Review Article

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# Nursing Challenges in Massive Transfusion Protocol: Team Coordination, Communication, and Documentation: A Narrative Review

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## Abstract

**Background and Aim:** Uncontrolled hemorrhage is a leading cause of preventable death in trauma. The Massive Transfusion Protocol provides a standardized strategy for damage control resuscitation. While Massive Transfusion Protocol medical protocols are well-established, the specific nursing challenges in coordinating these complex processes remain underexplored in the literature. Successful implementation requires complex interprofessional coordination, with nurses playing a pivotal role as the largest professional group involved in activation and execution. This narrative review identifies nursing challenges in team coordination, communication, and documentation during Massive Transfusion Protocol implementation and presents evidence-based solutions.

**Methods:** A structured literature search was conducted across PubMed, Scopus, Web of Science, CINAHL, SID, and Magiran for articles published between 2015 and 2026. Inclusion criteria comprised studies focusing on Massive Transfusion Protocol implementation in trauma centers that examined the nursing role, published in English or Persian.

**Results:** Identified challenges fell into three domains: team coordination (inappropriate activation, delays in blood product access, role ambiguity); communication (deficiencies in closed-loop communication, unclear hierarchy, interdepartmental challenges); and documentation (incomplete records, discrepancies between clinical and blood bank documentation).

**Conclusion:** Massive Transfusion Protocol success depends heavily on human factors, communication structures, and nursing documentation processes. Evidence-based solutions include preemptive activation systems, closed-loop communication, simulation-based training, and integrated documentation systems. Trauma nurses require empowerment in team leadership and interprofessional communication management.

**Key words:** Documentation, Interprofessional relations, Massive transfusion protocol, Patient care team, Trauma nursing

## Introduction

Uncontrolled hemorrhage following trauma is one of the leading causes of death among injured patients, particularly in the initial hours after injury (1). The management of these patients requires a rapid, coordinated, and evidence-based approach defined within the framework of damage control resuscitation (2).

The massive transfusion protocol (MTP), increasingly referred to as major hemorrhage protocols in contemporary literature, serves as the cornerstone of damage control resuscitation by providing a standardized algorithm for the rapid, coordinated replacement of blood products (3). A comprehensive review by Marinho et al. (2025) demonstrates that these protocols encompass specific activation criteria, predetermined blood product ratios, and clear delineation of team roles and responsibilities (4). By specifying predetermined ratios—typically a balanced 1:1:1 ratio of plasma, platelets, and red blood cells—these protocols facilitate clinical decision-making and

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improve patient outcomes (5,6).

However, successful MTP implementation extends far beyond the mere existence of written guidelines. This complex, multi-departmental process requires precise coordination among the emergency team, nurses, blood bank, pharmacy, surgical team, and other stakeholders (7). Among these, nurses constitute the largest professional group involved in the MTP process; a landmark study published in the Journal of Trauma Nursing identified nurses as comprising 46% of responding team members during MTP activations, underscoring their central role in coordinating communications, monitoring protocol execution, and documenting care (8).

The REPLACE model outlines seven key components of massive transfusion management: replacement of intravascular volume, cessation of exsanguination, permissive hypotension, low-temperature management, acidosis management, coagulopathy management, and electrolyte management (9). This model, while originally developed as an educational framework and not a validated clinical prediction tool, provides a structured conceptual approach for nursing assessment and intervention during massive transfusion. Its components align with current damage control resuscitation principles and have been incorporated into clinical guidelines for patient blood management in critical bleeding (9). This framework explicitly positions the nurse at the center of each stage, highlighting responsibilities that extend from blood product administration to continuous monitoring of vital signs, temperature, acid-base status, and electrolytes.

Despite the critical importance of nursing coordination in MTP, substantial evidence indicates persistent process failures. A 2025 quality improvement analysis reported that 62.5% of MTP activations experienced communication challenges, and 50% encountered problems with inaccurate paging of team members (8). These findings underscore that attention to the human and process-related aspects of MTP is as crucial as attention to transfusion ratios.

A 2021 systematic review examining preventable trauma deaths reinforced that hemorrhage remains a dominant contributor to potentially survivable injuries, renewing urgency for optimizing all aspects of massive transfusion delivery—including the nursing processes that support it (10). Novel research has also explored the potential of rotational thromboelastometry-guided protocols and lyophilized plasma in prehospital settings, indicating an evolving landscape that will place additional demands on nursing coordination and education (11,12).

