Test file: A Study on the Nursing Effectiveness for Emergency Surgical Trauma Patients

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Abstract

Background: Nursing care is a critical determinant of outcomes in emergency surgical trauma patients. These patients present with complex, time-sensitive needs requiring rapid assessment, coordinated intervention, and comprehensive physiological and psychological support. However, the specific components and overall effectiveness of structured nursing protocols in this high-acuity setting require ongoing evaluation. Objective: This study aimed to evaluate the impact of a structured, comprehensive nursing intervention protocol on clinical outcomes, complication rates, and patient/family satisfaction among emergency surgical trauma patients. Methods: A prospective, quasi-experimental study was conducted at a Level I trauma center over 18 months. A total of 312 patients requiring emergency surgery for traumatic injuries were allocated into two groups: an Intervention Group (n=156) receiving care under a new, multifaceted nursing protocol (Trauma Nursing Effectiveness Protocol - TNEP), and a Control Group (n=156) receiving standard emergency surgical nursing care. The TNEP emphasized: 1) Triage and primary survey efficiency using a dedicated trauma nurse role, 2) A structured pre-operative preparation checklist, 3) Standardized intraoperative handover and warming protocols, and 4) A post-operative bundle focusing on early mobilization, pain management, delirium screening, and family engagement. Primary outcomes were time from Emergency Department (ED) arrival to operation, incidence of post-operative complications (surgical site infection, pneumonia, deep vein thrombosis), and unplanned ICU readmission within 72 hours. Secondary outcomes included patient-reported pain scores, hospital length of stay (LOS), and satisfaction scores from patients and families. Results: The Intervention Group showed significant improvements across multiple metrics. The median time from ED arrival to surgery was reduced by 28 minutes ($p<0.01$). The composite rate of major post-operative complications was 18.6% in the Intervention Group vs. 31.4% in the Control Group ($p<0.01$), with significant reductions in pneumonia (5.8% vs. 12.8%, $p=0.03$) and surgical site infection (4.5% vs. 9.6%, $p=0.05$). Unplanned ICU readmission within 72 hours was lower (3.2% vs. 7.7%, $p=0.06$). Patients in the Intervention Group reported better pain control at 24 hours post-operation ($p<0.05$), had a shorter median hospital LOS (9 vs. 11 days, $p<0.05$), and provided significantly higher satisfaction scores regarding communication and overall care experience ($p<0.001$). Conclusion: The implementation of a structured, comprehensive nursing intervention protocol significantly improves the efficiency of care, reduces post-operative complications, and enhances patient satisfaction in emergency surgical trauma patients. This study underscores the vital role of organized, evidence-based nursing practices as a key driver of quality and safety in trauma care.

Keywords: Emergency Trauma Nursing; Surgical Trauma; Nursing Protocols; Patient Outcomes; Post-operative Complications; Quality Improvement; Trauma Center.

1. Introduction

Emergency surgical trauma care is a high-stakes, multidisciplinary endeavor where minutes and meticulous attention to detail can determine patient survival and functional recovery [1]. While the surgeon's role is often emphasized, the nursing team serves as the constant, coordinating linchpin from the moment of patient arrival through resuscitation, surgery, and into the recovery phase [2]. Emergency and perioperative nurses are responsible for executing rapid primary and secondary surveys, administering critical interventions, preparing for surgery, monitoring during the procedure, and managing the complex post-operative course [3].

The chaotic nature of trauma resuscitation and the subsequent rush to the operating room can lead to variability in care processes, potentially resulting in delays, missed steps in pre-operative preparation, and suboptimal handovers [4]. Such systemic inefficiencies increase the risk of adverse events, including hypothermia, missed injuries, and inadequate pain or anxiety management [5]. Furthermore, post-operative care for trauma patients is challenging due to the risk of complications such as infections, venous thromboembolism, and delirium, which are influenced by nursing surveillance and preventive practices [6].

Despite its centrality, the specific impact of structured, protocol-driven nursing care on hard clinical outcomes for emergency surgical trauma patients has not been fully quantified. While evidence supports individual nursing interventions—such as warming to prevent hypothermia or early mobilization to prevent pneumonia—their integration into a cohesive protocol from the emergency department to the post-operative ward requires validation [7, 8]. This study hypothesizes that a standardized, comprehensive Trauma Nursing Effectiveness Protocol (TNEP), encompassing the entire peri-trauma surgical journey, will improve care efficiency, reduce complication rates, and enhance the patient and family experience compared to conventional nursing care.

2. Methods

2.1 Study Design and Setting

A prospective, quasi-experimental study with a historical control group was conducted at a 40-bed Emergency Department and associated operating suites of an urban Level I trauma center. Ethical approval was obtained from the institutional review board. The study period included a 9-month pre-implementation (Control) phase and a 9-month post-implementation (Intervention) phase.

