



Trauma room requirements

Falco Hietbrink¹ · Frank Hildebrand² · Klemens Horst²

Received: 24 February 2025 / Accepted: 3 March 2025
© The Author(s) 2025

Abstract

Effective shock (or trauma) room management requires thorough preparation, staff competence, dedicated infrastructure and organised protocols. Shock rooms must be sufficiently equipped according to the hospital's designated level of care. This chapter outlines essential aspects, including equipment and facilities, staff qualifications and composition, and communication practices. Key areas including initial assessment, diagnostic procedures, emergency interventions, and future aspects in the care of severely injured patients are addressed, along with emerging innovations in trauma care.

Keywords Whitebook · Polytrauma · ESTE

Organisation

Preparation

Preparation in trauma care begins with structured protocols, adequate communication with pre-hospital personnel (see Chap. 5), crew resource management, teamwork, and utilisation of facilities and resources. These elements should be established as the standard of care and practised regularly. Team members must be called immediately, preferably via an automated system, and must know their assigned roles and tasks.

Team members

The resuscitation team may vary according to the country or level of care, but must include a sufficient number of trained specialists, including:

- Trauma team leader: The most experienced physician, preferably with surgical expertise, to oversee trauma management.
- Surgeons, anaesthesiologists, and specified nurses trained in trauma care.
- Radiology Personnel: To perform immediate diagnostic imaging.
- Specialists: Neurosurgeons or other experts are recommended to be present during resuscitation for severe trauma or available for consultation, depending on injury severity.

Communication

Closed-loop communication, where input from team members is actively incorporated while the leader maintains an overview, is critical for coordinated care. Trauma team leaders must ensure constant information flow, and regular team training is mandatory to optimise communication and treatment skills.

Facilities and resources

Shock rooms must provide:

- Diagnostic tools including X-ray equipment and ultrasound for eFAST.
- Resources for emergency procedures, including chest tubes, pelvic binders, C-clamp fixation, heaters, and rapid infusers.

✉ Frank Hildebrand
fhildebrand@ukaachen.de

Falco Hietbrink
F.Hietbrink@umcutrecht.nl

Klemens Horst
khorst@ukaachen.de

¹ Department of Trauma Surgery, University Medical Center Utrecht, Utrecht, The Netherlands

² Department of Orthopaedics, Trauma and Reconstructive Surgery, RWTH Aachen University, Aachen, Germany

- Supplies for massive transfusion protocols, including blood products. Familiarity with available blood products' possibilities and limitations is essential for all team members.
- ABCDE-charts, handover checklists, and a visible clock for time tracking.

Next steps

The chain of care must ensure:

- Intensive care unit (ICU) and operating room (OR) readiness.
- Early transport to facilities with adequate resources if required.
- Consultation with external specialists when necessary.

Initial assessment and management requirements

Training and workflow

All team members must be trained in the ABCDE approach, using recognised courses such as ATLS, ETC, or similar programmes, to ensure a common routine and language for processes, essential steps, and workflows. Throughput times should be as limited as possible to prioritise timely intervention. Regular trauma resuscitation practice is recommended to improve collaboration and reinforce the required team mindset.

Operating room team members must also undergo advanced trauma care training (e.g., ASSET ((Advanced Surgical Skills for Exposure in Trauma)), ATOM ((Advanced Trauma Operations Management)), DSTC ((Definitive Surgical Trauma Care)) (DATC ((Definitive Acute Trauma Care)) or DPNTC (Definitive Pre-Hospital and Trauma Care)), focusing on surgical procedures including clamshell thoracotomy, laparotomy, control of junctional bleeding, pelvic stabilisation and packing. These programmes develop critical skills in a team environment, emphasising communication and coordination for managing the most severely injured patients.

Diagnostics

Timely diagnosis is critical for trauma patients. Shock rooms must be equipped with the necessary tools to detect life-threatening injuries, which must always be available. These include:

- Ultrasound and X-ray capabilities for the entire thorax and pelvis.
- Computed tomography (CT), which should ideally be located within the shock room to avoid risky handovers but must, at minimum, be nearby.
- Laboratory tests for instant data on basic vital parameters, such as blood gas analysis, with 24/7 accessibility.
- Visco-elastic point-of-care devices for coagulative status analysis, if available.
- Routine blood tests, which must be immediately transported to the laboratory.
- Interventional angiography to control bleeding of vessels near the trunk.
- Access to MRI, infrequently requested but available on a 24/7 basis when needed.

Blood products

Trauma patients frequently require blood transfusions. Hospitals must provide immediate access to donor blood and its components. For those without in-house blood banks, reliable supply chains must be established. Pre-testing protocols should be in place to ensure timely availability, and facilities must have the capacity to conduct compatibility tests and antibody screening.

Protocols for massive transfusions must be readily available, regularly practised, and include appropriate checklists to streamline the process.

Conclusion and needs for the future

Effective trauma room management relies on thorough preparation, skilled teams, and well-equipped facilities to provide optimal care for severely injured patients. Innovations such as hybrid operating rooms (ORs), which combine open surgery and endovascular procedures in a single setting, are transforming trauma care by streamlining logistics and reducing intervention times. To fully realise their potential, hybrid ORs must be integrated into daily practice and resuscitative algorithms, ensuring they become a standard component of trauma management.

