



## Review

## Advanced trauma life support 2025: A brief review of updates

Akilesh Ramasamy 

Department of Dentistry, Jawaharlal Institute of Postgraduate Medical Education and Research, Karaikal Campus, Karaikal, Puducherry, India



## ARTICLE INFO

## Keywords:

ATLS  
Trauma-care  
Advanced trauma life support  
Damage control resuscitation  
Update

## ABSTRACT

Guidelines and practices in trauma care constantly evolve based on evidence available, and every healthcare provider who treats trauma should be up-to-date in trauma-care concepts. The Eleventh Edition of Advanced Trauma Life Support, released in 2025, contains a complete revamp of the foundational principles of acute trauma care, content design, delivery, and training, based on medical and educational evidence. In this edition, a significant update is the emphasis on control of exsanguinating/major haemorrhage (ABCDE to x-ABCDE where x stands for control of exsanguinating haemorrhage in trauma resuscitation. In addition to damage control resuscitation, some of the significant changes include recommendations for permissive hypotension, limiting crystalloids, early transfusion, neuroprotective focus, and modifications in operational principles in spine motion restriction. Some of these conceptual changes with their rationale are briefly described in this review as an update for any healthcare provider involved in trauma resuscitation.

## Introduction

Evidence and practices in trauma care constantly evolve based on clinical trials and lessons from the field; therefore, healthcare providers (HCPs) must remain continually updated on concepts of trauma care. Advanced Trauma Life Support(ATLS) represents a widely followed standardized training program to deliver trauma care using standardized protocols and principles. The Eleventh Edition of Advanced Trauma Life Support [1] in 2025 contains a radical shift in the foundational principles of care, content design, and training, with an integration of damage control resuscitation.

This edition is contextual and flexible in implementation with an improved instructional design. The “Flex Workgroup” reviewed all materials to ensure the course would apply to a wide variety of practice environments. Each workgroup included one surgical educator to guide and update the content and training. Introducing and integrating skills and procedures within the relevant chapters of trauma resuscitation is a significant rearrangement, similar to how they would occur in real-world settings during various phases of resuscitation. Furthermore, linking related topics helps with the integration, recall, and reinforcement of core concepts. Thus, clinically relevant teaching occurs throughout the training, providing a contextually relevant approach that brings practical points and theoretical background together for a more effective learning experience.

## Key updates

*Damage control resuscitation*

Evidence and experience in trauma-care have revealed that hemorrhage kills more people than other causes combined. Hence, the critical change in ATLS protocol is the formalization of the “damage control resuscitation”. Damage control resuscitation is a well-researched concept in trauma care that has led to improved survival rates. This damage control resuscitation is a routine trauma-care practice in austere environments and conflict zones [2,3]. This refers to prioritising control of massive haemorrhage, limiting crystalloids, permissive hypotension and use of early and massive transfusion protocol [4]. Permissive hypotension, means maintaining a lower blood pressure sufficient to provide tissue perfusion but not exacerbate bleeding, without using vasopressors, until hemorrhage control. The rationale is that while airway loss can kill the patient in minutes, massive hemorrhage can kill or create irreversible circulatory collapse in seconds. This sole premise is the reason for the major shift in the sequence of trauma resuscitation.

*Prioritizing hemorrhage control - shifting from ABCDE to xABCDE*

The current edition, has a foundational shift in sequence of trauma resuscitation from ABCDE to xABCDE with a strong rationale. Where the 10th edition viewed external bleeding as part of the “Circulation” assessment, the 11th edition treats it as a significant threat to survival that must be neutralized as early as possible even before “Airway”. This

E-mail address: [akilesh.r@jipmer.ac.in](mailto:akilesh.r@jipmer.ac.in).<https://doi.org/10.1016/j.injury.2026.113079>

