Adult major trauma in France: a roadmap for comprehensive and coordinated care

, For the GITE<ce:author-group id="aug0010">Etienne Allart, Paul Balandraud, Antoine Bertani, Chloé Bertolus, Xavier Bobbia, Pierre Bouzat, Thomas Clavier, Arnaud Dagain, Gaelle Fiard, Tobias Gauss, Julien Frandon, Sébastien Gaujoux, Julien Ghelfi, Edouard Girard, Laure Jainsky, Arthur James, Julie Paquereau, Julien Picard, Mathieu Raux, Karim Tazarourte, Antoine Yrondi

PII: S2352-5568(26)00122-0

DOI: https://doi.org/10.1016/j.accpm.2026.101864

Reference: ACCPM 101864

To appear in: *Anaesthesia Critical Care & Pain Medicine*

Accepted Date: 3 May 2026

Please cite this article as: Allart E, Balandraud P, Bertani A, Bertolus C, Bobbia X, Bouzat P, Clavier T, Dagain A, Fiard G, Gauss T, Frandon J, Gaujoux S, Ghelfi J, Girard E, Jainsky L, James A, Paquereau J, Picard J, Raux M, Tazarourte K, Yrondi A, Adult major trauma in France: a roadmap for comprehensive and coordinated care, *Anaesthesia Critical Care and Pain Medicine* (2026), doi: https://doi.org/10.1016/j.accpm.2026.101864

Adult major trauma in France: a roadmap for comprehensive and coordinated care

For the GITE[1]

1. Pôle d'Anesthésie-Réanimation, Hôpital Albert Michallon, BP 217, F-38043 Grenoble, France.

CORRESPONDING AUTHOR

Dr. Arthur JAMES, Département d'Anesthésie, Réanimation, et Médecine Péri-Opératoire, Hôpital Pitié-Salpetrière, 47-83 Boulevard de l'Hôpital 75013 Paris, France ; arthur.james@aphp.fr

ABSTRACT

Background

Despite a substantial burden, trauma care in France remains insufficiently structured at the national level. While France has pioneered physician-led prehospital emergency systems, trauma care organizations vary across regions and lack meaningful national coordination. This position paper, developed by experts from the Groupe d'Interface en Traumatologie Grave (GITE), describes the current organization of trauma care in France, identifies structural gaps across the continuum of care, and proposes strategic priorities to strengthen a coordinated national trauma system.

Priority Perspectives

Optimal outcomes depend on accurate recognition of major trauma patients and timely orientation to the most appropriate care pathway within regional systems. Despite a high level of clinical expertise, significant limitations persist, including fragmented trauma networks without national coordination, absence of standardized trauma center accreditation, heterogeneous triage implementation, and insufficient integration between prehospital services, hospitals, and rehabilitation pathways. National data systems also remain incomplete, limiting the ability to monitor performance and support quality improvement. To address these challenges, this article proposes targeted actions and introduces key performance indicators spanning the trauma pathway. These indicators aim to provide a standardized framework for evaluating trauma care delivery and to support benchmarking, research, and continuous system improvement.

Conclusions

France benefits from strong clinical expertise and substantial technical resources for major trauma care. However, greater coordination across the trauma care pathway is needed to fully leverage these assets. A structured national trauma strategy, with standardized governance,

integrated registries, and defined performance indicators, could improve system performance, reduce regional disparities, and strengthen resilience.

Keywords Major trauma Trauma System Quality Indicators Health Care Organization

I. INTRODUCTION

Worldwide, trauma is a leading cause of death and disability among people under 45 [1] and the onset of a chronic disease for survivors [2]. In France, trauma accounts for approximately 40,000 deaths per year, millions of emergency department visits, and almost 150 000 hospital admissions every year [3]. Yet, trauma remains a poorly structured and underfunded area [4]. In the United States, for instance, injuries cost $671 billion in 2013 and represent nearly 10% of total disability-adjusted life years (DALYs) lost annually, but they receive only 1% of the National Institutes of Health's biomedical research funding [5], and a comparable imbalance likely exists in France, despite the lack of robust national-level data. Trauma has thus rightfully been described as the "*neglected epidemic of our time*"[4,6].

Major trauma can be defined as an injury or combination of injuries that are life-threatening or could be life-changing because it may result in long-term disability, according to the British National Institute for Health and Care Excellence (NICE). It may encompass a wide spectrum of injuries, from isolated arterial wounds of the upper limb to extensive multiorgan deceleration injuries. Yet, these diverse conditions share common life-threatening features, most notably traumatic brain injury and acute traumatic coagulopathy, both of which are the leading causes of early post-traumatic mortality. In such situations, time is of the essence, and management must not suffer from any delay, whether prehospital or in-hospital [7,8]. Therefore, the diagnosis of major trauma must be made a priori **on immediate clinical grounds and partial medical history**, without waiting for comprehensive imaging or full diagnostic confirmation. Subsequent management is multidisciplinary at every stage, from prehospital care to rehabilitation, and the continuum of care must integrate rehabilitation and psychological support, as psychological sequelae and long-term disability are frequent [9] (**Figure 1**).

In this context, trauma care should not be siloed and must be coordinated through a network-based model, where resources and expertise are pooled across a geographic region [10]. While France has been a pioneer in the development of prehospital medicalization, it lags behind in the organization of such trauma networks. Only a few regions have implemented trauma networks, at least partially, and no national framework currently exists.

Trauma stakeholders should collectively engage in the integration of artificial intelligence. This requires access to high-quality data, including trauma registries, automated patient monitoring, and national health data systems. In combination with clinicians trained in artificial intelligence and collaboration with nonmedical data scientists, these resources can help define appropriate and effective applications of these technologies across all stages of care [11,12].

This paper thus seeks to identify the structural and organizational gaps that obstruct optimal trauma care in France. By defining standards of care, exposing unmet needs, and delineating key performance indicators, we argue for a unified national strategy, an actionable roadmap

for major trauma care that strengthens everyday practice while preparing for exceptional situations. For each critical stage in the management of major trauma patients, we will briefly review the state of the art, highlight current limitations and gaps, and propose perspectives and solutions (**Figure 2**).

II. TRAUMA SYSTEM AND TRAUMA CENTRES

1. Current organization

A trauma system aims to ensure maximum survival and optimal functional recovery following injury by minimizing preventable deaths and sequelae. This requires the right patient to reach the right place at the right time. In such systems, resources are organized around designated trauma centres, which concentrate the regional capabilities required for optimal trauma care. Landmark studies have shown that treatment in specialized trauma centres substantially reduces mortality, particularly among frail patients and those with high injury severity scores. [10,13]. This expertise is a combination of competencies, technical platforms availability, organizational capacity, and volume of trauma patients treated. In France, a national framework was implemented in 2019 and helps categorise trauma centres according to the resources available [14]. Nevertheless, unlike countries such as the United States, Canada, the United Kingdom, Australia, or Germany, the designation of a trauma centre in France relies solely on an informal self-declaratory process. Even in these systems, however, the distribution of trauma centres often fails to align with population needs. Rural areas, in particular, face limited access to high-level care [15].

Beyond structural organization, the effectiveness of a trauma network relies heavily on human factors: fostering interdisciplinary and interprofessional trust, promoting a shared understanding of community goals, and encouraging widespread engagement in quality improvement [16]. It is now widely accepted that a trauma centre is *a specialty hospital, not a hospital of specialties* [17]. Finally, strengthening civil–military cooperation remains a key strategic element for ensuring resilience and operational surge capacity during crises or mass casualty events [5].

2. Limitations and Gaps

Despite the growing number of regional initiatives, the French trauma system remains fragmented, often operating in silos, with a lack of national coordination and no standardized oversight [18]. As a result, regional trauma systems vary in their level of development and more commonly function as exclusive rather than inclusive networks. Similarly, there are currently no national indicators to monitor trauma care performance or patient outcomes, and even fewer addressing the medico-economic aspects of practice. This situation makes it difficult to assess system-wide effectiveness, which is regrettable in the current context.

Also, while prehospital care and early resuscitation are generally well-established priorities and relatively well integrated, post-ICU care, including perioperative medicine, coordination with primary care and rehabilitation pathways, remains poorly structured and insufficiently connected within trauma networks [19]. This is likely due to the fact that most investments

focus on the initial phase of care. As a result, perioperative medicine and long-term patient outcomes are often neglected, based on the assumption that survival alone is sufficient. This may partly explain why, aside from certain regions, the development of regional trauma networks lacks sustained support from the authorities, despite their responsibilities. Furthermore, the designation of trauma centres in France remains largely declarative, even though standard criteria have been published more than five years ago [14]. In the United States, where only one in three citizens lives within a functional trauma system, access to an integrated trauma system is similarly inconsistent [15]. These inconsistencies may reflect significant disparities in the timeliness and availability of critical resources.

Finally, reflecting these challenges, the national trauma registry, the Traumabase, remains primarily focused on acute hospital care and is still largely disconnected from prehospital regulation systems and mid- to long-term patient outcomes. Furthermore, it has yet to achieve nationwide coverage, due to persistent difficulties in enrolling all trauma centres, lacking dedicated and funded clinical research assistants. The ABC grading system triage tool, initially proposed by the TRENAU registry and subsequently validated by the GITE, is widely accepted and clinically effective but remains inconsistently implemented across regions and phases of care. In addition, it is poorly adapted for use by first responders during the earliest stages of triage [20,21].

3. Perspectives and Opportunities

National Standardisation of trauma governance. A first priority is the establishment of nationally standardized roles and processes within trauma systems. This includes the promotion of common protocols and organizations, implemented consistently across all regions and phases of care. The Groupe d'Interface en Traumatologie GravE (GITE), which brings together experts from all disciplines involved in trauma care, provides strategic direction and operational coherence, guiding nationwide coordination efforts. The GITE also serves as the primary point of contact for public authorities on matters related to trauma care coordination in France.

Accreditation of centres and networks. To ensure coherence and quality across the national territory, an independent body, in partnership with regional health authorities, should be responsible for accrediting trauma centres and networks. This process will have to be based on standardized and objective criteria encompassing infrastructure, clinical competencies, patient outcomes [14]. Such an approach would ensure that trauma centre designation is guided by population needs rather than institutional opportunity or preference, thereby promoting equitable access to high-level trauma care, reflecting the successful model implemented by regional obstetrical networks.

Data and quality Monitoring. The Traumabase, as the national trauma registry, has significantly advanced and accelerated trauma research in France. However, it must now also serve as a tool for quality improvement, enabling the monitoring of both patient, centres and system outcomes, identifying performance gaps, and facilitating benchmarking. Expanding its coverage and ensuring integration into every stage of the trauma pathway are essential steps to enable comprehensive patient tracking, from the point of injury through rehabilitation and return to work. This will also enable the medico-economic assessment of trauma care activities.

