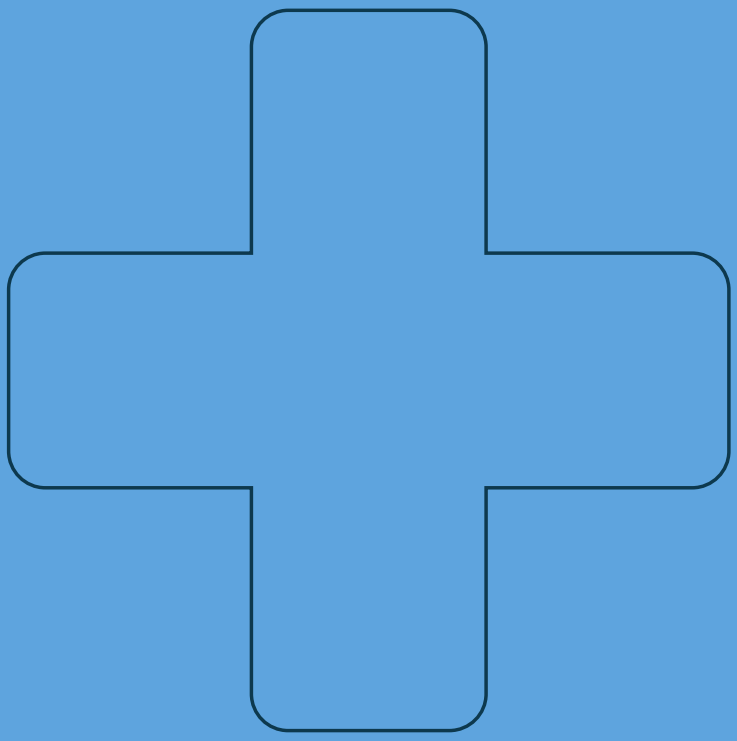
NEW PATIENT REGISTRY COHORT REPORT

# TRAUMA INDEX



FIFTH EDITION

2026

eso®

INSIGHTS AND BEST PRACTICES FOR

TRAUMA SYSTEMS

# Introduction

The measures in this report are built around decision points – moments in trauma care where a center's understanding of its own data, measured against a broader evidence base, can improve both performance and patient outcomes. Now in its fifth edition, the 2026 ESO Trauma Index is one of three annual indices, along with the EMS Index and Fire Service Index, that ESO releases to share trends and best practices. Powered by the ESO Data Collaborative, this Index offers insights and best practice recommendations for trauma centers and trauma systems quality improvement programs. This year's Trauma Index explores more than 84,000 patient encounters from 100 facilities with arrival dates between January 1, 2025 and December 31, 2025. This cohort reflects facilities that have transitioned to ESO's cloud-based patient registry platform, representing a group at the forefront of ESO's evolving registry ecosystem.

**A note on naming:** The naming convention for this edition of the ESO Trauma Index has been updated to align with the 2026 ESO EMS Index and 2026 ESO Fire Service Index, all of which are released annually. Previous editions of the Trauma Index were titled by the year of the data rather than the year of publication.

All measures presented in the ESO Trauma Index are calculated exclusively from records that meet National Trauma Data Bank (NTDB) submission criteria, with an abstraction status of **"Yes."** This means only fully abstracted, submission-ready records are included in any measure calculation. Partial records, records pending abstraction, and non-submission encounters are excluded. This approach ensures that the data underlying every metric in this Index reflects the same high-quality, standardized dataset that trauma centers submit for national benchmarking.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**84,071**
Total Encounters

**100**
Facilities

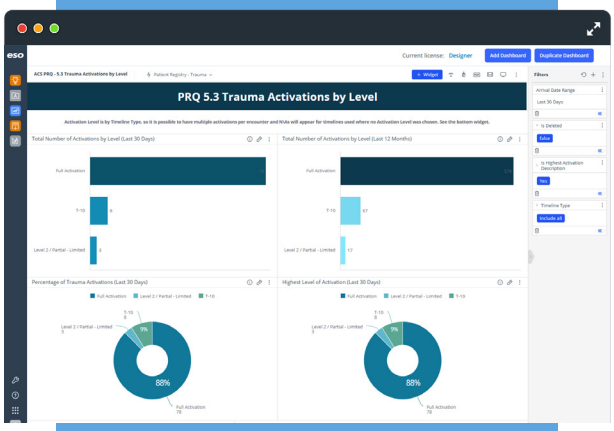
## INJURY SEVERITY CODING: WHY VERSION MATTERS