This review addresses a critical gap in the literature. Despite the critical importance of nursing coordination in MTP, the literature lacks a comprehensive synthesis of the specific challenges nurses face in team coordination, communication, and documentation during this time-sensitive, high-stakes process. Existing studies have examined MTP from medical and laboratory perspectives; however, the human factors and nursing-specific process challenges remain underexplored. This narrative review addresses this gap by systematically identifying and analyzing the nursing challenges across three key domains—team coordination, communication, and documentation—and presenting evidence-based, practical solutions to optimize trauma nursing practice during massive transfusions.

## Materials and Methods

### Study Design

This study was designed as a structured narrative review, which employs systematic search principles to enhance rigor and reproducibility while utilizing narrative synthesis to integrate heterogeneous evidence types. This approach is appropriate when the research question spans multiple domains—coordination, communication, and documentation—and the included evidence encompasses qualitative studies, quality improvement reports, and clinical reviews that cannot be meaningfully pooled using meta-analytic techniques (13).

### Search Strategy

The following databases were searched: PubMed, Scopus, Web of Science, CINAHL, Scientific Information Database, and Magiran. The search strategy employed combinations of the following keywords: "Massive Transfusion Protocol," "Major Hemorrhage Protocol," "Trauma Nursing," "Communication Barriers," "Team Coordination," "Nursing Documentation," "Patient Safety," "Quality Improvement," and "Damage Control Resuscitation." Boolean operators (AND, OR) were used to refine the search. The complete PubMed search strategy was: ("Massive Transfusion Protocol"[Title/Abstract] OR "Major Hemorrhage Protocol"[Title/Abstract]) AND ("Trauma



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Nursing"[Title/Abstract] OR "nurs*"[Title/Abstract]) AND ("Communication"[Title/Abstract] OR "Team Coordination"[Title/Abstract] OR "Documentation"[Title/Abstract]). This strategy was adapted for each database's controlled vocabulary and syntax.

**Study Selection and Inclusion Criteria**

The search timeframe was set from January 2015 to April 2026. Reference lists of relevant articles were also hand-searched to identify additional sources. Studies were eligible for inclusion if they met the following criteria: original research articles, review articles, systematic reviews, scoping reviews, and quality improvement reports that focused on the implementation of MTP or Major Hemorrhage Protocols in trauma centers, emergency departments, or prehospital settings. Eligible studies examined the nursing role, nursing challenges, or nursing interventions within the MTP process, or addressed aspects of interprofessional communication, team dynamics, or documentation during massive transfusion. Only articles published in English or Persian were considered.

**Exclusion Criteria**

Studies were excluded if they were animal studies or in vitro research, focused exclusively on biochemical, hematological, or laboratory aspects of MTP without attention to clinical process dimensions, or consisted of conference abstracts, editorials, commentaries, and letters to the editor lacking original data. Articles for which full texts were not available were also excluded.

**Data Extraction and Synthesis**

Two independent reviewers screened the titles and abstracts against the eligibility criteria. Disagreements were resolved through consensus discussion, with a third reviewer available if consensus could not be reached. A total of 142 articles were initially identified through database searching. After removing duplicates (n = 31), 111 unique records were screened by title and abstract. Of these, 68 full-text articles were assessed for eligibility. Finally, 38 studies met the inclusion criteria and were included in this narrative synthesis. Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