Resilience, disaster, and Conflict preparation. The expertise developed on a daily basis in trauma centres and trauma systems must, in coordination with the Military Health Service and Civil Security, be fully leveraged during disasters or high-intensity conflicts. This may involve providing strategic guidance, deploying material or human resources, or, when necessary, directly managing patient care, regardless of the timing of treatment.

III. TRIAGE AND PREHOSPITAL REGULATION

1. Current organization

Prehospital triage aims to *direct the right patient to the right place in a timely fashion*. It is a cornerstone of any efficient trauma care system. Undertriage occurs when a patient with major trauma is taken to a facility lacking the capacity to provide adequate trauma care, a mismatch associated with a 25% increase in mortality [22]. Conversely, overtriage occurs when a trauma patient is transported to a facility providing a higher level of care than necessary. While it may appear precautionary, overtriage can overwhelm trauma centres, compromising the availability of critical resources and potentially affecting care quality.

In France, the SAMU (Service d'Aide Médicale Urgente) holds legal responsibility for the medical regulation of prehospital emergencies within its respective jurisdictions. They operate in close collaboration with the fire department (Services d'Incendie et de Secours), which manages and dispatches most non-medical emergency teams with the highest degree of territorial granularity but with limited operational autonomy, delivering care only within the framework of strict, protocol-driven constraints. The entire French trauma system is built upon this model of medically supervised prehospital care, a system that has proven effective and has subsequently been adopted by several other countries [23–26]. Based on information provided by the first bystanders, the nature of the response is determined, dispatching a medical team alongside rescue personnel whenever the situation is perceived as serious or complex, and bringing the patient to the most adapted trauma centre. This point represents the SAMU's primary challenge: to identify, as accurately and as early as possible, cases that require prehospital medical teams.

In this context, the ABC grading system, used in conjunction with trauma centres' level categorisation, has emerged as a reference triage method designed to standardize decision-making and improve the accuracy of severity assessments [14,20]. Nevertheless, despite these improvements, accurately identifying the precise level of severity and determining the appropriate course of action remains challenging, even when a medical team intervenes.

2. Limitations and Gaps

Several limitations currently hinder the effectiveness of prehospital regulation and triage in France.

First and foremost, there is no reliable national data to quantify under- and overtriage, which limits the ability to monitor triage performance and assess or improve current practices.

Second, triage reliability still requires improvement, as clinical decision-making alone, especially under pressure or at night, can lead to significant misjudgements, even for the most severe cases of major trauma [27]. These situations highlight the limitations of clinical intuition and underscore the urgent need for new, validated triage tools, likely augmented by artificial intelligence and the use of real-time data [12]. Such tools are expected to save time at the medical dispatch level by assessing the probability of requiring emergent therapy. This type of integrated tool also enables the use of data collected upstream by first responders, as well as monitoring data, thereby enhancing the granularity and precision of medical decision-making.

Third, triage quality is still often assessed using parameters such as the Injury Severity Score, whereas metrics such as the Need for Trauma Intervention (NFTI) appear more relevant than traditional ISS-based thresholds for determining whether a patient has been appropriately triaged [28].

Moreover, while the ABC grading system has emerged as a reference framework, its implementation remains inconsistent across medical dispatch centres and regions, reflecting broader disparities in trauma system maturity [20]. Moreover, the ABC grading system is designed for use by medical professionals, limiting its applicability during the initial stages of triage. This occurs in a context where there is insufficient literature describing telephone-based criteria used by laypersons to recognize major trauma. In this regard, a linguistic and conversation-analytic approach to emergency calls may be needed, as developed in out-of-hospital cardiac arrest but still largely absent in trauma care [29,30]. It is also important to emphasize that the assessment and triage skills of first bystanders in France are highly heterogeneous, as no formal, accredited training exists for non-medical prehospital responders. This constitutes a critical issue when addressing the challenges of the initial triage performed at the time of the emergency call, which relies on the information reported by the first responders at the scene.

Finally, the lack of structured regional and national networks has direct consequences on patient care. Collaboration between SAMUs and SIS units from neighbouring departments remains insufficient and lacks formalized frameworks, despite their complementary responsibilities. Moreover, SAMU teams often operate with limited and unreliable visibility into the availability of in-hospital resources across the territory, making optimal, real-time patient orientation challenging. This lack of visibility is reciprocal: hospitals would clearly benefit from greater insight into prehospital care being delivered by emergency teams. Such visibility could include geolocation, shared vital signs, and information about therapeutic interventions, all aimed at improving anticipation and preparation capacities.

3. Perspectives and Opportunities

Structuring the governance of care. At a time when the governance of emergency response resources may be reconsidered in France, it is essential to affirm that the supervision of patient care must remain under medical oversight. Indeed, while high-stakes strategic decisions, such as the response to emergency situations, may legitimately involve executive authorities, the organization of care must remain grounded in evidence-based medicine and the expertise of trained clinical professionals.

Improving the reliability of triage and the recognition of major trauma from the very first call. Enhancing triage accuracy means reducing the variability in decision-making. This involves a shift from mortality-predictive scores (such as the MGAP score) toward resource-predictive tools like the RedFlag score (which identifies severe haemorrhage management needs)[31–33]. This change in paradigm will allow for better anticipation of care requirements and may rely on artificial intelligence tools. Such tools are expected to assist the regulator by analysing clinical parameters, and eventually unstructured signals such as vocal intonation, to support clinical decision-making [12]. For example, as in the case of acute coronary syndrome, telephone criteria (patient characteristics, history of illness, or words used by callers) must be found. Additionally, connected technologies may allow early projection of the regulator to the field, even before the arrival of first responders, thus improving the quality and coordination of the initial medical response. Finally, if the SAMU has not sent a medical team to a major trauma patient, French rescuers, with their low level of training, need to be able to recognize this. To achieve this, scores much simpler than the ABC grading system need to be developed. More broadly, the proposed triage tools should now be evaluated through high-quality prospective studies or a registry.

Real-Time Information Sharing with a Unique Point of Contact. The implementation of shared digital tools between SAMU, firefighter dispatching, and hospitals is now essential to enable real-time information exchange, whether regarding resource availability, patient data, or situational awareness. This would support an operational view at the regional level and a strategic overview nationally, without calling into question the importance of centralized medical regulation with a single point of contact within each dispatch center. Such data would have to be integrated into the national trauma registry to enable a nationwide trauma system quality improvement program

Shortening trauma orientation decisions. Reducing prehospital delays relies heavily on the early transmission of an initial assessment to the medical regulator. This early report, medicalized, not depending on the situation, and likely to be done within the first 10 minutes on site, would allow the regulator to build the hospital orientation decisions promptly and trauma centres to prepare for patient arrival. This information, combined with structured data streams such as those from patient monitors, could be integrated into digital decision-support tools powered by artificial intelligence. In addition, the need to negotiate admissions to trauma centers on a case-by-case basis often places a burden on dispatch teams, leading to delays in admission, especially for patients with multiple fractures. This delay is particularly problematic for the most critically ill patients, whose survival is closely linked to the timeliness of treatment, as well as for less severely injured patients, who may be perceived as not serious enough for the trauma centre yet too complex for the local hospital. It is proposed, as an operational objective, that all major trauma patients should receive a definitive hospital destination within 30 minutes of first on-scene contact.

Territorial organization and structure. The organization of patient triage and referral should rely on a regional, or at least territorial, framework. Such an approach is essential to ensure consistency, equity, and efficiency in trauma care delivery, particularly in the current context where greater authority in health system governance and crisis management is being devolved

to departmental-level authorities. This consideration is crucial for initial patient referral and supports the longitudinal structuring of care pathways within territories. One of the first steps will be to define a regional strategy aimed at minimizing transport time between the accident site and the trauma center. A strategy for the appropriate use of medical helicopters must be developed and tailored to local territorial contexts.

IV. PREHOSPITAL CARE

1. Current organization

The prehospital management of major trauma patients plays a decisive role in their prognosis. In France, as previously described, this phase is coordinated by the SAMU, often in conjunction with SIS teams. The model of physician-led prehospital care is a historical choice in France that continues to shape the organization of trauma response in the field [23–25].

Structured assessment frameworks such as ABCDE or MARCHE are widely applied to rapidly identify and treat life-threatening injuries. Early haemorrhage control, through compression, tourniquets, or pelvic binders, is a priority, alongside the application of damage control resuscitation principles. This focus reflects the reality that half of all trauma deaths occur within the first hour, during which most preventable fatalities also take place.

It is increasingly recognized that time itself is a therapeutic intervention. The coordinating physician must carefully balance the expected benefit of each procedure against the potential delay in hospital admission, every 10-minute delay being associated with a 4% increase in mortality [7]. Between the traditional paradigms of 'scoop and run,' rapid evacuation to the hospital with minimal on-scene intervention, and 'stay and play,' comprehensive treatment prior to transport, a more nuanced 'play and run' approach has emerged [7]. This strategy emphasizes performing only essential life-saving actions in the prehospital phase while avoiding unnecessary delays in transferring the patient to definitive hospital care.

2. Limitations and Gaps

Despite a structured approach and an increasing emphasis on damage control medicine, the current organization of prehospital trauma care in France still presents several limitations.

A first critical gap lies in the poor development of integrated, real-time communication systems between prehospital teams and receiving trauma centres, which hinders early patient orientation and limits anticipatory resource mobilization. This lack of data sharing is further illustrated by the fact that information from the prehospital phase is inconsistently collected and rarely integrated into national trauma registries, thereby reducing the capacity for performance evaluation and system-wide improvement.

In daily practice, a critical challenge remains the earliest possible recognition of a major trauma patient. Such early detection is indeed essential to enable the trauma system to activate the most appropriate chain of care and, particularly in the prehospital setting, to initiate a medicalized response. The training level of first responder firefighters is standardized

and focused on BLS, with the recent introduction of specific skills such as the use of Hemocue or cardiovascular monitoring tools. However, a large number of firefighters are volunteers with varying levels of skill. This heterogeneity directly affects the management of time-sensitive care, as no national benchmarks currently exist to ensure timely assessments or decision-making, often leading to delays incompatible with the requirements of trauma care.

3. Perspectives and Opportunities

Establish and follow key performance indicators. A pragmatic step forward would be to define explicit time targets for the prehospital phase**.** These timelines are not intended to serve as rigid dogmas to be applied to every patient**,** as valid individual circumstances may justify exceeding them. However, they would provide valuable indicators for temporal comparison within a single centre and for benchmarking across a trauma system. For example, a reasonable target could be a 30-minute delay between the first notification to the dispatch centre and the identification of the destination centre. Such a benchmark could also encourage receiving centres to either acknowledge receipt of the admission or facilitate transfer to a partner centre within the trauma network. Establishing these benchmarks would help synchronise decision-making and optimise patient flow, offering clear and practical criteria for evaluating professional practice.