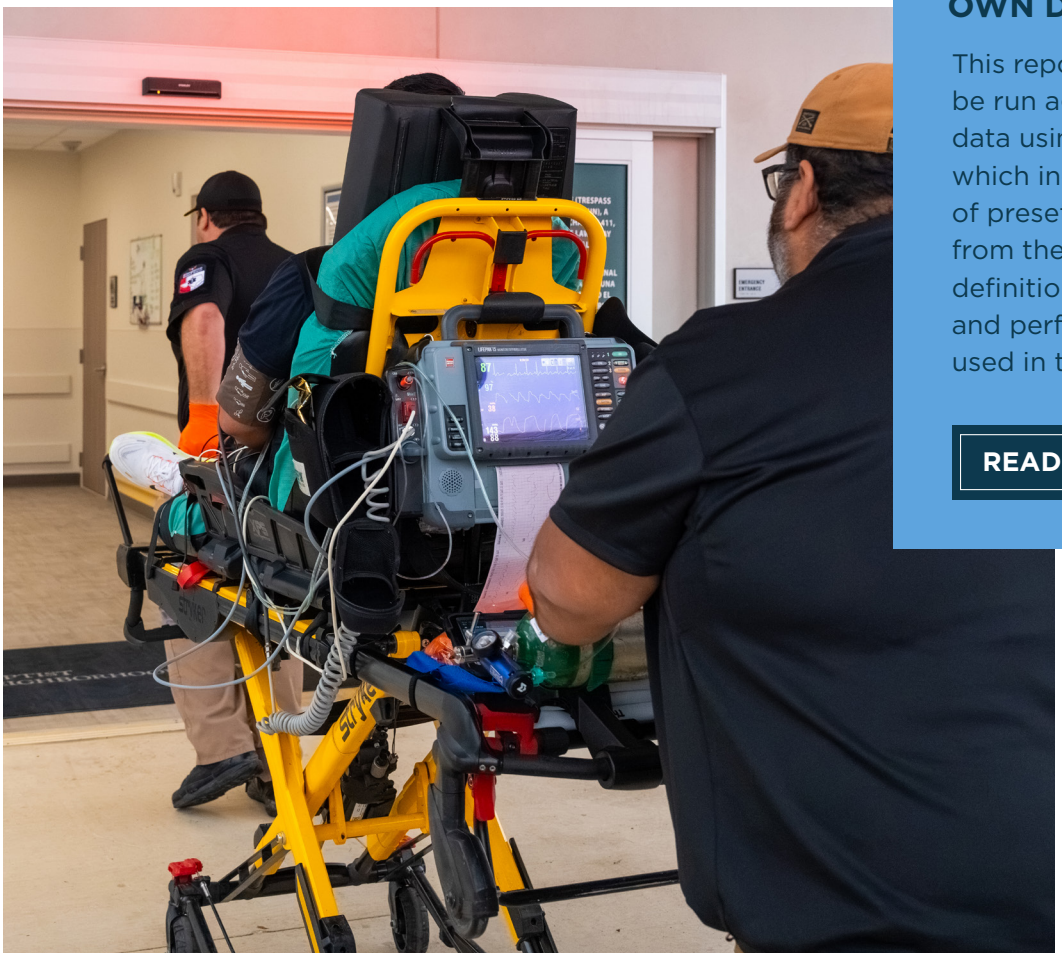
The Abbreviated Injury Scale (AIS) is the foundational coding system used to characterize injury severity in trauma registries worldwide. The transition from AIS 2008 to AIS 2015 represented one of the most substantive revisions in the system's history. AIS 2015 introduced over 500 new injury codes, retired or consolidated numerous legacy codes, and revised severity scores for a meaningful subset of injuries, particularly in the areas of traumatic brain injury (TBI), thoracic trauma, and solid organ injuries. Notably, several TBI descriptors were refined to better reflect contemporary understanding of injury patterns and outcomes, with some severity scores shifting in ways that directly affect Injury Severity Score (ISS) calculations.

Starting with the 2025 patient admission year, AIS 2015 is the only acceptable version of AIS defined in the National Trauma Data Standard (NTDS). As such, the 2026 ESO Trauma Index uses AIS 2015 as its coding standard.

## HOW TO USE THIS REPORT

Each of the measures in this edition includes an operational definition, a narrative analysis, best practice recommendations, and an "ESO in Action" sidebar showcasing how data flows through ESO's connected intelligence platform to make these insights possible. We encourage readers to compare these measures against their own data to compare clinical, operational, and financial outcomes and drive measurable improvement in their communities.



## QUERY YOUR OWN DATA

This report's measures can be run against your center's data using **ESO Insights**, which includes a library of preset queries built from the same operational definitions, inclusion criteria, and performance thresholds used in this analysis.

READ MORE

## THE FIVE MEASURES

This edition examines five measures spanning injury severity, blood product administration, inter-facility transfers, patients with open long bone fractures, and patients with traumatic brain injury. Each reflects a distinct dimension of trauma care where data can drive improvement.

### **1.** Injury Severity Score (ISS)

Consistency of injury severity distribution across mechanism categories suggests that mechanism of injury alone is a poor predictor of overall injury burden at the population level.

### **2.** Blood product administration

Packed red blood cells remain the foundational component of hemorrhagic shock resuscitation, but the resurgence of whole blood in trauma resuscitation represents one of the most significant shifts in damage control resuscitation practice over the past decade.

### **3.** Transfers out

The reasons driving inter-facility transfers reflect the full spectrum of specialized care needs that community and regional trauma centers are unable to provide in-house. The transition to physical discharge time in this Index provides a more operationally accurate, patient-centered picture that captures the full logistical burden of the transfer process.

### **4.** Open long bone fracture

High overall antibiotic administration rate reflects strong baseline adherence to open fracture management guidelines across participating centers.

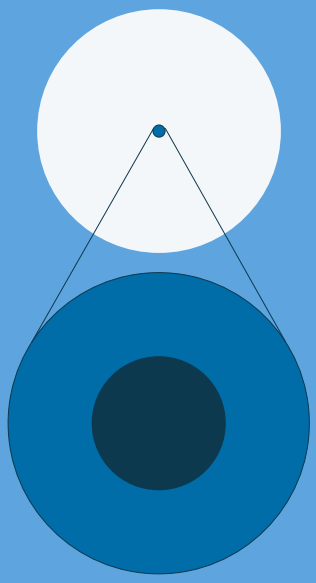
### **5.** Traumatic brain injury (TBI) NEW!