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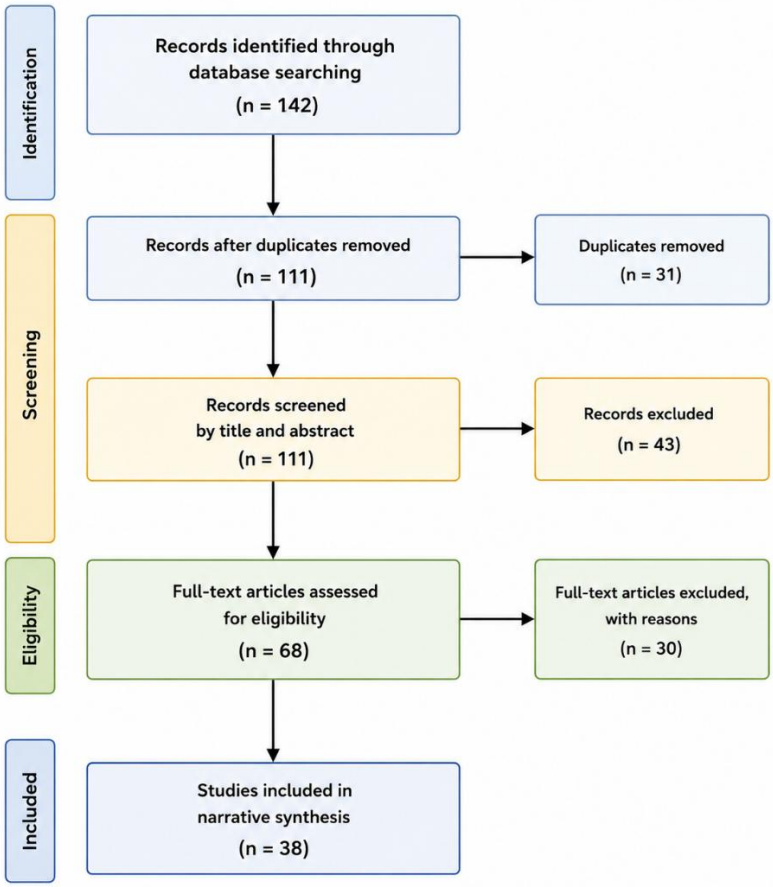


**Figure 1.** PRISMA Flow Diagram

Consistent with established narrative review methodology, formal quality appraisal using standardized tools was not performed. This decision reflects the heterogeneity of included evidence—spanning qualitative studies, quality improvement reports, and clinical reviews—for which a single appraisal instrument would be inappropriate. Instead, studies were critically evaluated during synthesis based on their conceptual contribution, methodological transparency, and relevance to the review aims. Data were extracted and analyzed qualitatively, with findings classified into three predefined thematic axes: team coordination challenges, communication barriers, and documentation problems.

## Results

The 38 included studies comprised qualitative research (n = 12), cross-sectional surveys (n = 10), quality improvement reports (n = 8), systematic or scoping reviews (n = 5), and mixed-methods designs (n = 3). The publication dates ranged from 2015 to 2026, with a concentration in the post-2020 period. Studies were conducted predominantly in North America (n = 22) and Europe (n = 10), with fewer from Asia (n = 4) and the Middle East (n = 2). The synthesis of findings identified challenges across three predefined domains: team coordination, communication, and documentation. Table 1 presents a structured overview of these key findings, along with their corresponding evidence-based solutions.

**Table 1.** Summary of Key Findings: Nursing Challenges and Evidence-Based Solutions in MTP

| Domain | Key Challenges | Evidence-Based Solutions |
|---|---|---|
| **Team Coordination** | • Missed MTP activation (up to 72%)<br>• Delays in blood product access (median 40 min)<br>• Role ambiguity<br>• Rural/resource-limited challenges | • Pre-emptive activation systems (blood cooler model)<br>• Objective activation criteria<br>• Structured role delineation |



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| | | |
|---|---|---|
| | | • Pre-briefing<br>• Context-specific rural strategies |
| Communication | • Inaccurate paging (50%)<br>• Interdepartmental gaps (62.5%)<br>• Lack of closed-loop communication<br>• Hierarchical barriers | • Closed-loop communication as standard<br>• Automated group alert systems<br>• SBAR framework<br>• Psychological safety cultivation<br>• Structured post-event debriefing |
| Documentation | • Incomplete documentation (11% missing units, 17% missing verification)<br>• Clinical–blood bank record mismatch<br>• Time pressure and cognitive load | • Dedicated documentation nurse role<br>• MTP-specific documentation tools<br>• Integrated electronic information systems<br>• Real-time audit and feedback |

**The Importance of Massive Transfusion Protocol (MTP) and the Nurse's Role**

The MTP, as a standardized algorithm, comprises a set of predetermined guidelines for the requisition, preparation, and rapid administration of blood products in patients with severe traumatic hemorrhage (4). The nursing responsibilities mapped within the REPLACE model, as described in the Introduction, provide a structured framework for understanding these critical functions (9). The importance of the nursing role in MTP implementation is substantiated by compelling evidence. A comparative study by May et al. (2020) suggested that when specialized trauma nurse clinicians managed intraoperative MTP, there were improved ratios of administered blood products toward the standard 1:1:1 ratio and reduced median crystalloid volume from 3000 mL to 1500 mL (15). These findings provide evidence supporting the proposition that specialized, well-trained nurses, through stricter adherence to protocol, may help prevent excessive crystalloid administration—a factor associated with dilutional coagulopathy, worsening acidosis, and increased mortality (15). Research conducted in military and austere settings has further reinforced the value of nursing-driven protocols [16].