Implement a graded response system. Under physician-led regulation, a tiered response system should be implemented, integrating first responders, protocol-driven nursing responders, and prehospital medical teams. The overarching objective is to deploy the most appropriate level of pre-hospital resources for each patient, ensuring that a physician systematically attends to major trauma cases. Achieving this requires enhanced triage accuracy to minimize both under-triage and over-triage in prehospital deployment.

Enhance scene visualization for dispatchers. High-quality and secure video transmission tools are now available and widely used in everyday life. These technologies could enable SAMU physicians to gain an early visual assessment of the scene, either through bystanders alerting emergency services or through the first responders already on site. Such approaches have been implemented for several years in prehospital organizations such as Magen David Adom (Israel), where live video feeds from the scene are routinely used to guide dispatch decisions and prehospital care. They could significantly improve triage quality and help optimise the allocation of limited resources in complex situations.

V. RESUSCITATION ROOM, INTERVENTIONAL RADIOLOGY, AND OPERATING ROOM

1. Current organization

The initial hospital care of major trauma patients relies on anticipation, preparation, and tight team coordination. Pre-alerts from medical dispatch, sent before patient arrival, enable in-hospital teams to prepare the resuscitation bay, activate massive transfusion protocols, and ready the operating room for immediate surgical intervention or embolization. Alongside the clinical examination performed by the receiving team, imaging is a cornerstone of trauma management. A rapid trauma assessment using eFAST, chest X-ray, and pelvic X-ray allows

identification of patients requiring immediate surgical or interventional management prior to whole-body CT acquisition [34,35]. This *head-to-pelvis* CT scan has become the gold standard for diagnostic assessment, for hemodynamically stable or stabilized patients, enabling rapid identification of life-threatening injuries and prioritization of therapeutic actions [36,37]. Consequently, trauma centres must guarantee 24/7 immediate access to CT scanners, ideally co-located with trauma bays and operating theatres.

Simultaneously, early activation tools, such as the Red Flag criteria, and standardized handovers at the time of arrival help identify high-risk cases in advance and enhance situational awareness [32]. Upon arrival at the hospital, trauma patients should be taken directly to dedicated trauma bays equipped with standardized resources and located as close as possible, both geographically and operationally, to the operating or interventional radiology room. It is now widely accepted that lost minutes in trauma care, even in the hospital, cannot be recovered and have an impact on in-hospital mortality [38]. Thus, the priorities upon the arrival of a patient in haemorrhagic shock are to identify the source of bleeding, ensure adequate tissue oxygenation and volume status, control bleeding and coagulopathy, and, later on, address the risk of thrombosis [39].

Damage control principles involve abbreviated procedures focused on haemorrhage control and contamination limitation, with the aim of keeping operative time as short as possible for each surgical site [8]. Meanwhile, early administration of tranexamic acid, balanced transfusion strategies with a high plasma-to-red-cell ratio, targeted correction of trauma-induced coagulopathy, and permissive hypotension are maintained until surgical haemostasis is achieved.

2. Limitations and Gaps

The widely promoted concept of the “Golden Hour” was originally intended to highlight the urgency of early trauma management. However, it may have inadvertently created a false sense of having a full hour to intervene, with each team involved, prehospital, resuscitation room, operating or interventional radiology room, sometimes interpreting this window independently. In reality, nearly 50% of trauma-related deaths occur within the first hour following injury, underscoring the critical importance of every minute. This misperception can fragment time management and hinder the coordination of truly time-sensitive care throughout the trauma pathway.

Nevertheless, while trauma leaders, radiologists, and surgeons in Level-1 centres benefit from structured training and high volume of cases, such standardization and daily practice are often lacking in lower-level centres. This raises critical challenges, particularly in non-academic hospitals where experience and expertise are frequently less important, even though these facilities can serve as the first point of access for major trauma patients because of under-triage matters. Moreover, trauma centres’ governance often depends on individuals, typically driven by a single specialty, rather than being embedded in a broader institutional culture. Despite the accelerating development of interventional radiology, its integration into trauma pathways in France remains heterogeneous. While several level-1 trauma centres have established formal “IR activation protocols” with rapid mobilization of on-call teams, this organization is far from standardized nationwide. Access to interventional radiology outside

working hours is uneven, and many level-2 centres lack local expertise, necessitating secondary transfers that may delay definitive care.

Structurally, trauma care is often perceived as a burden rather than a hospital-wide strategic priority. Several factors drive this perception. First, the management of major trauma patients is difficult to capture through standard coding systems, leading to inadequate reimbursement [40]. Second, the on-call surgical coverage required for trauma care competes directly with elective surgical activity, which is both more profitable and more highly valued in academic careers. As a result, trauma surgery and haemostatic embolization remain undercompensated, carry limited academic recognition, and impose continuous care obligations—factors that have long discouraged professionals from pursuing careers in this field.

Finally, tailoring trauma interventions to the specific needs, profiles, and trajectories of individual patients remains more an aspiration than a clinical reality. Although patient heterogeneity is increasingly recognized [41], clear and validated decision-making criteria for guiding key interventions, such as triage to a level-1 trauma centre, indications for damage control surgery or embolization, vasopressor use, or coagulation factor administration, are still lacking. Recent trials, such as CRYOSTAT-2, suggest that certain treatments may offer conditional benefits in specific subgroups (*e.g.*, penetrating trauma), underscoring the urgent need for real-time stratification tools [42]. At the same time, key time-stamped events, such as arrival, imaging, surgery, and interfacility transfers, are often inconsistently recorded, limiting the utility of registries for research, benchmarking, and quality improvement. Therefore, there is a pressing need to reform the data systems used for trauma research, with the aim of better reflecting the actual patient journey and evolving clinical phenotypes across the trauma system. Such improvements would facilitate the identification of which interventions, or combinations thereof, are most effective for specific trauma phenotypes, in defined contexts and organizational settings. [43].

3. Perspectives and Opportunities

Direct access to interventional platforms. Triage protocols should prioritize the direct referral of Grade A and B trauma patients to care units equipped with immediate surgical and interventional capabilities, while minimizing inter-team handovers. Whenever possible, patients should be brought directly to trauma bays designed for rapid access to operating and interventional radiology rooms. Accordingly, direct supervision of the initial assessment by an operating room–based team appears to facilitate a reduction in time to surgical intervention.

In this context, the emergence of hybrid resuscitation rooms and dedicated emergency operating rooms may further reduce initial management delays [44–46]. The overarching goal is to ensure that any patient requiring immediate surgery can be operated on within 30 minutes of arrival or sooner if necessary, and that all others can undergo a CT scan within the same timeframe. This CT scan can, if necessary, be performed in hemodynamically unstable patients [36], and sometimes even *on the way* to the operating room, with the aim of guiding the surgical procedure. Achieving this requires a dedicated trauma team coordinating care from the moment of arrival to the end of the damage control phase.

Standardized medical, interventional, and surgical training. Maintaining trauma care competencies in lower-volume or rural centres remains a major challenge, as clinical exposure

is often limited. To address this, targeted national strategies are needed to ensure equitable training across all regions, including rural centres, for medical, surgical, and interventional specialists. Such strategies could include the certification of damage control competencies and the formal designation of academic leaders in the field, potentially involving the creation of dedicated academic chairs in trauma surgery within level-1 trauma centres. Finally, this vision should clearly be developed within the framework of a trauma system response, with strong inter-hospital connections, up to enabling the immediate deployment of an expert team to a lower-level centre when a patient cannot be transported.

Operation and interventional room prioritization and capacity planning. Hospitals should implement structured systems for prioritizing trauma patients within emergency operating room workflows. This may include rapid scheduling protocols, pre-emptive estimation of surgical durations, and coordinated planning for ICU or downstream bed availability. Such an organization requires inter-specialty coordination and collaboration with specialized professionals such as engineers and logistics experts. Establishing a 24/7 platform for secure image transfer would also facilitate real-time radiological consultation with reference trauma centres, optimise decision-making for secondary transfers, and reduce delays in accessing definitive care [47].

Institutional trauma governance. As suggested by Davenport et al, a trauma centre should be a *specialty hospital, not a hospital of specialties*. In this perspective, it is essential that each trauma centre and each trauma system have clearly identified governance, recognized by clinical teams, hospital leadership, and public authorities alike. This governance must be cross-disciplinary, encompassing the entire continuum of trauma patient care. It should be responsible for overseeing trauma activity as well as for evaluating and maintaining its quality.

VI. CRITICAL CARE

1. Current organization

In addition to conventional organ support, critical care for major trauma patients has, in recent years, incorporated several important innovations. One key development is the increasing recognition of delayed trauma-induced coagulopathy, an entity closely associated with thrombotic complications, systemic inflammation, and multiorgan failure [48]. This delayed coagulopathy is now understood as a consequence of both the initial haemorrhagic insult and the extent of tissue injury. Another key finding is the concept of post-aggressive immunosuppression, which significantly increases susceptibility to secondary infections [49]. In this context, targeted interventions have been explored, such as the potential role of corticosteroids, immunostimulation, or preemptive antibiotic therapy, both of which may help reduce respiratory infection rates during this immunologically vulnerable period [50–52].

Apart from patients with intracranial hypertension or ARDS, a major shift has also occurred in sedation practices over the past decade, with a growing emphasis on light or even no sedation to facilitate early neurological assessment and rehabilitation, with the exception of severe TBI patients. This paradigm shift introduces new challenges, notably the need for effective pain control strategies. To this end, regional anaesthesia, especially thoracic blocks, is increasingly

used in the ICU to enable early mobilization, aligning with Enhanced Recovery After Trauma principles [53–55].

Finally, multidisciplinary collaboration is being implemented earlier in the critical care pathway, with close coordination involving infectious disease specialists, nutritionists, and rehabilitation teams. These collaborations increasingly extend beyond the ICU, with critical care teams taking on advisory roles during postoperative management and contributing to the growing development of post-ICU follow-up clinics.

2. Limitations and Gaps

Despite notable advances, ICU teams still face major challenges in tailoring care to individual risk profiles. For example, current thrombotic risk stratification tools lack specificity, leading to a one-size-fits-all approach that fails to capture patient heterogeneity in coagulation status and immuno-inflammatory responses. Similarly, advanced neuroprognostic methods, such as MRI-based methods, remain poorly accessible and often struggle to discriminate patients in a clinical "grey zone" [56,57].