The overall mortality rate for severe TBI cases and the proportional mortality rate for mild TBI cohort reinforces that improvement opportunities exist across the full severity spectrum, not only at the extremes.

# Injury Severity Score (ISS)

**KEY FINDING**

Of 84,071 trauma encounters, 87% involved minor injuries. Yet patients with critical injuries (just 5% of encounters) accounted for 45% of trauma deaths in this dataset. Mechanism of injury alone is a poor predictor of severity: Major trauma rates remained stable at 10–20% across blunt, penetrating, and burn injuries.



**5%**
Of all encounters are patients with critical injuries

**45%**
Of trauma deaths in this dataset

## OPERATIONAL DEFINITION

This measure examines the distribution of Injury Severity Scores (ISS) across all encounters in the ESO Trauma Index dataset. ISS is calculated from the three most severely injured AIS body regions. Injuries are categorized as mild (ISS 1–9), moderate (ISS 10–15), serious (ISS 16–24), or critical (ISS ≥25). Minor trauma is defined as ISS ≤ 15 and major trauma is defined as ISS >15.

| 84,071 | 83,777 | 13% |
|---|---|---|
| Total encounters | Encounters with ISS present | Classified as "major trauma" |

## CONTEXT

The Injury Severity Score (ISS) has been a cornerstone of trauma severity measurement since its introduction in 1974, providing a standardized, anatomically-based framework for quantifying the overall burden of injury in trauma patients. The ISS remains the most widely used summary severity metric in trauma registries, research, and quality benchmarking programs across the country.

Within the ESO Trauma Index, ISS serves as both a **risk stratification tool** and a **benchmarking anchor**. Because raw outcome comparisons between trauma centers are only meaningful when adjusted for the severity of the patients each center treats, ISS-based stratification ensures that hospitals are evaluated against peers caring for similar injury burdens. A center treating a high proportion of patients with major trauma operates in a fundamentally different clinical environment than one whose volume is dominated by minor trauma, and the Index is designed to reflect that reality. Understanding your center's ISS distribution is therefore not just descriptive – it is the foundation upon which fair, actionable performance comparisons are built.

Of the 84,071 encounters documented using the AIS 2015 coding standard, ISS was successfully calculated for 83,777 encounters (99.7%), reflecting strong data abstraction quality across participating centers. The distribution of injury severity across this population follows the pattern typical of mature trauma registry datasets: The majority of encounters involve mild to moderate injuries, with a smaller but clinically critical subset representing the most severely injured patients who place the greatest demands on trauma system resources.

## MECHANISM OF INJURY

Perhaps the most notable finding in this analysis is the remarkable consistency of injury severity distribution across mechanism categories. Regardless of whether a patient sustained a blunt, penetrating, or burn injury, approximately 80% to 90% of encounters fell in the minor trauma range, with major trauma comprising a relatively stable 10% to 20% across all groups. This consistency suggests that mechanism of injury alone is a poor predictor of overall injury burden at the population level, which has important implications for triage protocols, resource allocation, and quality benchmarking.

**FIGURE M1-1**

### Encounters by ISS category

Eighty-seven percent of encounters fell in the minor range, consistent with the well-documented predominance of minor trauma in registry populations. Serious and critical injury represented 8% and 5%, respectively. Taken together, patients with major trauma composed 13% of the total population, representing over 11,000 encounters where the stakes for optimal trauma system performance are highest.

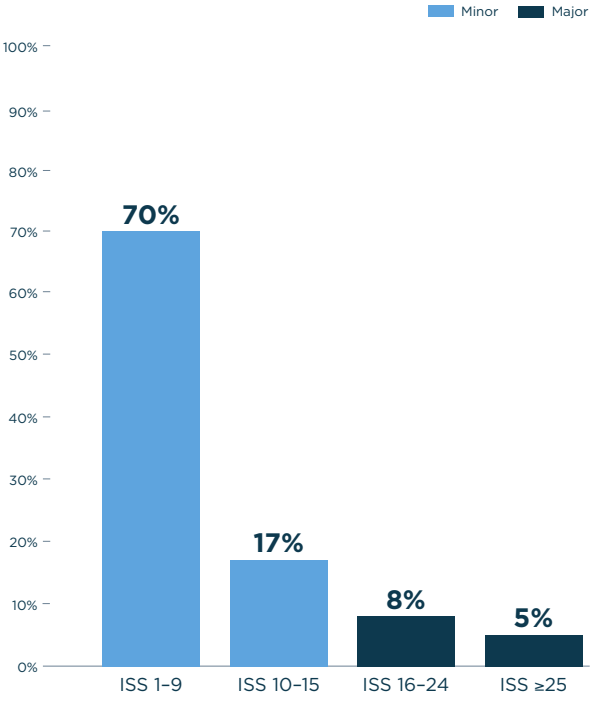
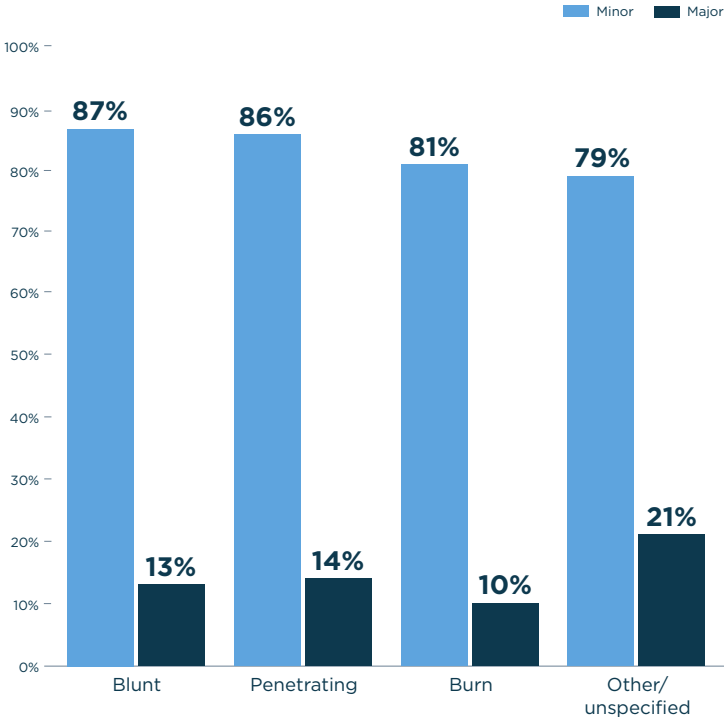