**Team Coordination Challenges**

Effective coordination among team members is a fundamental prerequisite for successful MTP implementation. However, the reviewed evidence reveals persistent gaps in this area. Studies documented that when standardized activation criteria were not applied, 72% of eligible patients did not receive MTP activation (17). Standardized, evidence-based activation triggers were associated with reduced rates of both under-activation and over-activation (10). A 2025 multicenter evaluation found considerable practice variability in MTP activation across centers (18). Research also documented that the median time from patient arrival to initiation of blood transfusion was approximately 40 minutes in non-optimized systems, during which patients received large volumes of crystalloid (median 3 liters). Following implementation of a preemptive product preparation system, the time to first transfusion decreased to 9 minutes (18).

Korsch and Knapp (2026) specifically examined MTP implementation in a rural Level III trauma center (8). The study identified critical barriers unique to these settings: staff shortages, delays in blood product delivery from off-site blood banks, product wastage due to infrequent MTP activation, and equipment challenges. Role ambiguity during MTP activation was identified as a persistent challenge across multiple studies. Research on team dynamics in trauma resuscitation has demonstrated that explicit role assignment, communicated during a pre-briefing, improves team performance (20, 22).

**Communication Barriers**

Communication is widely recognized as the "glue that holds the team together" in critical situations, and its role in MTP execution cannot be overstated. Research evidence indicates that communication breakdowns are among the most common causes of MTP process failure. In the Korsch and Knapp study (2026), 50% of participants reported inaccurate paging, and 62.5% of MTP activations were accompanied by communication challenges (8). These challenges included a pervasive lack of closed-loop communication, unclear hierarchy between the team leader and members, and conflicting priorities leading to delays or non-response. A root cause analysis of latent errors in MTP implementation identified incomplete



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communication between the clinical team and the blood bank as a particularly common source of error (23). In many trauma centers, no standardized communication protocol exists for coordination among the emergency department, blood bank, pharmacy, and laboratory during MTP activation, resulting in ad hoc and unreliable communication (24). Research on psychological safety in healthcare teams has demonstrated that environments in which all members feel safe to speak up are associated with significantly fewer errors (26).

**Documentation Challenges**

Accurate and timely documentation during MTP is essential for clinical care, medicolegal protection, quality assurance, and regulatory compliance. However, the chaotic, high-pressure environment of trauma resuscitation creates unique documentation challenges. Korsch and Knapp (2026) quantified documentation deficits: despite overall improvement following a quality improvement intervention, 11% of cases still lacked documentation of administered blood product units, and 17% lacked verification of transfusion orders (8). Incomplete documentation compromises the ability to accurately determine the total volume and ratio of products administered—information essential for guiding ongoing resuscitation. A common and particularly problematic documentation failure is the systematic mismatch between nursing documentation in the clinical record and blood bank inventory records (23). Several trauma centers have addressed documentation challenges by assigning a dedicated nurse documenter whose sole responsibility during MTP activation is real-time documentation. Observational studies have reported substantial improvements in documentation completeness and accuracy using this approach (24).

**Evidence-Based Solutions**

Building on the challenges identified across the three domains, Table 2 synthesizes the evidence-based solutions extracted from the reviewed literature. The table organizes each solution by domain and specifies its key components, offering a practical reference for clinicians and administrators seeking to optimize the MTP.

The evidence reviewed suggests that several low-technology, process-oriented interventions may improve MTP performance. Preemptive activation systems, objective activation criteria, and structured role delineation have been associated with reduced delays and improved protocol adherence (4,17,18). Closed-loop communication, automated alert systems, and SBAR frameworks have been recommended to address communication failures (25,26). Dedicated documentation personnel, MTP-specific tools, and integrated information systems may improve documentation quality (8, 24).