Also, operational coordination between the ICU, operating room, and surgical wards remains suboptimal, often resulting in fragmented care and, at times, delayed decision-making or interventions. In this context, intermediate care beds are typically reserved for patients with overt organ failure. However, patients with complex medical and surgical needs, such as those with multiple fractures, elderly individuals with multiple comorbidities, thoracic trauma requiring advanced ventilatory strategies, or simply patients at high risk of organ failure, are often managed on conventional wards, despite the potential benefits of enhanced monitoring and support for these populations in intermediate care beds.

Over the last decade, the transition toward lighter sedation protocols may have been insufficiently accompanied by robust pain management strategies [58]. Access to regional anaesthesia techniques, particularly thoracic nerve blocks, remains limited in many ICUs, restricting both patient comfort and the potential for early mobilization.

Critical care for trauma patients is inherently complex and often involves high-stakes decisions with potential life-changing consequences. Yet, patient involvement is frequently limited by impaired consciousness or delirium. Moreover, patients and their families often have only a partial understanding of the care being delivered and their implications. This communication gap limits the ability of healthcare providers to engage patients meaningfully in shared decision-making strategies.

3. Perspectives and Opportunities

Moving toward personalized medicine. While hundreds of predictive models have been published to predict a wide range of possible outcomes, research projects that challenge the real-world effectiveness of these models remain rare. Yet it is clear that what research needs is not another model, but the demonstration of clinicians' ability to implement existing models and assess their impact on meaningful patient outcomes through actionable interventions. Achieving this will require real-time access to high-quality data and the training of physicians in the use of such decision-support tools.

Early Rehabilitation in ICU. It is now necessary to disrupt the traditional sequence in which patients are first evaluated by rehabilitation specialists only after transfer from the ICU to surgical and radiological wards. Rehabilitation specialists should conduct early assessments directly in the ICU, including physiotherapists specifically trained in trauma recovery. The goal is to establish a true rehabilitation continuum that begins as soon as the patient is stable enough.

Strengthening patient and family understanding and involvement. While ICUs have largely opened up to families in recent years, notably by extending visiting hours, it is now time to find solutions to better involve patients and their relatives in decisions that concern them and that concern trauma care organisations. This could include the use of explanatory videos and documents focused on survival challenges and the realities of daily care. Such initiatives are likely to facilitate greater adherence to care decisions and could even foster increased participation in clinical research.

Develop Post-ICU rehabilitation units. These units, dedicated to the transition from intensive care to rehabilitation, serve the most complex and severely affected patients. They particularly focus on trauma cases in which neurological and respiratory impairments persist. Although such units already exist in a few major trauma centres across France, their development remains too slow. They aim to facilitate and streamline the patient's journey by enabling earlier ICU discharge once the patient's condition is sufficiently stable. Technical care, such as prolonged ventilatory weaning, can be continued outside the ICU as part of a coordinated rehabilitation approach delivered by multidisciplinary teams, alongside motor, cognitive, and functional rehabilitation.

VII. SURGICAL WARD AND PERIOPERATIVE MEDICINE

1. Current organization

The surgical ward is a key interface between the acute trauma phase and the patient's long-term trajectory. It is where hospital discharge plans are shaped, whether toward rehabilitation facilities or direct return home. It is also a critical site of expertise for delivering high-quality postoperative surgical and medical care.

To date, the daily management is primarily led by surgical teams, with anesthesiology and intensive care specialists providing support for acute and complex medical issues. In France, the evolution of the name of the specialty 'Anesthesiology and Intensive Care" toward "Anesthesiology, Intensive Care, and Perioperative Medicine" reflects a shift in focus: beyond intraoperative care, Critical Care Anesthesiologists are increasingly expected to intervene in perioperative optimization, risk stratification, and long-term care planning, including addressing non-acute issues.

During this post-resuscitation phase, diagnostic and interventional radiology remain integral to patient care. Follow-up imaging enables early detection of complications, while interventional procedures are frequently used to treat issues such as arterial pseudoaneurysms or postoperative collections. Close integration of radiology into the surgical

ward workflow facilitates timely decision-making, enhances patient recovery, and complements ongoing surgical, medical, and paramedical care.

2. Limitations and Gaps

Despite its strategic importance, the surgical ward currently faces significant organizational challenges. In particular, pain management, anticoagulation strategies, and postoperative infection control are inconsistently applied, sometimes reflecting a lack of investment and medical expertise to manage complex interventions**.** Notably, the absence of standardized postoperative pain management protocols has been identified as a critical gap, underscoring the need for rigorous guidelines [59]. Moreover, many inpatient beds in surgical wards have been closed, concentrating complex cases in the remaining beds, while less complex cases are increasingly managed on an outpatient basis. These issues have significantly increased both surgeons' and nurses' workloads and may also contribute to unnecessarily prolonged hospital stays for some patients.

Also, discharge planning remains fragmented, with insufficient structured linkage between acute hospital care, primary care, and the rehabilitation pathways. This fragmentation can lead to suboptimal patient transitions, which may impair patient outcomes such as readmission rates or hospital length of stay. Moreover, surgical wards are partly structured around elective activity. This organization may, at times, create tensions in bed availability or workflow, especially when urgent trauma admissions coincide with periods of high elective surgical activity. Rather than implying competition, these situations underline the need for improved coordination and greater adaptive capacity across services. Finally, although surgical wards naturally operate within specialty-specific frameworks, the management of severe trauma benefits from a better integration between urgent and elective care pathways, fostering a more resilient and responsive system.

Finally, within the continuum of ICU care challenges, early rehabilitation is often delayed due to persistent physiotherapist understaffing, limited access to specialized equipment (e.g., mobilization chairs, ergocycles), and the late involvement of physical and rehabilitation medicine specialists. Similarly, nutritional support is frequently suboptimal, with limited use of indirect calorimetry to accurately estimate energy needs, potentially further compromising recovery [60]. These gaps can undermine the functional recovery trajectory of major trauma patients.

3. Perspectives and Opportunities

Strengthen Perioperative Medicine in Surgical Wards. Enhancing perioperative medicine within surgical wards is a key strategy to optimise the care continuum for trauma patients. By bridging surgical and medical, this approach can significantly improve recovery trajectories, particularly for complex cases. Furthermore, multidisciplinary perioperative teams, including surgeons, anaesthesiologists-intensivists, rehabilitation specialists, and social workers, could provide consultative support for trauma patients managed elsewhere in the hospital, ensuring continuous, holistic, and perioperatively optimised care. Indeed, beyond the initial phase,

many trauma patients remaining in surgical units no longer require daily surgical interventions but instead need physical therapy, nutritional support, social services, or psychological care.

Strengthen Post-Discharge Support. New opportunities are emerging to intensify monitoring for patients who no longer require intensive care but remain at risk of complications in surgical wards. Wearable technologies could be leveraged to detect early deterioration and guide interventions. These technologies will also provide structured data that will be helpful to feed AI programs dedicated to anticipating patients' failure or complications. In the same spirit, tele-rehabilitation programs should be deployed early for patients discharged home, supporting continuous functional recovery and proactive complication management. Finally, stronger integration with primary care networks will be critical to ensure comprehensive follow-up and address the long-term medical, functional, and social needs of trauma patients after hospital discharge.

Early Identification of Patients at Risk for Prolonged Hospitalization. Early recognition of patients at risk for extended hospital stays may permit timely and early allocation of hospital resources to optimise post-surgical recovery. Systematic risk assessment during the initial days of admission, such as through validated scoring tools, may facilitate targeted interventions and proactive care planning, rather than waiting until discharge becomes imminent. This approach could prevent unnecessary stays in surgical units for patients who no longer require complex surgical care but still need rehabilitation services or social support.

VIII. REHABILITATION, COMMUNITY CARE, AND RETURN TO WORK

1. Current organization

Specialized rehabilitation pathways for trauma patients currently exist within post-acute care facilities in France. These units provide multidisciplinary rehabilitation tailored to patients' primary sequelae and functional autonomy, combining physical therapy, mental health, occupational therapy, social workers, and cognitive or language therapy. In 2017, trauma-related rehabilitation activity accounted for approximately 25% of all inpatient rehabilitation admissions nationwide, representing around 16,000 hospital stays per year [61,62]. These pathways are designed to ensure continuity of care through structured connections with outpatient day programs, specialist consultations, and community-based primary care services.

A particular strength of the French system lies in the fact that care is almost entirely free of charge when the patient is covered by the 'Affections Longue Durée 30' scheme, which can be activated after trauma under certain circumstances. However, for many patients, the financial impact of surviving major trauma persists well beyond the initial recovery period [63].

Finally, silver trauma, which is inherently linked to population aging, is an increasingly important issue. These patients are at high risk of undertriage and require dedicated care pathways, particularly during the rehabilitation phase [64].

2. Limitations and Gaps

Despite their importance, rehabilitation pathways remain insufficiently connected with acute trauma care services. As a result, acute care teams often lack visibility into patient outcomes after transfer, making early rehabilitation planning difficult and decision-making poorly informed by patient trajectories. Conversely, rehabilitation teams are often only minimally informed about the patient's initial care journey. Finally, admission to rehabilitation units is often anticipated late during the hospital stay, even though the need for rehabilitation can frequently be anticipated. This results in unnecessary occupancy of surgical or ICU beds and can delay in the initiation of rehabilitation.

Furthermore, existing specialized rehabilitation pathways, such as "multiple trauma", "complex digestive care", or "neurological injury" are very siloed in France, while many trauma patients present with overlapping conditions (*e.g.*, orthopaedic trauma, brain injury, tracheostomy care), making them poorly suited to the patient's needs. This segmentation leads to eligibility challenges and increases the risk of fragmented care. Moreover, up to 45% of patients develop psychiatric disorders that exacerbate their initial injuries, slow recovery, and compromise clinical outcomes. These disorders are associated with reduced treatment adherence, an increased risk of complications, and a higher likelihood of recurrent trauma, whether intentional or unintentional [65].

It is also essential to better address the growing importance of silver trauma [66,67]. Although these patients are captured in the French Trauma Registry, informal comparisons with international registries suggest that they remain underrepresented in severe trauma pathways [68]. In addition, dedicated pathways for older trauma patients remain largely focused on peripheral limb fractures and would benefit from further strengthening [69].

Finally, it appears essential that trauma care pathways better account for the impact of post-traumatic stress, following the example of recent initiatives addressing post-intensive care syndrome.

3. Perspectives and Opportunities

Develop Transversal Polytrauma Rehabilitation Units. Creation of transversal "polytrauma" rehabilitation units capable of managing complex, mixed pathologies could be a solution to address current gaps. Also, standardizing the implementation of rehabilitation consultations from the time of admission to the ICU or trauma centre, along with strengthening the deployment of mobile rehabilitation teams, could significantly improve trauma patients' early functional assessment.

