ☐			
	2. Mobility:	Normal ☐	Limited ☐	Lost ☐			
	3. Injury Site(s):	Head/Neck ☐	Extremities ☐	Chest/Abdomen ☐ Multiple ☐			
	4. Shock Signs:	Yes ☐	No ☐				
	5. Medical History:	Hypertension ☐	Diabetes ☐	Heart Disease ☐ Other: _____			
	6. Allergy History:	None ☐	Yes ☐ (Specify: _____)				
Procedures	1. Apply ID wristband (routine placement: left wrist).						
	2. Initiate oxygen inhalation (Titrate oxygen flow according to physician orders). Time target: within 2 min.						
	3. Commence ECG/BP/SPO ₂ monitoring (set appropriate parameters & alarm limits). Time Target: within 3 min.						
	4. Establish IV access (establish dual vascular access in hemorrhagic shock). Time target: within 5 min.						
	5. Blood collection and transport to the laboratory. Time target: within 5 min.						
	6. Comprehensive ECG assessment. Time target: within 5 min.						
	7. Blood resuscitation for hemorrhagic shock. Time target: within 30 min of admission.						
	8. Complete diagnostic imaging (CT/US/X-ray) & reassess patient. Time target: within 30 min of admission. Note: Transport equipped with emergency kit, portable ventilator, mobile cardiac monitor (calibrated target parameters)						
	9. Request specialist consultation (consult charge nurse when clinically indicated).						
	10. Complete preoperative preparation (per physician order). Time target: within 60 min of admission.						
TCM Nursing Interventions	Emotional support (Qingzhi Hu Li): provide clear explanations, reassure patient and family.						
	Acupressure and acupoint herbal patching (analgesic patch): common acupuncture points (e.g., Hegu, Lieque, Dazhui, Weizhong, Zusanli, and Fenglong)						
Discharge outcomes	1. Complete medical records & nursing documentation.						
	2. Print and affix diagnostic reports.						
	3. Finalize inter-unit transfer documentation and discharge outcomes. Perform terminal disinfection. Final vital signs: BP: _____ mmHg P: _____ bpm R: _____ rpm SPO ₂ : _____ %						

Figure 3 Nursing Quality Improvement Checklist (Version 3.0), outlining detailed procedures for prehospital, in-hospital, post-resuscitation, and TCM care, with columns for timelines, executors, and execution times; the entire page was highlighted in yellow to denote high-risk omission items for easy identification.

Abbreviations: BP, Blood Pressure; P, Pulse; R, Respiratory Rate; T, Temperature; SPO, Peripheral Capillary Oxygen Saturation; FBS, Fasting Blood Sugar.

constitutional condition and TCM diagnostic results, TCM injections were administered, including Shenmai injection and Shenfu injection for targeted treatment. d) Acupressure and acupoint herbal patching (analgesic patch): the treatment for acupoints was based on the patient's pain sites and individual relevant sites. The most frequently used acupuncture points to relieve pain include Hegu, Lieque, Dazhui, Weizhong, Zusanli, and Fenglong (administered as directed by a physician). e) TCM emotional regulation: severe trauma may induce psychological distress, inducing extreme fear, anxiety, and other emotions. Implemented TCM-based counseling and distraction therapy, which could alleviate or eliminate negative emotions, promoting disease prognosis and rehabilitation. f) Recovery guidance: during the recovery period, patients were advised to follow a light diet and consume warming and nourishing herbal medicines such as Goji (*Lycium barbarum*), Chinese jujube (*Ziziphus jujuba*), Huang Qi (*Radix Astragali*), and ginseng (*Radix Ginseng*) to achieve generating blood and replenishing Qi therapeutic effects. The implementation of graded functional exercises may enhance the recuperation of physiological functions. Emotional wellness should be ensured, patient inquiries were attended to expeditiously, and patients were consistently reminded to participate in scheduled follow-up consultations.