**Table 2.** Evidence-Based Solutions for Optimizing MTP Nursing Practice.

| Domain | Solution | Key Components |
|---|---|---|
| **Team Coordination** | Pre-emptive activation systems | Automatic product preparation upon trauma team activation |
| | Objective activation criteria | ≥4 RBC units/1hr; shock index >0.9; ABC score ≥2 |
| | Structured role delineation | Pre-briefing with assigned roles: team leader, medication nurse, product nurse, documentation nurse, communicator |
| | Context-specific rural strategies | Emergency-release blood on-site; cross-training staff; transfer agreements |
| **Communication** | Closed-loop communication | Sender confirms receiver understanding; standardized acknowledgments |
| | Automated alert systems | Secure messaging; group notifications; backup notification pathways |
| | SBAR framework | Situation, background, assessment, recommendation adapted for MTP |
| | Psychological safety | Explicit invitation to speak up; assertiveness training; blame-free debriefings |
| **Documentation** | Dedicated documentation nurse | Real-time recording of products, vitals, medications, critical events |
| | MTP-specific tools | Structured forms with essential fields; electronic templates |
| | System integration | Electronic interface between ED and blood bank records |
| | Real-time audit and feedback | Regular completeness audits; transparent feedback to individuals and teams |



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## Discussion

This narrative review aimed to identify and analyze the nursing challenges in team coordination, communication, and documentation during MTP implementation, and to synthesize evidence-based solutions. The findings reveal a substantial gap between the theoretical knowledge base supporting MTP, as focused on optimizing blood product ratios, laboratory-guided transfusion algorithms, and pharmacological adjuncts to resuscitation, and comparatively less attention has been devoted to the human factors and process elements that ultimately determine whether these evidence-based interventions reach the patient effectively and safely. This review synthesizes evidence demonstrating that team coordination, interprofessional communication, and nursing documentation are not peripheral concerns but rather central determinants of MTP success or failure. One of the most striking findings from recent literature is the persistently high rate of missed MTP activations. The study by Broxton et al., in which 72% of eligible patients were not managed under MTP, was published in 2018—yet the 2021 review of preventable trauma deaths continues to identify hemorrhage as a leading cause of potentially survivable mortality, suggesting that under-activation remains a clinically significant problem (10,17). Marinho et al. (2025) advocate for the integration of validated, objective activation criteria into clinical workflows, possibly supported by electronic clinical decision support tools, to reduce reliance on subjective clinician judgment alone (4). The communication challenges documented in this review are consistent with broader patient safety literature. Incomplete communication has been identified as a root cause in approximately 70% of sentinel events reported to The Joint Commission, and the high-acuity, time-pressured environment of MTP activation amplifies this risk considerably (27). The finding that 62.5% of MTP activations experienced communication challenges (8) provides evidence that current communication practices are inadequate and that evidence-based interventions—closed-loop communication, structured handoff frameworks, and automated alert systems—remain underutilized. It is noteworthy that these interventions are neither technically complex nor prohibitively expensive; their implementation requires primarily organizational commitment, training, and culture change.

The documentation deficits reported across studies have implications beyond quality assurance. Incomplete or inaccurate documentation of blood product administration creates medicolegal vulnerability, impedes accurate assessment of patient response to resuscitation, and undermines the ability to conduct meaningful quality improvement reviews. The systematic mismatch between clinical and blood bank records is a particularly concerning finding, as it may indicate fundamental process failures that warrant urgent attention (23).

Importantly, the challenges and solutions identified in this review are not uniform across all trauma center settings. Korsch and Knapp (2026) specifically examined the rural Level III trauma center context and documented challenges—staff shortages, off-site blood bank dependence, infrequent MTP activations leading to skill decay—that are qualitatively different from those in high-volume academic centers (8). This finding underscores the critical need for context-specific, scalable solutions. An MTP implementation model designed for a Level I center with 24/7 in-house blood bank support, dedicated trauma teams, and high activation volumes cannot be simply transposed to a rural center with limited staffing and infrequent trauma activations.