Standardize the use of functional assessment tools. There is a wide range of tools in the medical literature to assess autonomy, quality of life, and life expectancy after trauma. However, these tools often fail to focus on what truly matters to patients. Moreover, while they are sometimes used in research, they are only rarely implemented in a structured and sustainable way at the level of a centre or population. To address this, measurement tools must be defined through consensus, and these tools should be simple to collect, readily available, and meaningful to patients.

Improved consideration of patients with frailty. This point is especially important for older individuals. For this reason, since 2025, the French Trauma Registry has systematically collected frailty data using the Clinical Frailty Scale [70]. This reflects the need to develop care pathways, particularly for these populations, that extend beyond the acute phase and are strongly integrated with community-based healthcare. However, frailty assessment should also incorporate social and mental health dimensions, which are key determinants in the daily care of patients with major trauma

Establish Personalized Post-Trauma Follow-Up Plans. Each major trauma patient should have, before hospital discharge, an individualized post-trauma care plan ensuring continuity and personalization of long-term healthcare pathways. For patients who are not addressed to rehabilitation units, town-hospital networks should be strengthened, and follow-up care could involve a smartphone application and/or day hospital consultation programs, coordinated by advanced practice nurses. The structure and format of such follow-up should be designed to support patients and to improve their outcomes without becoming an additional burden [71].

Strengthen Links with Primary Care and communities. Stronger partnerships between acute care departments and surgery wards need to be established with primary care, rehabilitation units, mental health specialists, and more broadly with the civil society [72]. “Return to Work” programs could be developed in collaboration with primary care providers and community-based organizations to ensure a comprehensive and supported reintegration process for patients.

Expand Public Prevention Campaigns. Public health efforts must reinforce injury prevention strategies. These communication efforts should be based on the dissemination of prevention messages and public health initiatives aimed at the general population in order to reduce the incidence of everyday life trauma. Inspired by initiatives like *Stop The Bleed* and the *Hartford Consensus*, efforts should also focus on empowering citizens as immediate responders, while maintaining vigilance against the influence of powerful lobbies, particularly in sectors like alcohol and automobile industries.

IX. KEY PERFORMANCE INDICATORS PROPOSITIONS FOR MAJOR TRAUMA CARE

This section aims to propose an initial set of standardized performance indicators for the management of patients with major trauma in France. The proposed indicators correspond to key steps in the trauma care pathway identified by the authors as essential. When appropriate, a reference timeframe is provided. These timeframes are not intended as rigid thresholds that all patients must meet; rather, they should be adapted to the specific clinical context of each situation. They represent population-level targets suitable for benchmarking and quality assessment (**Table 1**).

These indicators could serve as a trauma care footprint for individual centres or trauma systems, enabling systematic evaluation of care quality for patients with major trauma. In addition, they may act as an incentive to promote the structured and sustainable collection of relevant data. Ultimately, these indicators are intended to be shared regularly and transparently at both the centre and trauma system levels.

The current list of indicators, based on expert clinical opinion, must be refined and validated using high-quality research data. Given the limited French evidence on variables associated with trauma care performance, it is essential that each trauma centre contributes data to the national trauma registry to support efforts in evaluating and improving care outcomes.

X. CONCLUSION

The resources required for the management of trauma patients exist in France and operate at a high level of quality. Nevertheless, strengthening coordination at both regional and national levels would further enhance their effectiveness. Establishing a structured national trauma roadmap could guide the strategic alignment of expertise, infrastructure, and care pathways, improving patient outcomes, reducing territorial disparities, and supporting a resilient, integrated trauma care system for the future. Indeed, no single specialty can manage trauma alone, and high-quality care depends on tightly integrated, multidisciplinary pathways.

Author contributions All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.
Yes

Funding This work did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

ACKNOWLEDGEMENTS

1. Presentation of the Gite

The Groupe d'Interface en Traumatologie Grave (GITE) is a multidisciplinary consortium of experts involved in the care of patients with severe trauma. Its mission is to coordinate and support the organization of severe trauma care in France.

The GITE board includes representatives from the different National Professional Councils involved in trauma care (in alphabetical order):

- *Anesthesiology, Critical Care, and Perioperative Medicine:* Prof. Clavier and Prof. Bouzat;
- *Emergency Medicine*: Prof. Bobbia and Prof. Tazarourte,
- *Physical and Rehabilitation Medicine*: Dr. Paquereau and Prof. Allart;
- *Radiology and Interventional Radiology*: Prof. Frandon and Prof. Ghelfi;
- *Surgery*: Prof. Balandraud (Visceral and Digestive Surgery, French Military Health Service), Prof. Dobremez (Pediatric Surgery), Prof. Rongieras (Orthopedic and Trauma Surgery), Prof. Fiard (Urological Surgery), and Prof. Dagain (Neurosurgery, French Military Health Service);
- *Other members*: Prof. Picard (*Anesthesiology, Critical Care, and Perioperative Medicine*) and Dr. Jainsky (*Emergency Medicine*).

2. Collaborators, by alphabetic order (co-investigators listed under the Gite network group author)

Allart, Etienne, Neurorehabilitation Unit, Lille university hospital, university of Lille, Lille, France

Balandraud, Paul, Sainte Anne Military Teaching Hospital, Department of Oncologic and Digestive Surgery, Toulon, France; French Military Health Service Academy, Ecole du Val-de-Grâce, Paris, France

Bertani, Antoine, Service de Chirurgie Orthopédique et Traumatologique, Hôpital Edouard Herriot, Hospices Civils de Lyon, Lyon, France

Bertolus, Chloé, Sorbonne Université. APHP -Service de Chirurgie Maxillo-faciale et Stomatologie

Bobbia, Xavier, IMAGINE, UR UM 103, Montpellier university, Department of Emergency Medicine, Montpellier University, Montpellier, France

Bouzat, Pierre, Univ. Grenoble Alpes, Anesthesiology and Critical Care, Grenoble Alpes University Hospital, Grenoble, France

Clavier, Thomas, CHU Rouen, Department of Anesthesiology, Critical Care and Perioperative Medicine, Normandie Univ, UNIROUEN, INSERM U1096, F-76000 Rouen, France

Dagain, Arnaud, Cranial neurosurgery department, Pierre Wertheimer Neurological Hospital, Hospices Civils de Lyon, Bron, France. Val-de-Grâce academy, Paris, France

Fiard, Gaelle, Department of Urology, Univ. Grenoble Alpes, CNRS, CHU Grenoble Alpes, Grenoble INP, TIMC, Grenoble, France

Frandon, Julien, IMAGINE, Université Montpellier, CHU Nimes, Radiology and Medical Imaging, Montpellier, France

Gauss, Tobias, Univ. Grenoble Alpes, Anesthesiology and Critical Care, Grenoble Alpes University Hospital, Grenoble, France. PBouzat@chu-grenoble.fr.

Gaujoux, Sébastien, Sorbonne Université, Service de chirurgie pancréatique et endocrine, Hôpital Pitié-Salpêtrière, Assistance Publique-Hôpitaux de Paris, Paris, France

Ghelfi, Julien, University of Grenoble-Alpes, Department of Radiology, Grenoble-Alpes University Hospital, La Tronche, France

Girard, Edouard, Department of Digestive Surgery, CNRS, UMR 5525, VetAgro Sup, Grenoble INP, CHU Grenoble Alpes, TIMC, University Grenoble Alpes, Grenoble, France

Jainsky, Laure, CH Paul Ardier Issoire, Services d'Accueil des Urgences, F-63500 Issoire, France

James, Arthur, Sorbonne Université, GRC 29, and Département d'Anesthésie Réanimation, Hôpital Pitié-Salpêtrière, AP-HP, Paris, France

Paquereau, Julie, Department of Physical and Rehabilitation Medicine, Raymond Poincaré Teaching Hospital, AP-HP, 104, boulevard Raymond-Poincaré, Garches, France

Picard, Julien, Univ. Grenoble Alpes, Anesthesiology and Critical Care, Grenoble Alpes University Hospital, Grenoble, France

Raux, Mathieu, Sorbonne Université, GRC 29, and Département d'Anesthésie Réanimation, Hôpital Pitié-Salpêtrière, AP-HP, Paris, France

Tazarourte, Karim, Université Lyon 1, SAMU 69-service des urgences, Hospices civils de Lyon, Lyon 69003, France

Yrondi, Antoine, Department of Psychiatry and Medical Psychology, Resistant Depression and Bipolar Disorder Expert Center, FondaMental, Toulouse University Hospital (CHU Toulouse), Purpan Hospital, ToNIC Toulouse NeuroImaging Center, Toulouse, France

3. Complete list of the GITE members (2025)

Abback Paer-Selim (Tours); Abba Julio (Grenoble); Allart Etienne (Lille); Angles Emeline (Bordeaux); Arnaudet Idriss (Nantes); Arvieux Catherine (Grenoble); Balandraud Paul (Toulon); Barbois Sandrine (Lyon); Beaussant Luc (Paris); Berthiau Jezequel Robin (Lyon); Bijok Benjamin (Lille); Bobbia Xavier (Montpellier); Boddaert Guillaume (Caen); Bouhours Guillaume (Angers); Bouzat Pierre (Grenoble); Bouras Marwan (Brest); Boutonnet Mathieu (Percy); Bruneau Nathalie (Lille); Cardinale Michael (Toulon); Carrie Cédric (Bordeaux); Cesareo Eric (Lyon); Charbit Jonathan (Montpellier); Chouihed Tahar (Nancy); Clavier Thomas (Rouen); Clovet Olivier (Paris); Dagain Arnaud (Toulon); David Jean-Stéphane (Lyon); Desseauve David (Grenoble); Dobremez Eric (Bordeaux); Dubuisson Vincent (Bordeaux); Dussau Leslie (Colmar); Feral Pierssens Anne-Laure (Bobigny); Fiard Gaëlle (Grenoble); Foucrier Arnaud (Paris); Frandon Julien (Nîmes); Garrigue Delphine (Lille); Gauss Tobias (Grenoble); Gaujoux Sébastien (Paris); Ghelfi Julien (Grenoble); Girard Edouard (Grenoble); Glasman Pauline (Paris); Godier Anne (Paris); Harrois Anatole (Kremlin-Bicêtre); Holleville Mathilde (Clichy); Incagnoli Pascal (Dijon); Jainsky Laure (Issoire); James Arthur (Paris); Jurcisin Igor (Paris); Kurfurst Nicolas (Poitiers); Langlois Olivier (Rouen); Launey Yoann (Rennes); Lebouvier Thomas (Rennes); Leone Marc (Marseille); Le Courtois du Manoir Maxime (Nantes); Levrat Albrice (Annecy); Lin Stéphanie (Grenoble); Martinière Hugo (Nîmes); Martin Vincent Jean Hubert (Marseille); Moyer Jean-Denis (Caen); Mora Pierre (Marseille); Nadji Abdelouaid (Dijon); Nothomb Jocelyn (Rennes); Outrey Justin (Besançon); Pessaux Patrick (Strasbourg); Philippe Jean-Marc ([Ville non précisée]); Picard Julien (Grenoble); Plenier Isabelle (Lille); Pottecher Julien (Strasbourg); Rahoui Alexandre (Poitiers); Ramonda Véronique (Toulouse); Rieu Benjamin (Clermont); Robert Jardine Jean-Baptiste (Lille); Rongieras Frédéric (Lyon); Rooze Paul (Nantes); Rousseau Geoffroy (Tours); Sapir David (Paris); Soulat Louis (Rennes); Taalba Medhi (Rouen); Taverna Xavier Jean (Lyon); Tazarourte Karim (Lyon); Travers Stéphane (Paris); Tresallet Christophe (Paris); Tresson Philippe (Marseille); Turgeon Alexis (Canada); Verhoye Jean-Philippe (Rennes); Yordanov Youri (Lyon).