Accepted 28 January 2026

Available online 3 February 2026

0020-1383/© 2026 Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

is based on years of evidence mounting from both civilian and tactical trauma settings where massive hemorrhage is an established factor in post-trauma survival. Although this has been acknowledged in the previous editions too, following ABCDE protocol meant that structurally HCP addressed bleeding alongside the "Circulation" phase only. Therefore, when attempting to secure a difficult airway, the patient may continue to bleed, creating a clinical lag with the patient progressing to a state of irreversible circulatory collapse. Hence, in the current update, "Exsanguinating hemorrhage/External hemorrhage" has been formally given prime priority and designated as the "x" in xABCDE in the current edition, replacing the previous ABCDE protocol. For controlling external hemorrhage, rapid, simple interventions are instituted compared to securing the "Airway", making this change practical and feasible to implement with a huge impact on survival. For example, applying a tourniquet, performing wound packing, placing a pelvic binder or maintaining direct pressure can often be accomplished in seconds, even before the airway equipment is fully prepared. Additionally, borrowing from tactical trauma resuscitation, Resuscitative Balloon Occlusion of the AORTA (REBOA) was introduced as an adjunct in the previous edition. This update integrates partial REBOA (pREBOA) as part of the control of massive hemorrhage, as a bridge to surgical control. pREBOA or intermittent total REBOA maintains some distal circulation, mitigating risks of acidosis and reperfusion injury, which may occur in total occlusion in total REBOA for longer durations. Considering the wide use of anticoagulants therapeutically, protocols for medication reconciliation by identifying medications that may exacerbate bleeding and instituting reversal protocols have also been included.

#### *Use whole blood and limit crystalloids during shock resuscitation*

The role of crystalloids is now mainly as "bridging fluids" until blood products are available. The current update recognizes Low-Titer O-Negative (may use O-positive for males) Cold-Stored Whole Blood (LTOWB) as the preferred resuscitation fluid when available influenced by improved survival using this protocol in the operational environment (ATLS-OE). This LTOWB is a physiologically balanced product that contains all necessary components in a single unit, effectively reducing the volume of anticoagulants and preservatives administered to the patient. Early whole blood transfusion and massive transfusion protocols are recommended, with emphasis on hemorrhage control. In addition, as an alternative, hemostatic resuscitation may use a 1:1:1 ratio of packed red blood cells (pRBC), plasma, and platelets over crystalloids to preemptively treat the coagulopathy of trauma. Criteria-based transfusion protocols and goal-directed treatment replace arbitrary, ambiguous protocols. For example, the use of Assessment of Blood Consumption (ABC) is an easily derived measure (+1 for each of Systolic BP  $\leq$  90; Pulse  $\geq$  120; + FAST; penetrating torso injury) and a score of  $\geq$  two is used as an indicator for initiating massive transfusion protocol. This aligns with accumulating evidence that damage control resuscitation improves trauma survival [5]. In trauma resuscitation, a critical administration threshold of more than three pRBC within one hour is a standard red flag to activate massive transfusion protocol. Furthermore, in a massive transfusion protocol, a 1:1:1 strategy is employed, incorporating early cryoprecipitate (or fibrinogen concentrate) to maintain a fibrinogen threshold typically above 1.5–2.0 g/L, which is critical for stable clot formation in the early stages of hemorrhagic shock.

#### *Use of tranexamic acid and reversal of clotting agents*

The protocol identifies a nuanced approach to using tranexamic acid in trauma resuscitation. The use of a one-gram bolus of tranexamic acid is recommended in scenarios of major hemorrhagic shock within three hours of trauma, and an additional one gram as a slow infusion over the next eight hours. In the presence of traumatic brain injury, two-gram bolus dose is recommended supported by evidence suggesting improved survival and reduced intracranial progression when a higher loading dose is utilized early [6].

#### *Use of vasopressors*

The role of vasopressors in early trauma-care is evolving and still ambiguous [7]. This edition of ATLS recommends that vasopressors should not be first-line therapy for hemorrhagic shock and may be used pre-intubation to avoid post-intubation hypotension, in cardiac arrest or for goal-directed resuscitation to achieve 80-90 mm of systolic blood pressure [4].

#### *Airway control*

For a definitive airway, drug-facilitated intubation (Rapid sequence intubation) is the norm in trauma-care and is to be done after shock resuscitation. In trauma-care, especially in the presence of facial injuries or a patient being agitated, every airway is potentially a "difficult airway", and hence the team is to be prepared for surgical airway (Cricothyroidotomy) if endotracheal intubation fails. In addition, video laryngoscopy is no longer an "adjunct" in airway control, and it is recommended as the primary tool in airway management to ensure first-pass success. Though in-line stabilization of the spine is essential, there is a clearly established priority that spinal motion restriction should not impede airway management.