**FIGURE M1-2**

### Minor vs. major trauma by mechanism data

Blunt trauma is the dominant mechanism of injury in the ESO Trauma Index dataset, accounting for 91% of all encounters. This distribution is consistent with national trauma registry trends and reflective of the predominance of falls, motor vehicle collisions, and other blunt force events in the injured population. Penetrating trauma, while representing just 7% of encounters, remains a clinically significant subset given its association with firearm and stabbing injuries that frequently demand immediate surgical intervention.



## AGE

Age is one of the most important demographic factors shaping trauma registry populations, and the ESO Trauma Index dataset reflects the national trend toward an aging trauma patient base. Older adults over 65 represent the single largest age cohort in the registry at 45% of all encounters. This finding is consistent with the well-documented rise in geriatric trauma driven by falls, which account for 78% of major trauma encounters in this population. Adolescents and adults aged 16 to 65 account for 44% of encounters, while pediatric patients under 16 represent the smallest cohort at 11%.

Despite being slightly smaller in volume than the older adult cohort, adolescents and adults aged 16 to 65 carry the highest major trauma burden of any age group, with 16% of encounters meeting the ISS threshold for major trauma. This rate is notably higher than that of older adults at 12% and nearly three times the pediatric rate of 6%.

Across all three age groups, falls now represent the leading mechanism of major trauma, mirroring broader national trends in injury epidemiology and underscoring the importance of fall prevention initiatives at every life stage. Among adolescents and adults, however, motor vehicle collisions remain a close second, and motorcycle crashes, firearms, and pedestrian injuries round out a mechanism profile that reflects the higher-energy, multisystem injury patterns prevalent in working-age populations.

**FIGURE M1-3**

### Volume of major trauma by age group

Pediatric patients, while representing the lowest major trauma rate in absolute terms, warrant particular attention in benchmarking contexts given the specialized resources, protocols, and expertise required to manage injured children effectively. The relatively lower ISS profile of this cohort should not be interpreted as lower clinical complexity.

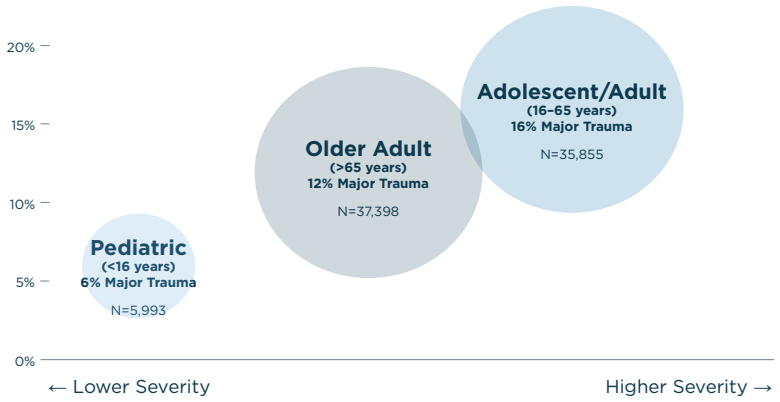
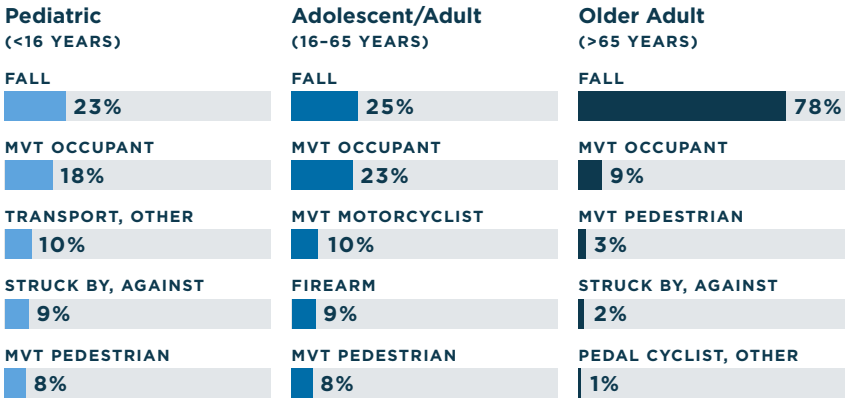



**FIGURE M1-4**

### Top 5 mechanisms of injury by age

Across all age groups, falls are the leading mechanism of major trauma, reflecting a shift in injury patterns even among younger populations.