Conflict of Interest

The authors declare that they have no known competing financial or personal relationships that could be viewed as influencing the work reported in this paper.

References

[1] Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet 2020;396:1204–22. https://doi.org/10.1016/S0140-6736(20)30925-9.

[2] Herrera-Escobar JP, Schneider JC. From Survival to Survivorship — Framing Traumatic Injury as a Chronic Condition. N Engl J Med 2022;387:581–3. https://doi.org/10.1056/NEJMp2205162.

[3] Bège T, Pauly V, Orleans V, Boyer L, Leone M. Epidemiology of trauma in France: mortality and risk factors based on a national medico-administrative database. Anaesth Crit Care Pain Med 2019;38:461–8. https://doi.org/10.1016/j.accpm.2019.02.007.

[4] Davis KA, Fabian TC, Cioffi WG. The Toll of Death and Disability From Traumatic Injury in the United States—The "Neglected Disease" of Modern Society, Still Neglected After 50 Years. JAMA Surg 2017;152. https://doi.org/10.1001/jamasurg.2016.4625.

[5] Committee on Military Trauma Care's Learning Health System and Its Translation to the Civilian Sector, Board on Health Sciences Policy, Board on the Health of Select Populations, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine, Donald Berwick, et al. A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths After Injury. Wash DC Natl Acad Press US 2016. https://doi.org/10.17226/23511.

[6] The committee on trauma and committee on shock, Division of medical sciences, National academy of sciences, National research council. Accidental death and disability: the neglected disease of modern society. Natl Acad Sci 1966.

[7] Gauss T, Ageron F-X, Devaud M-L, Debaty G, Travers S, Garrigue D, et al. Association of Prehospital Time to In-Hospital Trauma Mortality in a Physician-Staffed Emergency Medicine System. JAMA Surg 2019;154:1117. https://doi.org/10.1001/jamasurg.2019.3475.

[8] Clarke JR, Trooskin SZ, Doshi PJ, Greenwald L, Mode CJ. Time to Laparotomy for Intra-abdominal Bleeding from Trauma Does Affect Survival for Delays Up to 90 Minutes: J Trauma Inj Infect Crit Care 2002;52:420–5. https://doi.org/10.1097/00005373-200203000-00002.

[9] James A, Ravaud P, Riveiros C, Raux M, Tran V-T. Completeness and mismatch of Patient-Important Outcomes after trauma. Ann Surg Open 2022;3. https://doi.org/10.1097/AS9.0000000000000211.

[10] MacKenzie EJ, Jurkovich GJ, Frey KP, Scharfstein DO. A National Evaluation of the Effect of Trauma-Center Care on Mortality. N Engl J Med 2006:366–78. https://doi.org/10.1056/NEJMsa052049.

[11] Frock A, Robbins JT, Vital-Lopez FG, Desai V, Doros G, Sands BE, et al. A Case Study of AI-Enabled Software as a Medical Device Cleared by the FDA for Assessing Hemorrhage Risk Index (APPRAISE-HRI) after Trauma. NEJM AI 2025;2. https://doi.org/10.1056/AIcs2401170.

[12] Gauss T, James A, Colas C, Delhaye N, Holleville M, Bijok B, et al. Comparison of machine learning and human prediction to identify trauma patients in need of hemorrhage control resuscitation (ShockMatrix study): a prospective observational study. Lancet Reg Health - Eur 2025;55:101340. https://doi.org/10.1016/j.lanepe.2025.101340.

[13] Demetriades D, Martin M, Salim A, Rhee P, Brown C, Chan L. The Effect of Trauma Center Designation and Trauma Volume on Outcome in Specific Severe Injuries. Ann Surg 2005;242:512–9. https://doi.org/10.1097/01.sla.0000184169.73614.09.

[14] Gauss T, Balandraud P, Frandon J, Abba J, Ageron FX, Albaladejo P, et al. Strategic proposal for a national trauma system in France. Anaesth Crit Care Pain Med 2019;38:121–30. https://doi.org/10.1016/j.accpm.2018.05.005.

[15] American College of Surgery. Part 4: America's Incomplete Trauma System n.d. https://www.facs.org/quality-programs/trauma/systems/trauma-series/part-iv/.

[16] World Health Organisation. Guidelines for trauma quality improvement programmes n.d.

[17] Davenport RA, Tai N, West A, Bouamra O, Aylwin C, Woodford M, et al. A major trauma centre is a specialty hospital not a hospital of specialties. Br J Surg 2009;97:109–17. https://doi.org/10.1002/bjs.6806.

[18] Brooke Lerner E, Shah MN, Swor RA, Cushman JT, Guse CE, Brasel K, et al. Comparison of the 1999 and 2006 Trauma Triage Guidelines: Where Do Patients Go?? Prehosp Emerg Care 2011;15:12–7. https://doi.org/10.3109/10903127.2010.519819.

[19] Mullan F. Seasons of Survival: Reflections of a physician with Cancer. N Engl J Med 1985;313:270–3. https://doi.org/10.1056/NEJM198507253130421.

[20] Bouzat P, GITE Network. Standardizing categorization of major trauma patients in France: A position paper from the GITE Network. Anaesth Crit Care Pain Med 2024;43. https://doi.org/10.1016/j.accpm.2024.101345.

[21] Bouzat P, Ageron F-X, Brun J, Levrat A, Berthet M, Rancurel E, et al. A regional trauma system to optimize the pre-hospital triage of trauma patients. Crit Care 2015;19:111. https://doi.org/10.1186/s13054-015-0835-7.

[22] Haas B, Gomez D, Zagorski B, Stukel TA, Rubenfeld GD, Nathens AB. Survival of the Fittest: The Hidden Cost of Undertriage of Major Trauma. J Am Coll Surg 2010;211:804–11. https://doi.org/10.1016/j.jamcollsurg.2010.08.014.

[23] Yeguiayan J-M, Garrigue D, Binquet C, Jacquot C, Duranteau J, Martin C, et al. Medical pre-hospital management reduces mortality in severe blunt trauma: a prospective epidemiological study. Crit Care 2011;15:R34. https://doi.org/10.1186/cc9982.

[24] Lavery MD, Aulakh A, Christian MD. Benefits of targeted deployment of physician-led interprofessional pre-hospital teams on the care of critically Ill and injured patients: a systematic review and meta-analysis. Scand J Trauma Resusc Emerg Med 2025;33:1. https://doi.org/10.1186/s13049-024-01298-8.

[25] Maddock A, Corfield AR, Donald MJ, Lyon RM, Sinclair N, Fitzpatrick D, et al. Prehospital critical care is associated with increased survival in adult trauma patients in Scotland. Emerg Med J 2020;37:141–5. https://doi.org/10.1136/emermed-2019-208458.

[26] David JS, Bouzat P, Raux M. Evolution and organisation of trauma systems. Anaesth Crit Care Pain Med 2019;38:161–7. https://doi.org/10.1016/j.accpm.2018.01.006.

[27] Nakahara S, Matsuoka T, Ueno M, Mizushima Y, Ichikawa M, Yokota J, et al. Predictive Factors for Undertriage Among Severe Blunt Trauma Patients: What Enables Them to Slip Through an Established Trauma Triage Protocol? J Trauma Inj Infect Crit Care 2010;68:1044–51. https://doi.org/10.1097/TA.0b013e3181aca144.

[28] Chin B, Alter N, Wright D-D, Arif H, Haddadi M, OLeary J, et al. Assessing Effectiveness and Efficiency of Need for Trauma Intervention (NFTI) and Modified NFTI in Identifying Overtriage and Undertriage Rates and Associated Outcomes. Am Surg 2023;89:6181–9. https://doi.org/10.1177/00031348231191225.

[29] Riou M, Ball S, Williams TA, Whiteside A, O'Halloran KL, Bray J, et al. "Tell me exactly what's happened": When linguistic choices affect the efficiency of emergency calls for cardiac arrest. Resuscitation 2017;117:58–65. https://doi.org/10.1016/j.resuscitation.2017.06.002.

[30] Riou M, Feral-Pierssens AL, Tourette-Turgis C, Tazarourte K, Freund Y, Pelaccia T, et al. Que peuvent apporter les sciences humaines et sociales à la recherche en médecine d'urgence ? Ann Fr Médecine D'urgence 2019;9:1–4. https://doi.org/10.3166/afmu-2018-0118.

[31] Sartorius D, Le Manach Y, David J-S, Rancurel E, Smail N, Thicoïpé M, et al. Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP): A new simple prehospital triage score to predict mortality in trauma patients. Crit Care Med 2010;38:831–7. https://doi.org/10.1097/CCM.0b013e3181cc4a67.

[32] Hamada SR, Rosa A, Gauss T, Desclefs J-P, Raux M, Harrois A, et al. Development and validation of a pre-hospital "Red Flag" alert for activation of intra-hospital haemorrhage control response in blunt trauma. Crit Care 2018;22:113. https://doi.org/10.1186/s13054-018-2026-9.

[33] Nunez TC, Voskresensky IV, Dossett LA, Shinall R, Dutton WD, Cotton BA. Early Prediction of Massive Transfusion in Trauma: Simple as ABC (Assessment of Blood Consumption)? J Trauma Inj Infect Crit Care 2009;66:346–52. https://doi.org/10.1097/TA.0b013e3181961c35.