The study by May et al. provides evidence that trauma nurse clinicians achieved outcomes comparable to physician-led models, challenging traditional assumptions about which professional groups are best positioned to lead protocol-driven resuscitation (14). This finding suggests that specialized nursing roles, with appropriate training and organizational support, may achieve outcomes at least equivalent to physician-led models. The concomitant reduction in crystalloid administration—from a median of 3000 mL to 1500 mL—is clinically meaningful, as excessive crystalloid is independently associated with dilutional coagulopathy, worsening acidosis, and increased mortality (15). The emergence of prehospital blood product administration, including lyophilized plasma and cold-stored whole blood, as discussed in the military and civilian literature, will place new demands on nursing coordination (12,16,19). As the boundary between prehospital and in-hospital resuscitation becomes increasingly blurred, the need for seamless communication and documentation across care phases becomes even more critical. Nurses at every point along this continuum require not only clinical competence in transfusion practice but also proficiency in team



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coordination and communication.

This narrative review has several limitations that should be considered when interpreting its findings. First, as a narrative rather than a systematic review, formal quality appraisal of included studies was not performed using standardized tools, and the potential for selection bias in article inclusion and interpretation exists. Second, the majority of published MTP research originates from high-income countries, particularly North American and European trauma centers; the generalizability of these findings to low- and middle-income country settings, where both trauma burden and resource constraints are often greater, is uncertain. Third, this review focused specifically on three domains—coordination, communication, and documentation—and did not address other important aspects of MTP nursing practice, including specific transfusion competencies, management of transfusion reactions, or the role of viscoelastic testing in guiding resuscitation. Fourth, the exclusion of non-English and non-Persian language articles may have omitted relevant research published in other languages, particularly from Asian and South American trauma systems. Fifth, the rapidly evolving nature of this field means that new evidence may have emerged even since the 2026 cutoff date for this review.

The findings of this review have several implications. For clinical practice, trauma centers should critically evaluate their current MTP processes against the challenges identified here, with particular attention to activation criteria, communication structures, and documentation systems. Quality improvement initiatives targeting these domains should be prioritized and rigorously evaluated.

For nursing education, curricula at both undergraduate and postgraduate levels should incorporate explicit training in team coordination, closed-loop communication, and MTP-specific documentation. Simulation-based training, which allows teams to practice MTP scenarios in a safe environment, has demonstrated effectiveness in improving team performance and should be integrated into ongoing professional development (21).

For research, several priorities emerge: prospective studies evaluating the effectiveness of specific communication interventions (e.g., SBAR implementation, automated alert systems) on MTP outcomes; studies examining MTP implementation in resource-limited and rural settings, where evidence is particularly sparse; and investigation of the relationship between nursing documentation quality and patient outcomes following massive transfusion. Additionally, as healthcare systems increasingly adopt electronic health records, research examining the impact of electronic MTP documentation tools on completeness, accuracy, and clinical workflow would be valuable.

## Conclusion

The MTP is an indisputably life-saving intervention for patients with severe traumatic hemorrhage, but its real-world effectiveness is determined not only by the blood product ratios and pharmacological agents specified in the protocol document but by the human and process factors that govern its execution. This narrative review has synthesized evidence demonstrating that team coordination failures, communication breakdowns, and documentation deficiencies are prevalent, consequential, and modifiable barriers to optimal MTP performance. Trauma nurses, constituting the largest professional group responding to MTP activations, occupy a uniquely central position from which to identify implementation barriers, advocate for process improvements, and lead quality enhancement initiatives. The evidence reviewed here provides support for the proposition that when nurses are appropriately trained and empowered—as trauma nurse clinicians, team coordinators, or documentation specialists—MTP processes and patient outcomes may improve measurably. The solutions identified in this review—preemptive activation systems, objective activation criteria, closed-loop communication, structured role assignment, dedicated documentation personnel, and integrated information systems—are predominantly low-technology, process-oriented interventions that can be adapted to diverse trauma center settings. Their implementation requires organizational commitment, interdisciplinary collaboration, and sustained investment in education and quality improvement; however, they do not require expensive equipment or advanced technologies that may be inaccessible to resource-limited centers. As trauma resuscitation continues to evolve—incorporating prehospital blood products, viscoelastic-guided transfusion, and novel hemostatic agents—the demands on nursing coordination will only intensify. Strengthening the human and process infrastructure that supports MTP delivery is therefore both an immediate priority and



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a long-term investment in trauma patient survival.

## Ethics Approval and Consent to Participate

Not applicable.

## Consent for Publication

Not applicable.

## Data Availability Statement

The datasets used in the current study are available from the corresponding author upon reasonable request.

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## Author's Contribution

S. M. M. conducted the literature search, synthesized the data, and wrote the first draft of the manuscript. H.S. supervised the study, validated the content, and critically revised the manuscript. Both authors reviewed and approved the final version of the manuscript.