**Falls dominate major trauma in older adults, representing nearly 8 in 10 serious injuries.**

## MORTALITY

As expected, mortality risk rises sharply with injury severity. Patients in the mild ISS range die at a rate of just 1%, while those with critical trauma face a mortality rate of 25%. Most strikingly, despite accounting for only 5% of all encounters, patients with critical trauma accounted for 45% of all trauma deaths in this dataset. This concentration of mortality in the most severely injured underscores why ISS-based risk stratification is foundational to any meaningful trauma quality benchmarking program. Raw mortality comparisons without severity adjustment will systematically disadvantage centers that treat the sickest patients.

The mechanisms that generate the greatest absolute death burden are firearm injuries and motor vehicle-pedestrian incidents, which together account for an estimated 526 deaths driven by their combination of significant encounter volume and elevated mortality rates of 16% and 9%, respectively. Firearm injuries in particular represent a critical focus area for trauma systems. With over 2,000 encounters and a mortality rate more than five times the overall average, they represent both a high-lethality and high-volume challenge that demands targeted prevention and clinical intervention strategies.

Taken together, these findings reinforce a core principle of trauma system improvement: Mortality reduction requires a dual focus on the highest-severity patients, where individual case outcomes are most at stake, and on the highest-volume mechanisms, where even modest improvements in care processes translate into meaningful reductions in absolute deaths.

**FIGURE M1-5**

### Mortality rate by ISS category

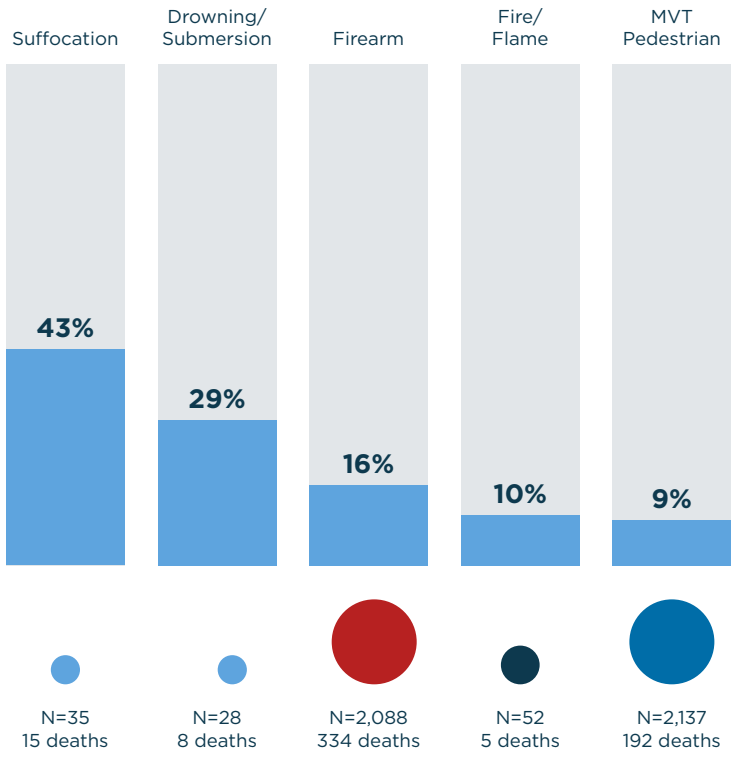
The overall mortality rate across categories was 3%.

| 1% | 2% | 6% | 25% |
|---|---|---|---|
| ISS 1–9 | ISS 10–15 | ISS 16–24 | ISS ≥25 |

**FIGURE M1-6**

### Mortality rate vs. encounter volume by mechanism

When mortality is examined through the lens of mechanism of injury, the picture becomes more nuanced. Suffocation at 43% and drowning/submersion at 29% carry the highest mechanism-specific mortality rates, though their small patient volumes, 35 and 28 encounters respectively, limit the statistical weight of these findings.



## BEST PRACTICES

### 1 Know your ISS distribution before benchmarking.

A center's case mix is the single most important context for interpreting any performance metric. Before comparing your outcomes to peers, understand what proportion of your encounters fall in each ISS band. A center with 20% critical trauma patients is operating in a fundamentally different environment than one with 5%.

### 2 Use ISS stratification to identify your highest-leverage improvement opportunities.

With 45% of all deaths concentrated in the critical population, quality improvement efforts targeting the most severely injured will have the greatest impact on mortality outcomes. Ensure your center has dedicated protocols, rapid response pathways, and multidisciplinary resources calibrated to this cohort.

### 3 Don't overlook mild injury trauma mortality.

The ISS 1–9 population generated 627 deaths despite a 1.1% mortality rate, simply because of volume. Auditing unexpected deaths in low-ISS patients can surface system failures, documentation gaps, and missed injuries that might otherwise go undetected.