[34] Planquart F, Marcaggi E, Blondonnet R, Clovet O, Bobbia X, Boussat B, et al. Appropriateness of Initial Course of Action in the Management of Blunt Trauma Based on a Diagnostic Workup Including an Extended Ultrasonography Scan. JAMA Netw Open 2022;5:e2245432. https://doi.org/10.1001/jamanetworkopen.2022.45432.

[35] Peytel E, Menegaux F, Cluzel P, Langeron O, Coriat P, Riou B. Initial imaging assessment of severe blunt trauma. Intensive Care Med 2001;27:1756–61. https://doi.org/10.1007/s00134-001-1119-z.

[36] Huber-Wagner S, Biberthaler P, Häberle S, Wierer M, Dobritz M, Rummeny E, et al. Whole-Body CT in Haemodynamically Unstable Severely Injured Patients – A Retrospective, Multicentre Study. PLoS ONE 2013;8:e68880. https://doi.org/10.1371/journal.pone.0068880.

[37] Huber-Wagner S, Lefering R, Qvick L-M, Körner M, Kay MV, Pfeifer K-J, et al. Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicentre study. The Lancet 2009;373:7.

[38] Marsden MER, Vulliamy PED, Carden R, Naumann DN, Davenport RA. Trauma Laparotomy in the UK: A Prospective National Service Evaluation. J Am Coll Surg 2021;233:383–94. https://doi.org/10.1016/j.jamcollsurg.2021.04.031.

[39] Rossaint R, Afshari A, Bouillon B, Cerny V, Cimpoesu D, Curry N, et al. The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition. Crit Care 2023;27:80. https://doi.org/10.1186/s13054-023-04327-7.

[40] Perozziello A, Gauss T, Diop A, Frank-Soltysiak M, Rufat P, Raux M, et al. La codification PMSI identifie mal les traumatismes graves. Rev DÉpidémiologie Santé Publique 2018;66:43–52. https://doi.org/10.1016/j.respe.2017.10.002.

[41] Jeanmougin T, Cole E, Duceau B, Raux M, James A. Heterogeneity in defining multiple trauma: a systematic review of randomized controlled trials. Crit Care 2023;27:363. https://doi.org/10.1186/s13054-023-04637-w.

[42] Davenport R, Curry N, Fox EE, Thomas H, Lucas J, Evans A, et al. Early and Empirical High-Dose Cryoprecipitate for Hemorrhage After Traumatic Injury: The CRYOSTAT-2 Randomized Clinical Trial. JAMA 2023;330:1882. https://doi.org/10.1001/jama.2023.21019.

[43] Gauss T, Bouzat P, Josse J. From bedside to data and back to bedside: why do we need better data to perform trauma phenotyping and improve trauma care? Intensive Care Med 2025;51:1161–3. https://doi.org/10.1007/s00134-025-07946-6.

[44] Ito K, Nagao T, Tsunoyama T, Kono K, Tomonaga A, Nakazawa K, et al. Hybrid emergency room system improves timeliness of angioembolization for pelvic fracture. J Trauma Acute Care Surg 2020;88:314–9. https://doi.org/10.1097/TA.0000000000002544.

[45] 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;90:232–9. https://doi.org/10.1097/TA.0000000000003020.

[46] Lepercq D, Gauss T, Godier A, Bellet J, Bouhours G, Bouzat P, et al. Association of Organizational Pathways With the Delay of Emergency Surgery. JAMA Netw Open 2023;6:e238145. https://doi.org/10.1001/jamanetworkopen.2023.8145.

[47] Agence du numérique en santé. Le Ségur du numérique en santé pour l'imagerie médicale n.d. https://esante.gouv.fr/segur/imagerie-medicale (accessed April 23, 2026).

[48] Moore EE, Moore HB, Kornblith LZ, Neal MD, Hoffman M, Mutch NJ, et al. Trauma-induced coagulopathy. Nat Rev Dis Primer 2021;7:30. https://doi.org/10.1038/s41572-021-00264-3.

[49] Roquilly A, Jacqueline C, Davieau M, Mollé A, Sadek A, Fourgeux C, et al. Alveolar macrophages are epigenetically altered after inflammation, leading to long-term lung immunoparalysis. Nat Immunol 2020;21:636–48. https://doi.org/10.1038/s41590-020-0673-x.

[50] Dahyot-Fizelier C, Lasocki S, Kerforne T, Perrigault PF, Geeraerts T, Asehnoune K, et al. Ceftriaxone to prevent early ventilator-associated pneumonia in patients with acute brain injury: a multicentre, randomised, double-blind, placebo-controlled, assessor-masked superiority trial. Lancet Respir Med 2024;12:375–85.

[51] Roquilly A, Mahe PJ, Seguin P, Guitton C, Floch H, Tellier AC, et al. Hydrocortisone Therapy for Patients With Multiple Trauma. JAMA 2011;305.

[52] Bodinier M, Peronnet E, Llitjos J-F, Kreitmann L, Brengel-Pesce K, Rimmelé T, et al. Integrated clustering of multiple immune marker trajectories reveals different immunotypes in severely injured patients. Crit Care 2024;28:240. https://doi.org/10.1186/s13054-024-04990-4.

[53] Hardcastle TC, Gaarder C, Balogh Z, D'amours S, Davis KA, Gupta A, et al. Guidelines for Enhanced Recovery After Trauma and Intensive Care (ERATIC): Enhanced Recovery After Surgery (ERAS) Society and International Association of Trauma Surgery and Intensive Care (IATSIC) Recommendations: Paper 1: Initial Care—Pre and Intraoperative Care Until ICU, Including Non-Operative Management. World J Surg 2025;49:1997–2028. https://doi.org/10.1002/wjs.70002.

[54] Hardcastle TC, Gaarder C, Balogh Z, D'amours S, Davis KA, Gupta A, et al. Guidelines for Enhanced Recovery After Trauma and Intensive Care (ERATIC): Enhanced Recovery After Surgery (ERAS) and International Association for Trauma Surgery and Intensive Care (IATSIC) Society Recommendations: Paper 2: Postoperative and Intensive Care Recommendations. World J Surg 2025;49:2029–54. https://doi.org/10.1002/wjs.70004.

[55] Hardcastle TC, Gaarder C, Balogh Z, D'amours S, Davis KA, Gupta A, et al. Guidelines for Enhanced Recovery After Trauma and Intensive Care (ERATIC): Enhanced Recovery After Surgery (ERAS) and International Association for Trauma Surgery and Intensive Care (IATSIC) Society Recommendations: Part 3: Trauma Ethics and Systems Aspects. World J Surg 2025;49:2055–65. https://doi.org/10.1002/wjs.70003.

[56] Puybasset L, Perlbarg V, Unrug J, Cassereau D, Galanaud D, Torkomian G, et al. Prognostic value of global deep white matter DTI metrics for 1-year outcome prediction in ICU traumatic brain injury patients: an MRI-COMA and CENTER-TBI combined study. Intensive Care Med 2022;48:201–12. https://doi.org/10.1007/s00134-021-06583-z.

[57] Velly L, Perlbarg V, Boulier T, Adam N, Delphine S, Luyt C-E, et al. Use of brain diffusion tensor imaging for the prediction of long-term neurological outcomes in patients after cardiac arrest: a multicentre, international, prospective, observational, cohort study. Lancet Neurol 2018;17:317–26. https://doi.org/10.1016/S1474-4422(18)30027-9.

[58] Blanchard F, Barage A, Bouhemad B, Miard C, Breteau I, Martino F, et al. Epidemiology of pain, delirium, psychiatric disorders, discomfort and sedation-analgesia management in the intensive care unit: a one-day nationwide study. Crit Care 2025;29:483. https://doi.org/10.1186/s13054-025-05654-7.

[59] Joseph JM, Gori D, Curtin C, Hah J, Ho VT, Asch SM, et al. Gaps in standardized postoperative pain management quality measures: A systematic review. Surgery 2022;171:453–8. https://doi.org/10.1016/j.surg.2021.08.004.

[60] Wischmeyer PE, Bear DE, Berger MM, De Waele E, Gunst J, McClave SA, et al. Personalized nutrition therapy in critical care: 10 expert recommendations. Crit Care 2023;27:261. https://doi.org/10.1186/s13054-023-04539-x.

[61] Peretti C, Woimant F, Schnitzler A. Les patientèles des SSR spécialisés pour les affections de l'appareil locomoteur et les affections du système nerveux. Doss DREES 2019;44.

[62] Direction de la recherche, des études, de l'évaluation et des statistiques. Les patients suivis en soins de suite et de réadaptation. Établ Santé En 2022 n.d.:130–6.

[63] James A, Tran V-T, Gauss T, Hamada S, Roquet F, Bitot V, et al. Important issues to severe trauma survivors: a qualitative study. Ann Surg 2022;275:189–95. https://doi.org/10.1097/SLA.0000000000003879.

[64] De Simone B, Chouillard E, Podda M, Pararas N, De Carvalho Duarte G, Fugazzola P, et al. The 2023 WSES guidelines on the management of trauma in elderly and frail patients. World J Emerg Surg 2024;19:18. https://doi.org/10.1186/s13017-024-00537-8.

[65] Simske NM, Breslin MA, Hendrickson SB, York KP, Vallier HA. Implementing recovery resources in trauma care: impact and implications. OTA Int Open Access J Orthop Trauma 2019;2:e045. https://doi.org/10.1097/OI9.0000000000000045.

[66] Legros V, Seube-Remy P-A, Floch T, Chauchard C, Leclercq-Rouget M, Prevot-Minella P-A, et al. Frailty and 6-month trajectory of elderly trauma patients over the age of 65 years admitted to intensive care unit for severe trauma: experience of a level 1 trauma center. BMC Geriatr 2024;24:759. https://doi.org/10.1186/s12877-024-05350-1.

[67] Legros V, Picard B, Pasqueron J, Kanagaratnam L, Garrigue D, Rozenberg E, et al. Prognosis of major trauma in patients older than 85 years admitted to the ICU, a registry-based study. Eur J Trauma Emerg Surg 2024;50:3199–208. https://doi.org/10.1007/s00068-024-02622-8.

[68] Alshibani A, Alharbi M, Conroy S. Under-triage of older trauma patients in prehospital care: a systematic review. Eur Geriatr Med 2021;12:903–19. https://doi.org/10.1007/s41999-021-00512-5.

[69] Boddaert J, Cohen-Bittan J, Khiami F, Le Manach Y, Raux M, Beinis J-Y, et al. Postoperative Admission to a Dedicated Geriatric Unit Decreases Mortality in Elderly Patients with Hip Fracture. PLoS ONE 2014;9:e83795. https://doi.org/10.1371/journal.pone.0083795.