2.2 Participants

Consecutive adult patients (≥18 years) who presented with traumatic injuries requiring emergency surgical intervention (defined as surgery within 6 hours of ED arrival) were enrolled. Exclusion criteria included: patients dead on arrival, those with isolated minor injuries requiring only bedside procedures, and those transferred from other hospitals after initial stabilization. A total of 312 patients were included (156 in each group).

2.3 Intervention: Trauma Nursing Effectiveness Protocol (TNEP)

The TNEP was developed by a multidisciplinary team and implemented after intensive nurse training. Its key components were:

1. ED Phase - Dedicated Trauma Nurse Role: A senior trauma nurse assigned to lead the primary survey, coordinate diagnostics, and complete a standardized pre-operative checklist (allergies, consent, antibiotics, tetanus status, IV access, lab draws, family contact).
2. Pre-Operative Phase - Warming Protocol: Active warming with forced-air warmers initiated in the ED and continued during transfer and in the operating room holding area.
3. Intraoperative Phase - Structured Handover: A mandatory, face-to-face handover using the ISBAR (Identify, Situation, Background, Assessment, Recommendation) format between the ED/trauma nurse and the operating room circulating nurse.
4. Post-Operative Phase - Recovery Bundle: Implemented in the Post-Anesthesia Care Unit (PACU) and surgical ward:

Early Mobilization: Out-of-bed protocol initiated within 12 hours if physiologically stable.

Pain & Delirium Management: Scheduled pain assessment using the Numeric Rating Scale (NRS) and twice-daily screening for delirium using the Confusion Assessment Method (CAM).

Family Engagement: Structured family updates provided by the primary nurse within 1 hour of PACU arrival and daily thereafter.

Complication Prevention: Enforced venous thromboembolism prophylaxis, incentive spirometry, and wound care protocols.

2.4 Control Group Care

Patients in the Control group received standard emergency and perioperative nursing care as per existing hospital policies, which lacked the formalized structure, dedicated roles, and bundled post-operative interventions of the TNEP.

2.5 Outcome Measures

Data were collected prospectively by research nurses blinded to the study hypothesis for outcome assessment.

Primary Outcomes: 1) Time from ED arrival to surgical incision; 2) Incidence of composite major post-operative complications (surgical site infection, pneumonia, deep vein thrombosis/pulmonary embolism) within 30 days; 3) Rate of unplanned ICU readmission within 72 hours of initial post-operative transfer.

Secondary Outcomes: 1) Patient-reported pain scores (NRS) at 24 and 48 hours post-operation; 2) Hospital length of stay (LOS); 3) Patient and family satisfaction scores measured via a validated 10-item survey at discharge.

2.6 Statistical Analysis

Data were analyzed using SPSS 25.0. Continuous variables were compared using independent t-tests or Mann-Whitney U tests. Categorical variables were compared using Chi-square or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

3. Results

The two groups were comparable in terms of baseline demographics, injury mechanism (predominantly motor vehicle collisions and falls), Injury Severity Score (ISS), and types of surgical procedures (primarily orthopedic and abdominal).

3.1 Primary Outcomes

The median time from ED arrival to surgical incision was 98 minutes (IQR 75-130) in the Intervention Group compared to 126 minutes (IQR 95-165) in the Control Group ($p<0.01$). The composite major complication rate was significantly lower in the Intervention Group (29/156, 18.6%) versus the Control Group (49/156, 31.4%) ($p<0.01$). Specifically, pneumonia (5.8% vs. 12.8%, $p=0.03$) and surgical site infection (4.5% vs. 9.6%, $p=0.05$) were reduced. The rate of unplanned ICU readmission was lower in the Intervention Group (5/156, 3.2% vs. 12/156, 7.7%), though this difference approached but did not reach statistical significance ($p=0.06$).

3.2 Secondary Outcomes

Patients in the Intervention Group reported lower median pain scores at 24 hours post-operation (4 vs. 5 on NRS, $p<0.05$). The median hospital LOS was shorter for the Intervention Group (9 days, IQR 6-14) compared to the Control Group (11 days, IQR 7-17) ($p<0.05$). Both patient and family satisfaction scores were significantly higher in the Intervention Group across all survey domains, particularly regarding "clear communication from nurses" and "feeling involved in care" ($p<0.001$).

4. Discussion

This study demonstrates that a structured, comprehensive nursing protocol (TNEP) significantly enhances the quality and effectiveness of care for emergency surgical trauma patients. The observed reduction in time to surgery by nearly 30 minutes is clinically substantial in the context of traumatic hemorrhage and likely reflects improved coordination and efficiency gained from the dedicated trauma nurse role and standardized checklist [9]. This finding aligns with principles of high-reliability organizations and trauma team training [10].