Training and Simulation Protocol

A multi-tiered training framework was implemented under the supervision of the head nurses and responsible leaders in the department. All nursing staff received standardized instruction in integrated Chinese-Western medical procedures, interdisciplinary team coordination, and compliance with checklist-based procedures. Additionally, operational videos were recorded, and an electronic emergency knowledge database was established to facilitate repeated learning, reinforce memory, and ensure mastery by all staff. Finally, through the simulation protocol of trauma emergency care, practical operational assessments, and random interrogation, the standardization of procedures and the uniformity of operations are thoroughly evaluated and guaranteed.

Observation Measures

(1) Emergency department length of stay (ED-LOS): compare the total time spent in emergency rescue between the two groups of patients, quantified from entering the emergency room until their transfer out of there, measured in minutes. (2) Time to CT completion: compare the time interval between hospital admission and finalized CT scan, measured in minutes. (3) The rate of nursing adverse events: compare the rate of nursing adverse events between the two groups. Nursing adverse events include nursing errors, nursing deficiencies, and nursing accidents.²⁰ (4) Resuscitation success rate: rescue successes were defined as survival >24 hours after admission. Calculated as: the success rate of rescue = (successful cases/total cases) × 100%.²¹ (5) Patient satisfaction: this study assessed using a validated hospital-developed questionnaire (Cronbach's $\alpha = 0.872$). The questionnaire covered multiple dimensions, including technical skills, service attitude, and theoretical knowledge, aiming to comprehensively assess patient satisfaction with medical services, with a maximum score of 100 points. Total scores categorized as: Very Satisfied (90–100 points), Somewhat Satisfied (80–89 points), Satisfied (60–79 points), and Dissatisfied (0–59 points). (6) Clinician satisfaction: this study used a validated hospital-satisfaction questionnaire, which included evaluations of satisfaction with the nursing quality improvement checklist and suggestions for improvement. Measured via a 4-point Likert scale survey evaluating checklist utility and improvement suggestions, divided into four levels: very satisfied, somewhat satisfied, satisfied, and dissatisfied. However, when calculating satisfaction, only the very satisfied and somewhat satisfied categories are considered.

Statistical Methods

SPSS 26.0 statistical software was used for statistical analysis. Count data were expressed as n (%) and analysed using statistical methods such as the chi-square (χ^2) test. T-tests were chosen for normally distributed continuous data, and chi-square tests for count data, as these are standard for comparing group differences in clinical studies. For continuous data that followed a normal distribution, the mean ± standard deviation (SD) was used for expression, and analysis was performed using the *t*-test. A P-value <0.05 was considered statistically significant.

Results

General Information on the Two Groups of Patients

There were no statistically significant differences between the two groups of patients in terms of gender, age, injury location, injury mechanism, and other clinical data ($P > 0.05$), as shown in Table 1.

ED-LOS and CT Scan Completion Time

After implementing checklist management, the observation group significantly shorter ED-LOS from 126 minutes to 98 minutes, and the CT scan completion time was faster from 42 minutes to 30 minutes ($P < 0.01$), as shown in Table 2.

Resuscitation Success Rate

After implementing the checklist management strategy, the observation group had significantly higher resuscitation success rates than those in the control group ($P < 0.05$), as shown in Table 3.

Table 1 Clinical Characteristics of Trauma Patients in Two Groups

Clinical Characteristic		Control Group (n = 417)	Observation Group (n = 362)	Statistical Value (χ^2/t)	P-value
Gender	Male	289 (69.3%)	243 (67.1%)	0.424	0.515
	Female	128 (30.7%)	119 (32.9%)		
Age (years)		49.42 $\pm$ 17.507	47.55 $\pm$ 18.864	1.434	0.152
Injury Site (n)	Head and neck	144 (34.5%)	126 (34.8%)	4.861	0.182
	Trunk	104 (24.9%)	105 (29.0%)		
	Extremities	74 (17.7%)	45 (12.4%)		
Injury Mechanism (n)	Multiple injuries	95 (22.8%)	86 (23.8%)	1.757	0.624
	Traffic accident	275 (65.9%)	227 (62.7%)		
	Fall from height	92 (22.1%)	90 (24.9%)		
	Machinery injury	30 (7.2%)	23 (6.4%)		
	Other	20 (4.8%)	22 (6.1%)		

Note: Data are presented as n (%) or mean $\pm$ SD. χ^2 : Chi-square test; t: Student's t-test.