## BEST PRACTICES (CONTINUED)

### 4 Prioritize firearm injury protocols.

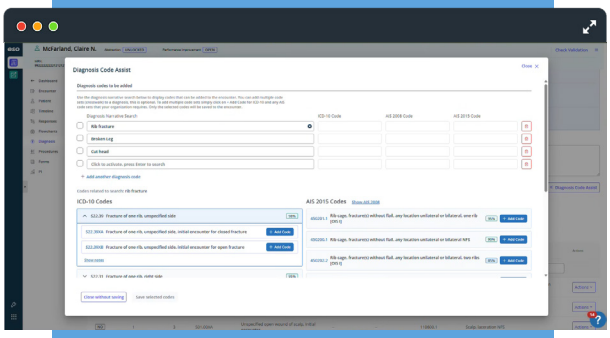
With a mortality rate exceeding 16% and over 2,000 encounters, firearm injuries represent one of the highest-yield targets for trauma QI intervention. Centers should examine key process metrics like time-to-OR, hemorrhage control protocols, and massive transfusion activation rates specifically for this population.

### 5 Geriatric volume demands geriatric-specific care.

With older adults accounting for 45% of trauma encounters, centers without dedicated geriatric trauma pathways, including frailty screening, anticoagulation reversal protocols, and early palliative care integration, may be underserving their largest patient population.

### 6 Pediatric complexity is not captured by ISS alone.

The lower ISS profile of pediatric patients can mask significant clinical complexity. Centers should ensure pediatric-specific triage criteria, weight-based resuscitation protocols, and access to pediatric surgical expertise are not deprioritized based on severity scores alone.




### ESO IN ACTION

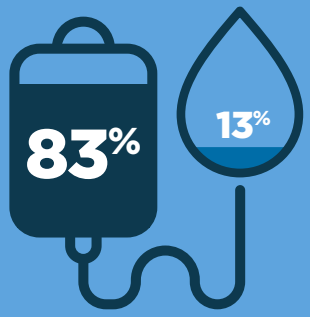
**Your case mix, in context. ESO Patient Registry** offers administrators the ability to activate the data elements that matter most to their program, including ISS and AIS coding fields. **ESO Code Builder** simplifies the process with smart search, support for coding multiple injuries at once (including direct crosswalks between ICD-10 and AIS), and a workflow built for speed and accuracy. **ESO Insights** turns that registry data into benchmarkable dashboards, so you can see how your center's case mix compares to the national population in this Index.

READ MORE

# Blood product administration

**KEY FINDING**

In 2025, 5,204 trauma encounters documented blood or blood product administration. Packed red blood cells (PRBCs) accounted for 83% of administrations – but whole blood appeared in 13% of records, reflecting its growing adoption in civilian trauma centers. Penetrating trauma patients were nearly three times more likely to receive blood products than their share of the overall registry population.




Packed red blood cells administration

Whole blood administration

## OPERATIONAL DEFINITION

This measure captures trauma encounters in which one or more blood products were administered at any point during care, from the prehospital setting through inpatient recovery. Products tracked include packed red blood cells (PRBCs), fresh frozen plasma, platelets, whole blood, plasma cryoprecipitate, never frozen plasma, and other products. Administration is analyzed by product type, mechanism of injury, and care setting. Patients may appear in multiple product categories.

**5,204**
Encounters with blood product administration

**83%**
PRBC share of administrations

**682**
Whole blood administrations

## CONTEXT

Blood and blood product administration are critical indicators of trauma resuscitation practice, reflecting both the severity of hemorrhagic injury and the protocols centers use to manage it. In 2025, there were 5,204 records documenting blood or blood product administration.

PRBCs were by far the most frequently administered product, accounting for 83% of all encounters with blood product administration. This is consistent with national trends, as PRBCs remain the foundational component of hemorrhagic shock resuscitation.

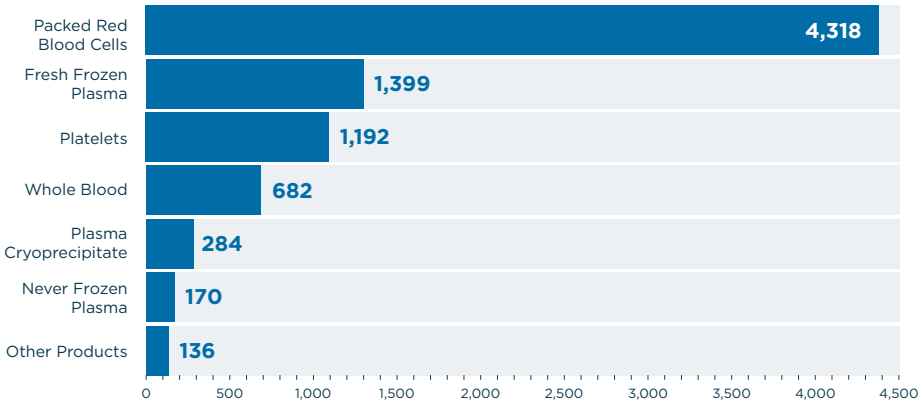
Fresh frozen plasma was the second most common product at 27%, followed by platelets at 23%. Perhaps the most clinically notable finding in this dataset is the presence of 682 whole blood administrations. The resurgence of whole blood in trauma resuscitation, driven by military experience and growing civilian evidence, represents one of the most significant shifts in damage control resuscitation practice over the past decade. Its presence in 13% of blood product records suggests meaningful adoption among ESO Trauma Index centers, and its continued growth will be an important trend to track in future index editions.

FIGURE M2-1

### Blood product administration

The relative proportions of the top three products offer a window into balanced resuscitation practice: Trauma centers increasingly following a 1:1:1 ratio of PRBCs to plasma to platelets in massive transfusion scenarios, consistent with evidence from the PROPPR trial and current TQIP massive transfusion guidelines.[1]

A patient may receive more than one blood product.