The significant reduction in post-operative complications, particularly pneumonia and surgical site infections, is a major finding with important implications for patient morbidity and healthcare costs. This improvement can be attributed to the bundled post-operative interventions. Early mobilization and enforced incentive spirometry directly target pulmonary hygiene, reducing atelectasis and pneumonia risk [11]. Structured wound care protocols and timely antibiotic administration (ensured by the pre-op checklist) mitigate infection risk [12]. The proactive delirium screening may have led to earlier intervention, potentially avoiding complications that prolong hospitalization [13]. The trend towards reduced ICU readmissions suggests better stabilization and monitoring in the initial post-operative phase.

The improvements in patient-reported outcomes—better pain control and higher satisfaction—are equally critical. They highlight that systematic nursing care not only addresses physiological needs but also profoundly impacts the patient's subjective experience. Effective communication, family engagement, and attentive pain management are core components of patient-centered care and are strongly linked to better adherence and recovery [14].

The success of the TNEP underscores that nursing effectiveness in trauma is not merely a function of individual skill but of optimized systems and standardized processes. By creating clear roles, checklists, and bundled care pathways, the protocol reduces variability, minimizes cognitive load, and ensures critical evidence-based practices are consistently delivered [15].

5. Limitations

This study was conducted at a single center, which may limit generalizability. The use of a historical control design carries the risk of temporal confounding, though no major systemic changes in surgical or anesthesia techniques occurred during the study period. The nurses were not blinded to the intervention, which could introduce performance bias, though objective outcome measures were used to mitigate this.

6. Conclusion

The implementation of a comprehensive Trauma Nursing Effectiveness Protocol led to faster surgical access, fewer post-operative complications, shorter hospital stays, and higher patient satisfaction among emergency surgical trauma patients. These results provide robust evidence for the pivotal role of organized, protocol-driven nursing care in improving outcomes in this vulnerable population. Trauma systems and hospitals should invest in developing, implementing, and sustaining such integrated nursing protocols as a fundamental strategy to enhance the quality, safety, and patient-centeredness of emergency surgical trauma care.

7. References

1. Trauma Nursing: From Resuscitation Through Rehabilitation. McQuillan KA, Von Rueden KT, Hartsock RL, Flynn MB, Whalen E. Elsevier Health Sciences. 2019.
2. The Role of Nursing in the Management of Trauma Patients. Cipriano A, Gunning A, Hammad S, Taggart M. Journal of Trauma Nursing. 2018.
3. Advanced Trauma Care for Nurses (ATCN): A systematic review of the literature. Fitzgerald M, Reilly S, Smit DV, et al. Nurse Education Today. 2015.
4. Communication failures in the operating room: an observational classification of recurrent types and effects. Lingard L, Espin S, Whyte S, et al. Quality and Safety in Health Care. 2004.
5. Preventing hypothermia in trauma patients: A systematic review. Watts DD, Roche M, Tricarico R, et al. Journal of Trauma Nursing. 2007.
6. Postoperative complications: risk assessment and prevention. Khuri SF, Henderson WG, DePalma RG, et al. Annals of Surgery. 2005.
7. Effectiveness of a nurse-led early mobilization protocol on a trauma surgery ward. Dubb R, Nydahl P, Hermes C, et al. Critical Care Nurse. 2017.
8. A bundled intervention to improve surgical site infection prevention practices. Anthony T, Murray BW, Sum-Ping JT, et al. JAMA Surgery. 2014.
9. Impact of a dedicated trauma service on the quality and cost of trauma care. Dutton RP, Levitt MA, Sokolowski P, et al. Journal of Trauma. 1999.
10. High-Reliability Emergency Response Teams in the Hospital: Improving Quality and Safety Using In Situ Simulation Training. Patterson MD, Geis GL, Falcone RA, LeMaster T, Wears RL.

BMJ Quality & Safety. 2013.
11. Early mobilization reduces duration of mechanical ventilation and intensive care unit stay in patients with acute respiratory failure. Schweickert WD, Pohlman MC, Pohlman AS, et al. The Lancet. 2009.
12. Guidelines for the prevention of surgical site infection. Berríos-Torres SI, Umscheid CA, Bratzler DW, et al. JAMA Surgery. 2017.
13. Delirium in mechanically ventilated patients: validity and reliability of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). Ely EW, Inouye SK, Bernard GR, et al. JAMA. 2001.
14. Patient-centered care and outcomes: a systematic review of the literature. Rathert C, Wyrwich MD, Boren SA. Health Services Research. 2013.
15. The checklist manifesto: how to get things right. Gawande A. Metropolitan Books. 2009.