Table 2 Emergency Department Length of Stay and CT Completion Time in Both Groups

Group	ED Length of Stay (min)	Time to CT Completion (min)
Control Group (n = 417)	125.92 $\pm$ 54.563	42.29 $\pm$ 7.295
Observation Group (n = 362)	97.78 $\pm$ 37.244	30.05 $\pm$ 5.816
t-value	8.495	26.024
P-value	<0.01	<0.01

Note: Data presented as mean $\pm$ SD. Statistical analysis performed using independent Student's t-tests.

Table 3 Resuscitation Success Rates in Both Groups

Group	Resuscitation Success		Success Rate (%)	χ^2 -value	P-value
	Successful (n)	Failed (n)			
Control Group (n = 417)	379	38	90.89%	5.760	0.016
Observation Group (n = 362)	345	17	95.30%		

Note: Data are presented as n (%). χ^2 : Chi-square test.

Table 4 Incidence of Nursing Adverse Events in Both Groups

Group	Nursing Adverse Events		Incidence (%)	χ^2 -value	P-value
	Present (n)	Absent (n)			
Control Group (n = 417)	11	406	2.64%	5.136	0.023
Observation Group (n = 362)	2	360	0.55%		

Note: Data presented as n (%).

Table 5 Patient Satisfaction Rates in Both Groups

Group	Very Satisfied	Somewhat Satisfied	Satisfied	Dissatisfied	t-value	P-value
Control Group (n = 417)	52 (12.5%)	165 (39.6%)	197 (47.2%)	3 (0.7%)	33.348	<0.01
Observation Group (n = 362)	63 (17.4%)	197 (54.4%)	102 (28.2%)	0		

Note: Data presented as n (%). Satisfaction assessed using 4-point Likert scale: Very Satisfied (90–100 points), Somewhat Satisfied (80–89 points), Satisfied (60–79 points), and Dissatisfied (0–59 points). Data presented as n (%). Statistical analysis performed using an independent samples t-test.

Table 6 Clinician Satisfaction Rates

Group	Overall Satisfaction	Satisfaction Level				t-value	P-value
		Very Satisfied	Somewhat Satisfied	Satisfied	Dissatisfied		
Pre-intervention (n = 92)	71.7%	24 (26.1%)	42 (45.7%)	23 (25%)	3 (3.3%)	21.862	<0.01
Post-intervention (n = 92)	95.7%	43 (46.7%)	45 (48.9%)	4 (4.3%)	0 (0%)		

Notes: Data presented as n (%). Satisfaction assessed using 4-point Likert scale: Very Satisfied (90–100 points), Somewhat Satisfied (80–89 points), Satisfied (60–79 points), and Dissatisfied (0–59 points). Data presented as n (%). Statistical analysis performed using an independent samples t-test.

Incidence of Adverse Nursing Events

The introduction of checklist management resulted significantly lower incidence of nursing adverse events in the observation group compared to the control group ($P < 0.05$). Detailed data were shown in [Table 4](#).

Patient Satisfaction

After adopting checklist management, patient satisfaction scores in the observation group were significantly higher than those in the control group ($P < 0.01$), as shown in [Table 5](#).

Clinician Satisfaction

Implementation of checklist management significantly improved clinician satisfaction rates from 71.7% to 95.7% compared to pre-intervention levels ($P < 0.01$), as shown in [Table 6](#).