## BLOOD PRODUCT ADMINISTRATION BY INJURY TYPE

Among the 5,201 encounters in which blood products were administered, blunt trauma remained the most common mechanism at 79%, consistent with its dominance in the overall registry population. However, the shift in mechanism distribution among transfused patients tells a more nuanced story. Penetrating trauma, which accounts for just 7% of all registry encounters, represents 19% of blood product recipients – nearly three times its share of the overall population.

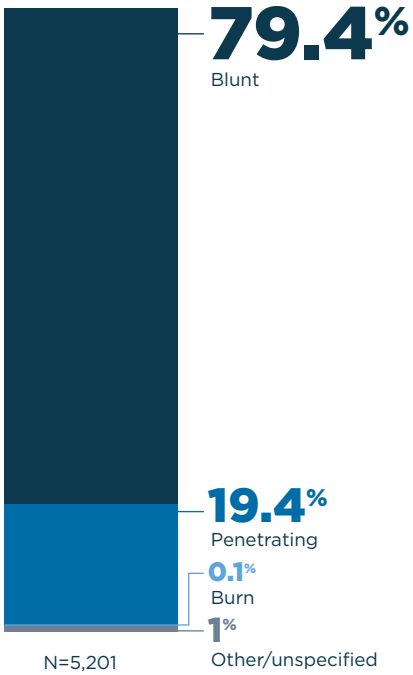
This pattern becomes even more striking when viewed alongside findings from the 2026 ESO EMS Index, which reported that prehospital blood product administration was nearly evenly split between blunt and penetrating mechanisms at 46% and 47%, respectively. The contrast between prehospital and in-hospital transfusion patterns suggests that penetrating trauma patients are being identified and treated aggressively in the field, consistent with the growing adoption of prehospital blood product programs and stop-the-bleed protocols. Meanwhile blunt trauma patients, who may present with less obvious hemorrhage, account for a larger share of transfusions once the full injury burden is assessed in the hospital setting.

Together, these findings reinforce the importance of mechanism-aware resuscitation protocols across the continuum of care. Penetrating trauma demands rapid hemorrhage recognition and early product administration both in the field and on arrival, while blunt trauma programs should ensure that occult hemorrhage pathways are robust enough to capture patients whose transfusion needs may not be immediately apparent at the scene.

FIGURE M2-2

### Blood product recipients by injury type

The over-representation of penetrating trauma reflects the well-established hemorrhagic injury profile of penetrating mechanisms, particularly firearm and stab wounds, which frequently cause vascular and solid organ injuries requiring immediate transfusion support.