#### *Spinal motion restriction (SMR)*

The previous edition introduced Spinal motion restriction (SMR) as the preferred terminology, replacing cervical immobilization, de-emphasising the long spine board and rigid collars. The current guidelines continue to restrict the use of backboards to short-term needs (extrication or temporary movement) and not for prolonged spine stabilization. The current recommendation is to avoid the use of cervical collars altogether in low-risk patients (for example in penetrative neck injuries). Hence, the current edition recommends criteria-based selective use of SMR devices and judicious use of imaging for cervical spine clearance. The current guidelines empower the trauma-care team to prioritize hemorrhage control and manage the airway without being hindered by a rigid neck collar, while maintaining in-line stabilization reinforcing xABCDE again. A poorly fitting collar or an agitated patient fighting a collar can hinder securing an airway and additional risk causing more spinal movement than no collar at all. Thus, a clear priority has been established for hemorrhagic shock resuscitation, followed by airway management, and then for SMR. Massive hemorrhage kills faster in trauma, compared to airway loss and hypoxia. And hypoxia kills faster than secondary spinal injury. Hence, routine SMR is not recommended because spinal injuries are rare and rigid improperly applied collars can increase intracranial pressure or make intubation more difficult, increasing risk of mortality.

#### *Disability (D) and exposure (E)*

GCS and pupillary assessment remain primary measures for assessing brain injury and recovery. Exposure (E) component emphasizes a complete examination and preventing hypothermia while maintaining dignity to avoid missed injuries.

#### *Neuroprotective focus*

The current update recommends specific neuroprotective strategies for TBI, to prevent secondary brain injury through stringent physiological targets. To maintain a Systolic Blood Pressure (SBP)  $>$  100 mmHg (for patients aged 50–69) or  $>$  110 mmHg (for those aged 15–49 or  $>$  70) to ensure adequate cerebral perfusion pressure. Regarding intracranial pressure (ICP) management, a tiered approach starting with basic measures such as head elevation and neutral neck positioning, progressing to the use of hypertonic saline or mannitol, and early consultation for ICP monitoring in patients with a GCS  $\leq$  8 and an abnormal CT scan. As discussed earlier, the use of a 2g IV bolus of

Tranexamic Acid (TXA) specifically for TBI patients within 3 h of injury to limit hematoma expansion and improve neurological outcomes is another update [18].

#### *Adjunctive aids in resuscitation*

Adjunctive aids can be used to identify further bleeding after primary survey and massive hemorrhage control. Where clinically indicated, appropriate life-saving interventions should be carried out without waiting for proof of diagnosis or additional imaging. Adjunctive aids using focused assessment with sonography for trauma (FAST), extended FAST (e-FAST), echocardiography, chest and pelvis radiograph, and diagnostic peritoneal lavage may help identify additional sources of bleeding. Shifting the patient for computed tomography is done only after achieving some modicum of stability, aligning with best practice guidelines of imaging by ACS CoT [8]. The use of viscoelastography for coagulopathy may also be used for guiding resuscitation, where available.

#### *Communication and teamwork*

In trauma-care systems, stable situations suddenly evolve into utter chaos. Thus, dynamic or situational leadership strategies are essential in such chaotic situations, based on individual skills while maintaining team-cohesiveness. In trauma-care, as in other high-stakes settings, communication errors cause most preventable errors [9]. Hence, better non-technical skills, communication and leadership can enhance the overall team performance and is a significant update in this edition [10–12]. In addition, a new chapter on Communicating serious news introduces the ABCDE model (Ask, Begin with warning, Concise summary, Don't speak too much & Do allow silence, Encourage emotions/Elicit questions & End encounter with plan for next step).

#### *Penetrative trauma*

The new chapter on penetrative trauma highlights the unique challenges in managing such injuries. The update recommends against routine use of SMR in penetrative trauma settings where spinal injuries may be rare, and SMR can cause local pressure injury, increased intracranial pressure, missed injury, and make procedures such as endotracheal intubation more difficult.

#### *Trauma care during conflicts and in an austere environment*

The ATLS-Operational Emphasis (ATLS-OE), introduced in the previous edition, is no longer a supplemental chapter. Two key concepts of ATLS-OE - quaternary survey and zero survey are already part of trauma-care guidelines in austere environment and military settings [3,13].

A quaternary survey refers to the pre-transfer evaluation of transfer requirements and logistics, as well as care capabilities at the referral site, depending on the nature of the injury. This assessment is vital in remote regions and conflict zones. Zero survey refers to a pre-arrival resource assessment to evaluate system readiness in preparation for receiving the injured patient, philosophically similar to the "Zero point survey" [14].