Discussion

Risk-Based Checklist Implementation Reduces ED-LOS and Improves Resuscitation Outcomes

Emergency severe trauma patients suffer from high morbidity and mortality rates. The precise implementation of each step in the integration of traditional Chinese and Western medicine treatment and nursing processes during emergency rescue was critically influencing rescue quality.²²

This study designed a nursing quality improvement checklist based on a risk perspective, effectively integrating TCM-Western medicine principles, standardizing complex resuscitation workflows. The protocol transformed complex

resuscitation workflows into standardized, sequential operations while enhancing interdisciplinary coordination through simulation training. This systematic approach ensured strict checklist compliance, mitigating procedural omissions and deviations to optimize resuscitation efficiency, quality assurance, and patient outcomes.²³ The study results showed that under the nursing quality improvement checklist management, the average ED-LOS was reduced by approximately 28 minutes and CT completion time by 12 minutes compared to before the intervention, while increasing the resuscitation success rate from 90.89% to 95.30% ($P < 0.01$). Analysing these reasons, the key mechanistic innovation was the integration of TCM with modern medical technologies throughout the entire emergency rescue process. For instance, firstly, diagnostic integration via the application of “four diagnostic procedures” in Chinese medicine with modern medical tests has enabled rapid enhancement of physicians’ evaluations of patients’ conditions and expediting the diagnostic procedure. Secondly, the unique advantages of Chinese herbal medicine therapeutics enhance hemostatic efficacy to control bleeding, and TCM injections are applied for nourishing Qi and blood therapy. For example, Shenfu injection (derived from Shenfu decoction, with traditional functions of restoring yang and boosting qi to stabilize desertion) promotes brain function recovery and facilitates the systemic inflammatory response in multiple trauma patients with hemorrhagic shock.²⁴ Shenmai injection can replenish qi to stabilize desertion syndrome, prevent progressive qi from escaping with blood in hemorrhagic shock, improve microcirculation, and enhance microcirculatory perfusion.²⁵ Complementary acupoint therapy—combining acupressure and acupoint herbal patching (analgesic patch) are administered for alleviating patient pain.

Concurrent emotional regulation therapy administered to patients and their families built resilience, promoted treatment adherence by enhancing the patients’ and families’ confidence in managing the disease and their inclination to cooperate, thereby creating a conducive psychological environment for the seamless progression of emergency treatment. Post-stabilization, structured handovers were implemented to ensure continuity of care, while also guiding medical nutrition and a graded functional exercise protocol.

On the other hand, contemporary epidemiological data indicate that a significant increase in the incidence of trauma, particularly among patients with severe multiple trauma, where traffic collisions and falls from height constitute predominant mechanisms.²⁶ These patients with multiple trauma frequently exhibit complex and occult presentations. For instance, diaphragmatic injuries are often masked by concomitant hemorrhage or damage to thoracic and abdominal organs, leading to misdiagnosis or missed diagnosis. Our checklist-based protocol effectively mitigated such risks through systematic assessment prompts. Furthermore, the nursing quality improvement checklist and process align with the actuality in this study. The nursing quality improvement checklist featured: (1) logical procedural sequencing, (2) explicit time-critical milestones, and (3) integrated verification workflows. This checklist eliminated redundant confirmation of completed tasks during resuscitation, reduced treatment and CT scans time, and enhanced the efficiency of care. The resultant time savings (ED-LOS: 28-min reduction, clinically meaningful for ~20% throughput improvement) facilitated subsequent treatment, earlier diagnosis, and improved clinical decision-making, while also decreasing resuscitation room occupancy and effectively improving resuscitation efficiency, though alternative explanations like Hawthorne effects possible.²⁷ >24-h survival is a valid proxy for early stability, though not a standard long-term outcome. These improvements have clinical relevance by potentially reducing healthcare costs and improving resource allocation in high-volume emergency departments.

Risk-Based Checklist Implementation Reduces Adverse Events While Enhancing Care Quality and Clinician Satisfaction

Nursing adverse events refer to unexpected outcomes occurring under routine clinician care, influencing patient prognosis, and resulting in nursing disputes, even increasing morbidity, healthcare costs, and mortality.²⁸ The emergency resuscitation room presents unique challenges for managing acute illnesses and trauma, with high demands on the medical environment, equipment, technology, and healthcare personnel. Resuscitation environments involve complex multi-provider coordination, rapid integration of traditional and Western nursing interventions, and all high-acuity decision-making. This may result in clinical oversights, and if a medical safety adverse event occurs, it may be difficult to determine responsibility.