Where hybrid ORs are not feasible, maintaining well-practised routines in standard ORs remains essential to ensuring patient safety and minimising adverse events. Emerging technologies like 3D imaging further enhance trauma care by supporting navigated procedures and minimally invasive techniques, but these tools must complement—not replace—comprehensive trauma care strategies.

Looking ahead, standardisation of protocols, continued team training, and integration of advanced technologies will drive improvements in trauma room efficiency and

outcomes. By combining preparation, expertise, and innovation, trauma systems can continue to save lives and reduce complications in the most critical moments of patient care.

Author contributions All authors wrote the main manuscript text.

Funding Open Access funding enabled and organized by Projekt DEAL.

Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Hietbrink F, Mohseni S, Mariani D, Naess PA, Rey-Valcárcel C, Biloslavo A, Bass GA, Brundage SI, Alexandrino H, Peralta R, Leenen LPH, Gaarder T. Visceral trauma section of the European society of trauma, emergency surgery. What trauma patients need: the European dilemma. *Eur J Trauma Emerg Surg*. 2022. <https://doi.org/10.1007/s00068-022-02014-w>. Epub ahead of print. PMID: 35798972.
- American College of Surgeons. Resources for optimal care of the injured patient; 2022 standards.
- American College of Surgeons. Student course manual ATLS® advanced trauma life support, 10th ed.; 2018. EAN 9780996826235.
- Horst K, Lambert A, Meister FA, Kalverkamp S, Hildebrand F. Stop the bleeding-Acute bleeding control in injuries to the trunk and extremities. *Unfallchirurgie (Heidelberg)*. 2023;126(7):533–41. Epub 2023 Mar 29. <https://doi.org/10.1007/s00113-023-01309-w>
- Waydhas C, Trentzsch H, Hardcastle TC, Jensen KO, World-Trauma TAcTIC Study Group. Survey on worldwide trauma team activation requirement. *Eur J Trauma Emerg Surg*. 2021;47(5):1569–1580. <https://doi.org/10.1007/s00068-020-01334-z>. Epub 2020 Mar 2. PMID: 32123951; PMCID: PMC8476357.
- Holcomb JB, Dumire RD, Crommett JW, Stamatidis CE, Fagert MA, Cleveland JA, Dorlac GR, Dorlac WC, Bonar JP, Hira K, Aoki N, Mattox KL. Evaluation of trauma team performance using an advanced human patient simulator for resuscitation training. *J Trauma*. 2002;52(6):1078–85; discussion 1085–6. <https://doi.org/10.1097/00005373-200206000-00009>. PMID: 12045633.
- Maarseveen OECV, Ham WHW, Huijsmans RLN, Leenen LPH. The pace of a trauma resuscitation: experience matters. *Eur J Trauma Emerg Surg*. 2022;48(3):2503–2510. <https://doi.org/10.1007/s00068-021-01838-2>. Epub 2022 Feb 9. PMID: 35141771; PMCID: PMC9192480.
- Bankhead BK, Bichard SL, Seltzer T, Thompson LA, Chambers B, Davis B, Knowlton LM, Tatebe LC, Vella MA, Dumas RP. Bias in the trauma Bay: A multicenter qualitative study on team communication. *J Trauma Acute Care Surg*. 2023;94(6):771–7. Epub 2023 Mar 7. PMID: 36880706.
- Haerckens MHTM, Kox M, Noe PM, Van Der Hoeven JG, Pickkers P. Crew resource management in the trauma room: a prospective 3-year cohort study. *Eur J Emerg Med*. 2018;25(4):281–287. <https://doi.org/10.1097/MEJ.0000000000000458>. PMID: 28328728.
- Stengel D, Leisterer J, Ferrada P, Ekkernkamp A, Mutze S, Hoenning A. Point-of-care ultrasonography for diagnosing thoracoabdominal injuries in patients with blunt trauma. *Cochrane Database Syst Rev*. 2018;12(12):CD012669. <https://doi.org/10.1002/14651858.CD012669.pub2>. PMID: 30548249; PMCID: PMC6517180.
- Shih AW, Al Khan S, Wang AY, Dawe P, Young PY, Greene A, Hudoba M, Vu E. Systematic reviews of scores and predictors to trigger activation of massive transfusion protocols. *J Trauma Acute Care Surg*. 2019;87(3):717–729. <https://doi.org/10.1097/T.A.0000000000002372>. PMID: 31454339.
- Saltzherr TP, Bakker FC, Beenen LF, Dijkgraaf MG, Reitsma JB, Goslings JC, REACT Study Group. Randomized clinical trial comparing the effect of computed tomography in the trauma room versus the radiology department on injury outcomes. *Br J Surg*. 2012;99 Suppl 1:105–13. <https://doi.org/10.1002/bjs.7705>. PMID: 22441863.
- Umemura Y, Watanabe A, Kinoshita T, Morita N, Yamakawa K, Fujimi S. Hybrid emergency room shows maximum effect on trauma resuscitation when used in patients with higher severity. *J Trauma Acute Care Surg*. 2021;90(2):232–239. <https://doi.org/10.1097/TA.0000000000003020>. PMID: 33165282.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.