#### *Trauma-informed care & social determinants of health*

Some life events have long-term effects on an individual's overall well-being (psychological trauma). A history of psychological trauma is highly prevalent among patients seen in acute trauma-care settings [15]. In addition, non-medical factors also affect the outcomes in trauma-care (social determinants of health). Thus, a dedicated chapter discusses trauma-informed care and social determinants of health as key factors to manage individuals with psychological trauma without re-traumatisation.

#### *Other content updates*

The current edition aims to be inclusive and culturally sensitive with the use of safe and impactful framing and illustrations. Disaster management and triage are now part of the core ATLS course, as these skills are essential for trauma-care personnel. Considering ocular injuries are the most common missed injuries in polytrauma settings [16], the topic is rightfully moved to the core curriculum. Similarly, thoracic, abdominopelvic and genitourinary trauma concepts have been updated in scope and content. For the interested, there is also a recent update on genitourinary trauma from ACS CoT [17,18]. Finally, in this update, there is a clear mandate to expand the guidelines from a care-delivery module to a holistic system for effective trauma-care by including new dedicated content on prevention and trauma care systems. In pediatric resuscitation, the update simplifies the initial management of shock. Children less than 20 kg weight shall receive 10-20 mL/kg crystalloid bolus, and older children (over 20 kg), are to receive one-litre crystalloid bolus. Either way, if hemodynamic stability is not achieved, to consider blood (10 ml/Kg) instead of repeating crystalloids. Regarding goals for vital signs, age and z-score-based goals are recommended based on age norms.

#### *Summary*

Lessons learnt from the wars in the 2000s indicated that more people lose their lives to exsanguinating bleeding than other reasons, and hence shock resuscitation should take priority, using whole blood. Overall, ATLS guidelines in previous editions addressed civilian trauma resuscitation differently and were slow to adopt lessons from military trauma care by almost a decade. However, the recent update incorporates many lessons learnt from military trauma care over the past two decades, which brings about a foundational change in this edition. Also, whole blood transfusion was better than crystalloids in improving survival in hemorrhagic shock in war-zones, and these principles apply to any situation where bleeding is a problem, be it civilian trauma, war zone or in the operating rooms.

The recently updated ATLS program incorporates several foundational shifts in trauma-care principles, with a major update to the sequence replacing ABCDE with xABCDE, establishing exsanguinating hemorrhage as the primary priority. Furthermore, there is a clear emphasis on criteria-based selective spinal motion restriction (SMR), hemorrhagic shock resuscitation with damage control resuscitation, and the restricted use of crystalloids, along with the early use of blood products. Apart from this, the introduction of communication, leadership, and standard communication frameworks, with the use of inclusive terms and images, highlights some of the significant changes. Thus, the recently updated ATLS program incorporates major evidence-based updates while remaining inclusive, standardised, and flexible. In addition, there are new contents on leadership, including standard communication frameworks that highlight the importance of non-technical skills. Integrating principles of injury prevention and concepts of trauma-care systems reveals a significant shift of ATLS from being an individual-focused trauma care guideline to a patient-centric trauma resuscitation and preventive system.

#### **Disclaimer/Disclosure**

This review is an independent summary and discussion of the recently updated Advanced Trauma Life Support (ATLS) 11th Edition. The author is not formally affiliated with the American College of Surgeons (ACS) Committee on Trauma, and this manuscript has not been officially endorsed by the ATLS/ACS CoT group. Additionally, the author acknowledges that it is not feasible to cover every change in the update, so some changes in the management of specific populations and special circumstances are not addressed in detail. However, an attempt has been made to cover major changes and reasons for the change in the

foundational principles.

### Ethics statement

No specific ethical concerns, since this is a review article based on recently published guidelines and no patient data or primary data is involved.

### Ethical concerns

Not applicable since this is a review article based on recently published guidelines and no patient data or primary data is involved.

### Funding

None.

### Copyrights disclaimer

This article is original content and currently not submitted or published elsewhere in part or whole.