## Conflict of Interest

The authors declared no conflicts of interest.

## Declaration of Generative Artificial Intelligence in Scientific Writing

ChatGPT version 5.2 was used to improve the English grammar of this study.

## References

1. Curry N, Davis PW. What's new in resuscitation strategies for the patient with multiple trauma? Injury. 2012;43(7):1021-8. [DOI: 10.1016/j.injury.2012.03.014] [PMID: 22487163]
2. Holcomb JB, Jenkins D, Rhee P, Johannigman J, Mahoney P, Mehta S, et al. Damage control resuscitation: directly addressing the early coagulopathy of trauma. J Trauma. 2007;62(2):307-10. [DOI: 10.1097/TA.0b013e3180324124] [PMID: 17297317]
3. Cannon JW, Khan MA, Raja AS, Cohen MJ, Como JJ, Cotton BA, et al. Damage control resuscitation in patients with severe traumatic hemorrhage: a practice management guideline from the eastern association for the surgery of trauma. J Trauma Acute Care Surg. 2017;82(3):605-17. [DOI: 10.1097/TA.0000000000001333] [PMID: 28225743]
4. Marinho DS, Brunetta DM, Carlos LMB, Carvalho LEM, Miranda JS. A comprehensive review of massive transfusion and major hemorrhage protocols: origins, core principles and practical implementation. Braz J Anesthesiol. 2025;75(2):844583. [DOI: 10.1016/j.bjane.2024.844583] [PMID: 39730103]
5. Berková J, Šrámek V, Suk P, Zýková I. Massive transfusion protocol. Rozhl Chir. 2023;102(5):189-93. [DOI: 10.33699/PIS.2023.102.5.189-193] [PMID: 37527944]
6. Spahn DR, Bouillon B, Cerny V, Duranteau J, Filipescu D, Hunt BJ, et al. The European guideline on management of major bleeding and coagulopathy following trauma: fifth edition. Crit Care. 2019;23(1):98. [DOI: 10.1186/s13054-019-2347-3] [PMID: 30917843]
7. Tisherman SA, Stein DM. ICU management of trauma patients. Crit Care Med. 2018;46(12):1991-7. [DOI: 10.1097/CCM.0000000000003407] [PMID: 30199391]
8. Korsch MB, Knapp GM. Improving massive transfusion protocol response in the rural level III trauma center setting. J Trauma Nurs. 2026;33(1):60-6. [DOI: 10.1097/JTN.0000000000000897] [PMID: 41505189]
9. Mitra B, Jorgensen M, Reade MC, Keegan A, Holley A, Farmer S, et al. Patient blood management guideline for adults with critical bleeding. Med J Aust. 2024;220(4):211-6. [DOI: 10.5694/mja2. 52212] [PMID: 38282333]
10. Hakkenbrak NAG, Mikdad SY, Zuidema WP, Halm JA, Schoonmade LJ, Reijnders UJL, et al. Preventable death in trauma: a systematic review on definition and classification. Injury. 2021;52(10):2768-77. [DOI: 10.1016/j.injury.2021.07.040] [PMID: 34389167]
11. Bugaev N, Como JJ, Golani G, Freeman JJ, Sawhney JS, Vatsaas CJ, et al. Thromboelastography and rotational thromboelastometry in bleeding patients with coagulopathy: Practice management guideline from the Eastern Association for the Surgery of trauma. J Trauma Acute Care Surg. 2020;89(6):999-1017. [DOI: 10.1097/TA.0000000000002961] [PMID: 32941349]
12. El-Menyar A, Asim M, Ahmed K, Fatima A, Latifi R, Al-Thani H. Prehospital plasma transfusion versus standard of care following traumatic injury: a review of the systematic reviews and a meta-analysis. Eur J Trauma Emerg Surg. 2025;51(1):354. [DOI: 10.1007/s00068-025-03033-z] [PMID: 41307703]
13. Siddaway AP, Wood AM, Hedges LV. How to do a systematic review: a best practice guide for conducting and reporting narrative reviews, meta-