Implementing the nursing improvement quality checklist and standardized emergency care workflows with explicit time points clarifies staff responsibilities and enables mutual accountability, though alternative explanations such as Hawthorne effects cannot be ruled out. Unit-specific safeguards targeted high-risk omissions through accountability enforcement: the project executor was required to sign their employee ID number and execution time, omitting item risk avoidance, which eliminated ambiguous responsibility distribution for critical interventions. This checklist was associated with reduced adverse events (absolute reduction 2.09%), aligning with Bidhendi et al's study.²⁹ Concurrently, based on the nursing continuous quality improvement report, the satisfaction of most clinician was improved. Through in-depth interviews, most nurses indicated that documentation efficiency improved, nurse-reported load decreased, repeated questioning decreased, and quickly identified and easily overlooked matters were addressed, thereby enhancing nursing efficiency. Especially during multi-casualty emergency treatment, the checklist enabled efficient resource allocation, seamless workflow coordination, and orderly operations, thereby guaranteeing that patients receive treatment efficiently.

Furthermore, the department's audit teams regularly conducted spot-checks on the quality improvement checklist. The findings were analyzed and discussed to continuously optimize the protocol details. Meanwhile, competency evaluations ensured staff proficiency, driving the clinical practicality and high adaptability of the checklist. These systematic interventions increased nursing quality indicators.

Risk-Based Checklist Implementation Significantly Enhances Patient Satisfaction

The quality of emergency care not only reflects multidisciplinary technical capabilities but also demonstrates its management efficiency, directly affecting patients' comprehensive evaluations and satisfaction with institutional assessments.³⁰ In this study, patient satisfaction significantly increased compared to pre-intervention levels, with "very satisfied" and "satisfied" responses increasing by 19.8%. This improvement stems from the following key innovations. The emergency checklist integrated patient-centered care. During emergency care, healthcare workers should comply with emotional regulation therapy for patients and their families. For trauma patients with poor emotions, TCM emotional care and standardized explanations of procedures improved patient cooperation, which effectively improved the doctor-patient relationship. These also helped to deeply meet patients' needs, thereby promoting patient satisfaction and hospital service quality.³¹

The checklist transcended the inherent constraints of conventional disease-centered models, which neglected the TCM's mind-body integration principle for emotional homeostasis and established preventable barriers to optimal clinical outcomes and satisfaction metrics. In contrast, risk-based checklist implementation incorporated patient-centered care by systematically addressing every aspect of the therapeutic process while prioritizing psychosocial and social needs, causing a paradigm shift from disease-focused management to a holistic therapeutic.

Conclusion

In summary, implementing a risk-based nursing quality improvement checklist for emergency trauma care was associated with significant reductions in ED-LOS and CT scan time while lowering the incidence of adverse events. This protocol enhanced nursing quality metrics, increased resuscitation success rates, and strengthened the doctor-patient relationship. This checklist framework establishes a replicable pathway for modern emergency systems, though limited by single-center design and lack of randomization. Potential confounders, such as staff experience variations, were not controlled; future randomized trials could address this. Limitations include the lack of a priori power analysis and single-center design, which may limit generalizability to resource-limited settings. While replicable in similar settings, adaptation may be needed for resource-limited countries due to equipment constraints. Pre-post design limits causal inference due to potential time-related confounders like seasonal patterns.

Data Sharing Statement

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Changsha Traditional Chinese Medicine Hospital (Ethics No. 2023072002). Informed consent was obtained from all the participants. All methods were carried out in accordance with Declaration of Helsinki. Patient confidentiality was maintained by anonymizing data and restricting access to authorized researchers.

Consent for Publication

All patients signed the informed consent form.

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, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declared that they have no conflicts of interest regarding this work.

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