### CRediT authorship contribution statement

**Akilesh Ramasamy:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization.

### Declaration of competing interest

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### References

- [1] ACS CoT. ATLS 11 | ACS. n.d. <https://www.facs.org/quality-programs/trauma/education/advanced-trauma-life-support/atls-11/>; 2025. accessed November 3
- [2] Tactical Combat Casualty Care (TCCC) Guidelines: 25 January 2024. J Spec Oper Med 2025. n.d. <https://jsomonline.org/product/tactical-combat-casualty-care-tccc-guidelines-25-january-2024/>. accessed November 3
- [3] War surgery - working with limited resources in armed conflict and other situations of violence Volume 1 2020. accessed November 3, <https://shop.icrc.org/war-surgery-working-with-limited-resources-in-armed-conflict-and-other-situations-of-violence-volume-1.html>; 2025. accessed November 3.
- [4] The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition | Critical Care | Full Text. n.d. <https://ccforum.biomedcentral.com/articles/10.1186/s13054-023-04327-7>; 2025. accessed November 3
- [5] ACS CoT. ACS TQIP massive transfusion in trauma guidelines. n.d. [https://www.facs.org/media/zcjdtrd1/transfusion\\_guidelines.pdf](https://www.facs.org/media/zcjdtrd1/transfusion_guidelines.pdf); 2025. accessed November 3
- [6] Utsumi S, Kawakami A, Amemiya Y. Optimal dose of tranexamic acid in traumatic brain injury: systematic review and network meta-analysis of randomized controlled trials. J Trauma Acute Care Surg 2025;98(5):816–23.
- [7] Burke EG, Hartley BW, Succar B, Dumas RP. Rethinking vasopressor use in the trauma bay: a shifting perspective. Trauma Surg Acute Care Open 2025;10. <https://doi.org/10.1136/tsaco-2025-001788>.
- [8] ACS CoT. ACS TQIP best practices guidelines in imaging. ACS; 2018.
- [9] Breaking the silence: communication failures are the leading errors identified in 10-years of trauma morbidity and mortality conferences | Eur J Trauma Emerg Surg 2025. n.d. <https://link.springer.com/article/10.1007/s00068-025-02913-8>. accessed November 4
- [10] Coulthard SL, Algur E, Kaufman EJ. Leading diverse teams in high-stress trauma environments. Curr Trauma Rep 2025;11:12. <https://doi.org/10.1007/s40719-025-00288-0>.
- [11] Iedema R, Ball C, Daly B, Young J, Green T, Middleton PM, et al. Design and trial of a new ambulance-to-emergency department handover protocol: “IMIST-AMBO. BMJ Qual Saf 2012;21:627–33. <https://doi.org/10.1136/bmjqs-2011-000766>.
- [12] TeamSTEPPS Updates. n.d. <https://www.ahrq.gov/teamstepps-program/updated/index.html>; 2025. accessed November 4
- [13] TCCC Working Group. Tactical casualty combat care handbook. 2025. n.d. <https://api.army.mil/e2/c/downloads/2023/01/19/31e03488/17-13-tactical-casualty-combat-care-handbook-v5-may-17-distro-a.pdf>. accessed November 3.
- [14] Reid C, Brindley P, Hicks C, Carley S, Richmond C, Lauria M, et al. Zero point survey: a multidisciplinary idea to STEP UP resuscitation effectiveness. Clin Exp Emerg Med 2018;5:139–43. <https://doi.org/10.15441/ceem.17.269>.
- [15] A scoping review of trauma informed approaches in acute, crisis, emergency, and residential mental health care | BMC Psychiatry | Full Text. n.d. <https://bmcpyschiatry.biomedcentral.com/articles/10.1186/s12888-023-05016-z>; 2025. accessed November 4
- [16] Bashir MT, Bouamra O, Kirwan JF, Lecky FE, Bourne RRA. Ocular injuries among patients with major trauma in England and Wales from 2004 to 2021. Eye 2024;38: 2761–7. <https://doi.org/10.1038/s41433-024-03116-y>.
- [17] ACS CoT. ACS TQIP best practices guidelines management of genitourinary injuries 2025. accessed November 3, [https://www.facs.org/media/ya5hcu0s/genitourinary\\_guidelines.pdf](https://www.facs.org/media/ya5hcu0s/genitourinary_guidelines.pdf); 2025. accessed November 3.
- [18] Hardcastle TC, Zietsman C, Mwandiri M, Macleod JBA, Ouattara A. Explosive Weapons Trauma Care Collective (EXTRACCT) blast injury clinical practice guideline: genito-urinary trauma. World J Surg 2025. <https://doi.org/10.1002/wjs.12621>.