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analyses, and meta-syntheses. Annu Rev Psychol. 2019;70(1):747-70. [DOI: 10.1146/annurev-psych-010418-102803] [PMID: 30089228]
14. May LA, Harrell KN, Bell CM, Basham-Saif A, Barker DE, Maxwell RA. Intraoperative resuscitation by specialized trauma nurse clinicians improves adherence to massive transfusion protocol. Am Surg. 2020 Jan;86(1):35-41. [DOI: 10.1177/000313482008600120] [PMID: 32077414]
15. Cotton BA, Guy JS, Morris JA Jr, Abumrad NN. The cellular, metabolic, and systemic consequences of aggressive fluid resuscitation strategies. Shock. 2006;26(2):115-21. [DOI: 10.1097/01.shk.0000209564.84822.f2] [PMID: 16878017]
16. Abuelazm M, Rezq H, Mahmoud A, Tanashat M, Salah A, Saleh O, et al. The efficacy and safety of pre-hospital plasma in patients at risk for hemorrhagic shock: an updated systematic review and meta-analysis of randomized controlled trials. Eur J Trauma Emerg Surg. 2024;50(6):2697-707. [DOI: 10.1007/s00068-024-02461-7] [ PMID: 38367091]
17. Broxton S, Medeiros R, Abuzeid A, Peterson C, Schumacher A. Implementation of a massive transfusion protocol: evaluation of its use and efficacy. J Trauma Nurs. 2018;25(2):92-7. [DOI: 10.1097/JTN.0000000000000350] [PMID: 29521775]
18. Seo D, Kwon J, Heo I, Kim Y, Kim JH, Kim T, et al. Toward standardized massive transfusion protocols: a multicenter evaluation of practice variability within a national trauma system. Healthcare. 2025;13(15):1848. [DOI: 10.3390/healthcare13151848] [PMID: 40805881]
19. Pusateri AE, Moore EE, Moore HB, Le TD, Guyette FX, Chapman MP, et al. Association of prehospital plasma transfusion with survival in trauma patients with hemorrhagic shock when transport times are longer than 20 minutes: a post hoc analysis of the pamper and combat clinical trials. Jama Surg. 2020;155(2): e195085. [DOI: 10.1001/jamasurg.2019.5085] [PMID: 31851290]
20. Sommer N, Schnüriger B, Candinas D, Haltmeier T. Massive transfusion protocols in nontrauma patients: a systematic review and meta-analysis. J Trauma Acute Care Surg. 2019;86(3):493-504. [DOI: 10.1097/TA.0000000000002101] [PMID: 30376535]
21. Murphy M, Curtis K, McCloughen A. What is the impact of multidisciplinary team simulation training on team performance and efficiency of patient care? An integrative review. Australas Emerg Nurs J. 2016;19(1):44-53. [DOI: 10.1016/j.aenj.2015.10.001] [PMID: 26614537]
22. Hughes KM, Benenson RS, Krichten AE, Clancy KD, Ryan JP, Hammond C. A crew resource management program tailored to trauma resuscitation improves team behavior and communication. J Am Coll Surg. 2014;219(3):545-51. [DOI: 10.1016/j.jamcollsurg.2014.03.049] [PMID: 25026871]
23. Pham HP, Shaz BH. Update on massive transfusion. Br J Anaesth. 2013;111(Suppl 1): i71-82. [DOI: 10.1093/bja/aet376] [PMID: 24335401]
24. Adkins BD, Kothari R, Koepke L, Noland DK, Booth GS, Stephens LD, et al. How did we reform our out of control massive transfusion protocol program? Transfusion. 2021;61(11):3127-35. [DOI: 10.1111/trf.16706] [PMID: 34661301]
25. Müller M, Jürgens J, Redaèlli M, Klingberg K, Hautz WE, Stock S. Impact of the communication and patient hand-off tool sbar on patient safety: a systematic review. BMJ Open. 2018;8(8):e022202. [DOI: 10.1136/bmjopen-2018-022202] [PMID: 30139905]
26. Edmondson AC. The fearless organization: creating psychological safety in the workplace for learning, innovation, and growth. Hoboken (NJ): John Wiley Sons. 2018. [URL: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=+Edmondson+AC.]
27. Nazir A, Shore EM, Keown-Stoneman C, Grantcharov T, Nolan B. Enhancing patient safety in trauma: Understanding adverse events, assessment tools, and the role of trauma video review. Am J Surg. 2024;234:74-9. [DOI: 10.1016/j.amjsurg.2024.04.027] [PMID: 38719680]

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