[70] Rockwood K. A global clinical measure of fitness and frailty in elderly people. Can Med Assoc J 2005;173:489–95. https://doi.org/10.1503/cmaj.050051.

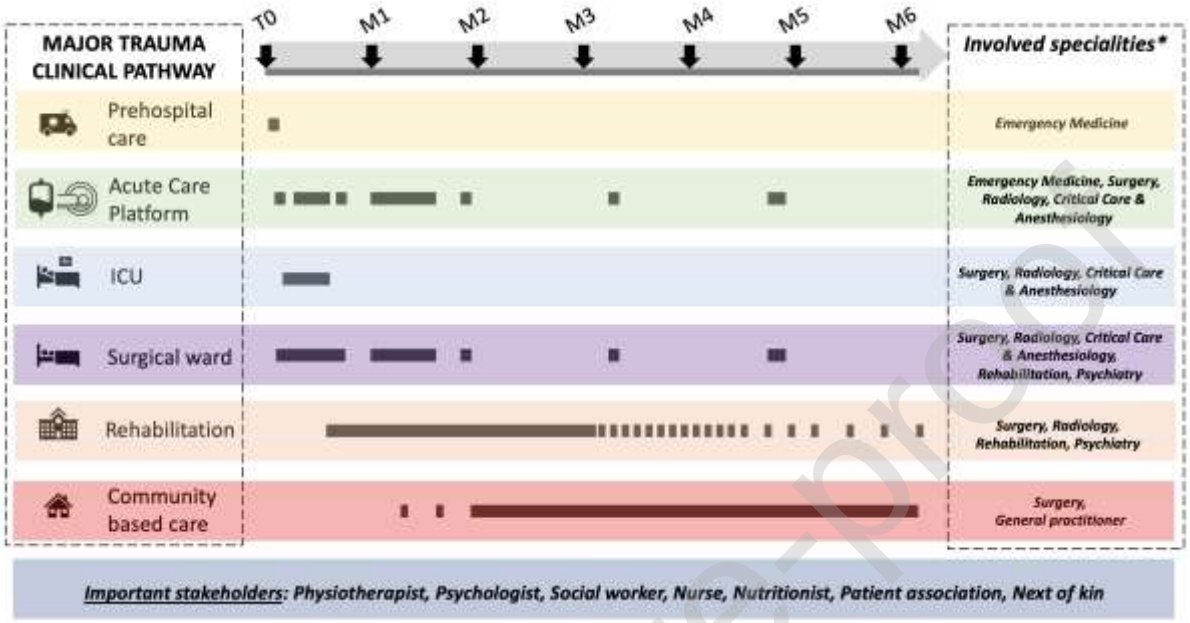
[71] Sharshar T, Grimaldi-Bensouda L, Siami S, Cariou A, Salah AB, Kalfon P, et al. A randomized clinical trial to evaluate the effect of post-intensive care multidisciplinary consultations on mortality and the quality of life at 1 year. Intensive Care Med 2024;50:665–77. https://doi.org/10.1007/s00134-024-07359-x.

[72] Haider AH, Haut ER, Velmahos GC. Converting Bystanders to Immediate Responders: We Need to Start in High School or Before. JAMA Surg 2017;152:909. https://doi.org/10.1001/jamasurg.2017.2231.

FIGURE

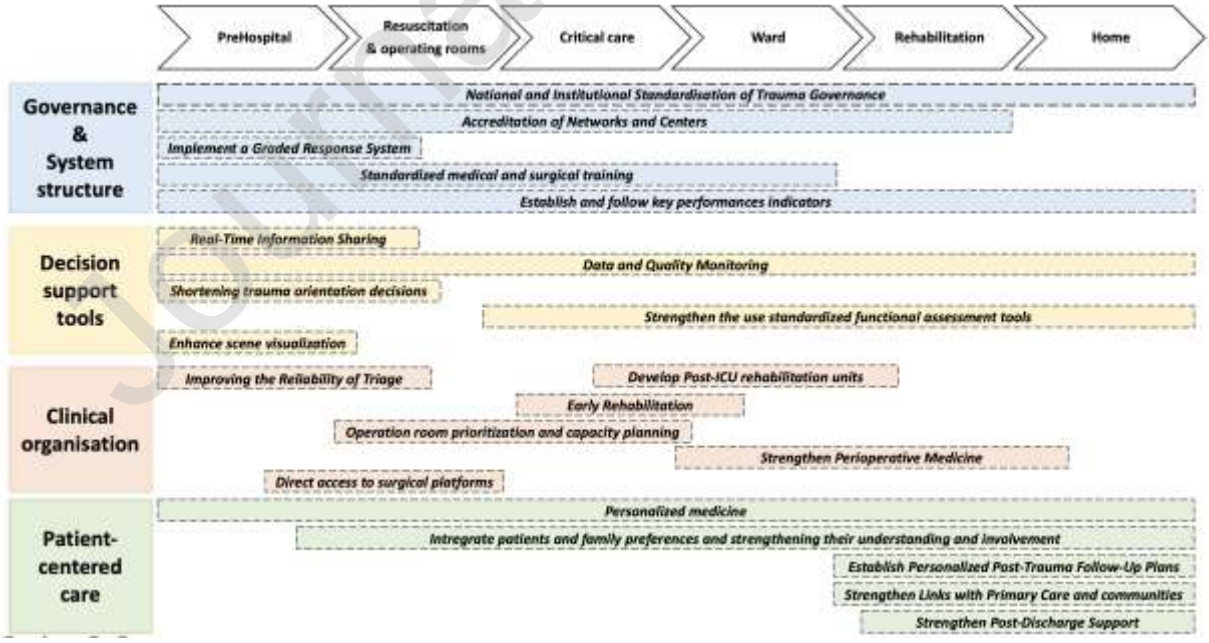
1. **Figure 1: Involvement of specialties throughout patient's care pathway, illustrating the constant multidisciplinary nature of trauma management**

The proposed list of specialties is not exhaustive. Radiology includes both conventional radiology and interventional radiology.



2. **Figure 2: Key perspectives and opportunities across the trauma care timeline**

The timing of these interventions may be extended or shortened depending on clinical circumstances and contextual factors.



TABLES

Table 1: Propositions of trauma system and trauma centres key performance indicators

Indicators	Description / Unit	Possible thresholds for dichotomization	Availability in the national Traumabase registry
Structure indicators			
Existence of multidisciplinary trauma governance	Yes /No		**No**
Institutional funding dedicated to trauma epidemiology	Yes /No		**No**
Proportion of trauma patients included in the national registry	**%**		**No**
Existence of multidisciplinary morbidity and mortality review dedicated to trauma	Yes /No		**No**
Epidemiological indicators			
Total number of trauma patients managed	Number		Yes
Distribution by GRADE (A/B/C) severity classification	Number		Yes
In-hospital mortality rate	%		Yes
Gap between observed and predicted mortality	%		Yes
Under-triage rate[£]	%	5%	**No**
Over-triage rate[$]	%	30%	Possibly
Proportion of patients aged >75 years	%		Yes
Proportion of patients aged <15 years	%		Yes
Number of incoming secondary transfers	Number		Yes
Number of outgoing secondary transfers	Number		Yes
Pre-Hospital indicators			
Delay to the first medical team on site	Median [IQR]	25 min	Yes
Delay between the team on site and the first handover the medical dispatch centre	Median [IQR]	10 mn	**No**
Delay between notification to the medical dispatch centre and identification of the destination centre	Median [IQR]	30 mn	**No**
Medical time on scene (from arrival to departure)	Median [IQR]	30 mn	Yes
Medial total medical time (on site + transport to the trauma center)	Median [IQR]	60 mn	Yes
Proportion of patients transported to the hospital by a medicalized means	%		Yes
Proportion of patients presenting with haemorrhagic shock receiving tranexamic acid ??? bof	%		Yes
Proportion of secondary medicalisation rate.	%		**No**
Helicopter transportation	%		Yes
Proportion Prehospital tracheal intubation	%		Yes
Dead on scene	%		**No**
Prehopital use blood component	%		Yes
Early care hospital Indicators			

Proportion of patients who received at least one unit of red blood cells within the first six hours after hospital admission	%		Yes
Proportion of patients presenting with a Glasgow Coma Scale score ≤ 8 or with abnormal CT findings	%		Yes
Proportion of patients undergoing CT scan	%		Yes
Proportion of patients undergoing direct haemorrhage control procedures (without prior CT scan)	%		Yes
Delay between arrival in the resuscitation room and departure for haemorrhage control procedures or CT scan	Median [IQR]	30 mn	Yes
Delay between arrival in the resuscitation room and completion of damage control surgery (t_o = time of operating room admission)	Median [IQR]	60 mn	**No**
Hospital length of stay	Median [IQR]		Yes
Intensive care unit length of stay	Median [IQR]		Yes
Duration of mechanical ventilation (excluding intraoperative period)	Median [IQR]		Yes
Proportion of patients undergoing surgery within 24 hours	**%**		Yes
Proportion of patients undergoing interventional radiology within 24 hours	**%**		Yes
Proportion of patient readmitted in critical care within 7 days after discharge	%		**No**
Later in hospital indicator			
Proportion of patient readmitted within 14 days after discharge			**No**
Proportion of patients receiving a psychological assessment before discharge	%		**No**
Proportion of patients receiving opioid treatment for more than 7 days with a pain specialist assessment	**%**		**No**
Proportion of patients with an ICU stay > 7 days or a ward stay > 15 days who received a rehabilitation assessment	**%**		**No**
Proportion of patients with an ICU stay > 7 days or a ward stay > 15 days who received a social worker assessment	**%**		**No**
Proportion of patients admitted in ICU	%		Yes
Proportion of patients discharged to a rehabilitation facility	%		**No**
Proportion of patients discharged at home	%		**No**
Later care Indicators			
Proportion of patients with a general practitioner visit within 7 days after hospital discharge	**%**		**No**
Proportion of patients receiving a mental health evaluation within 3 months after hospital discharge	**%**		**No**
Proportion of patients receiving a chronic pain risk assessment within 6 months after hospital discharge	**%**		**No**
Proportion of patients who have returned to their pre-injury living situation and activity 6 months after trauma	**%**		**No**
Proportion of patients who have returned to work 6 months after trauma	**%**		**No**
Proportion of patients discharged alive who died within the first year after discharge	**%**		**No**

$^{\$£}$ % of secondary admission. $^{\$}$ % of ISS < 9. The proposed temporal thresholds for dichotomization are provided for illustrative purposes; they should not be interpreted as

values below which a patient would be considered inadequately treated, but rather as tools useful for population-level comparison and monitoring.