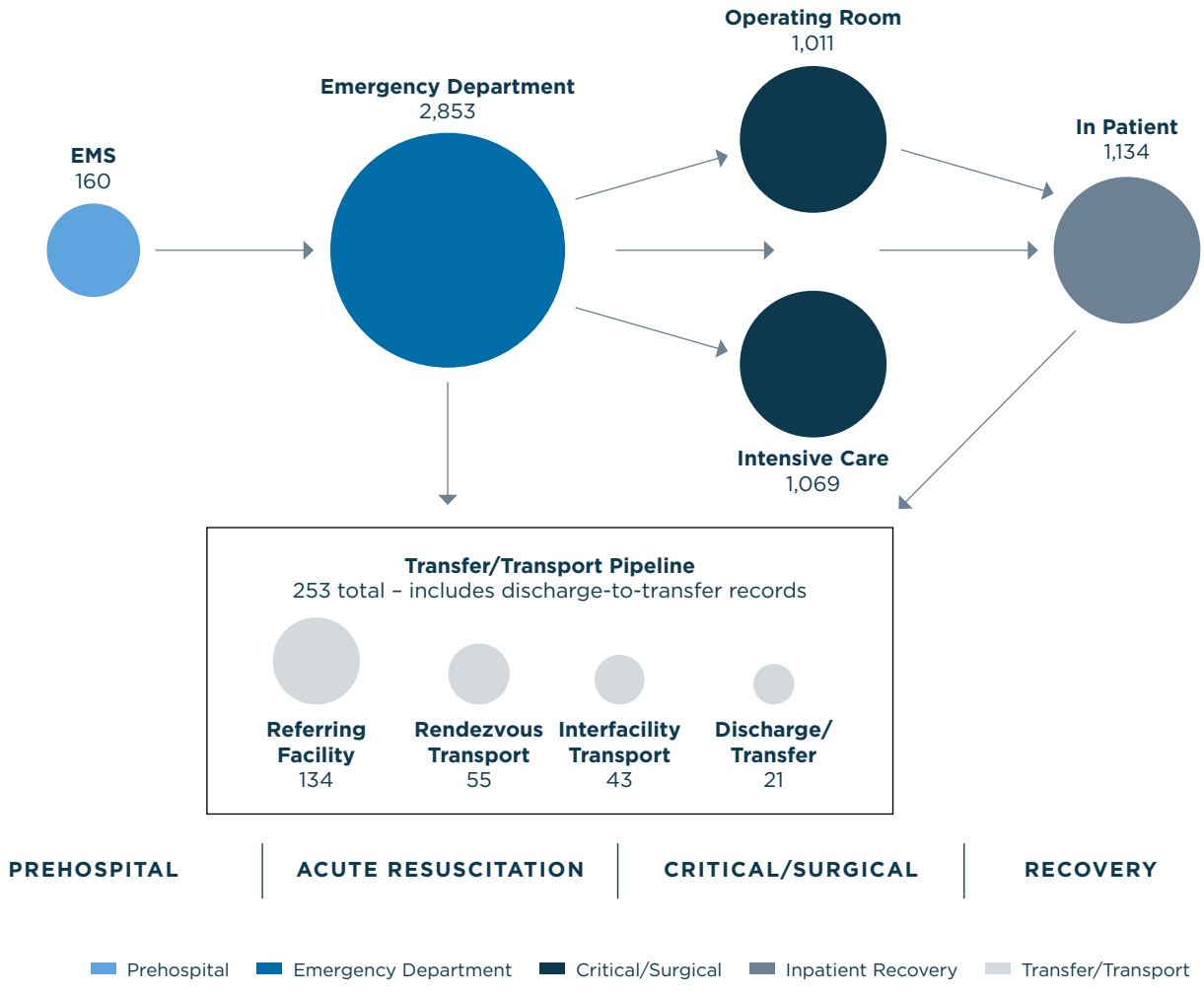
## LOCATION OF ADMINISTRATION

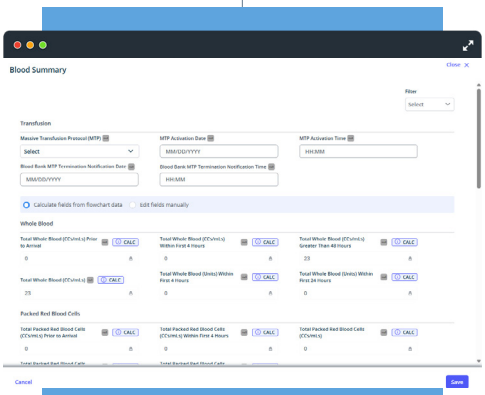
Blood product administration occurs across every phase of trauma care, from the prehospital environment through inpatient recovery. The emergency department is the primary site of transfusion, accounting for 46% of all records, consistent with its role as the first point of definitive resuscitation for hemorrhagic trauma patients. Surgical and critical care settings contribute substantially as well, with the operating room and intensive care unit together accounting for an additional 33% of administrations – underscoring that, for the most severely injured patients, transfusion is not a single intervention but an ongoing component of care that extends well beyond initial stabilization. Importantly, EMS administered blood products in 160 encounters, reflecting the growing footprint of prehospital transfusion programs across the country.

**FIGURE M2-3**

### Blood product administration across the care continuum

The emergency department is the primary site of transfusion – but for the most severely injured patients, transfusion extends well beyond initial stabilization, continuing through the operating room, intensive care unit, and inpatient recovery.






## ESO IN ACTION

**The full transfusion picture. ESO Patient Registry** documents blood and blood product administration from the prehospital setting through inpatient recovery, capturing product type, timing, and care setting in a single record. That complete documentation chain is what makes the analysis in this measure possible, and what lets your team evaluate massive transfusion protocol adherence against real data.

READ MORE

# BEST PRACTICES

## 1 Activate massive transfusion protocols early.

With nearly half of all blood product administrations occurring in the emergency department, early recognition of hemorrhagic shock and timely massive transfusion protocol (MTP) activation are critical. Centers should audit door-to-first-blood-product times and MTP activation thresholds to ensure patients are not under-resuscitated in the critical early window.

## 2 Track whole blood adoption.

With 682 whole blood administrations in this dataset, whole blood resuscitation has moved from military practice into civilian trauma centers. Centers not currently using whole blood should evaluate program feasibility, particularly for penetrating trauma and high-acuity blunt trauma populations.

## 3 Consider the role of prehospital blood product availability.

The 160 EMS transfusion records in this dataset, alongside the EMS Index finding of near-equal blunt and penetrating prehospital transfusion rates, reflect a growing body of evidence supporting earlier hemorrhage intervention in the field. Centers and their EMS partners may wish to evaluate local transport time profiles, call volume, and resource capacity when considering whether prehospital blood product programs align with their system's needs and capabilities.

## 4 Audit transfer patients receiving blood products.

The 253 records in the transfer and transport pipeline represent a clinically vulnerable population: patients sick enough to require transfusion before or during transfer. These patients warrant dedicated handoff protocols, pre-arrival notification systems, and rapid reassessment on arrival to ensure resuscitation continuity.

# Transfers out

**KEY FINDING**

In 2025, 4,562 inter-facility transfers were documented. Level 3 trauma centers originated 58% of all transfers – more than all other levels combined. Once the decision to transfer was made, the median time from discharge order to physical departure was 89 minutes, representing the most actionable window for improvement in transfer efficiency.

## OPERATIONAL DEFINITION

This measure captures inter-facility transfers defined using the ED disposition basecode descriptor for "Transfer to another hospital." Transfer time is measured as the interval from ED arrival to physical departure from the transferring facility. Order-to-departure time measures the interval from when the discharge order is written to when the patient physically leaves. Transfer reason categories are drawn from documented clinical and administrative transfer indications.

Last year's Index used discharge order time as the endpoint for this measure. The transition to physical discharge time in this Index provides a more operationally accurate, patient-centered picture but may result in longer reported times compared to prior year data, and direct year-over-year comparisons should be interpreted accordingly.

**4,562**
Transfers

**58%**
Level 3 trauma center transfers

## CONTEXT

Inter-facility transfer sits at the heart of trauma system performance. For patients whose injuries exceed the capabilities of the initial receiving facility, the speed and efficiency of the transfer process can directly determine outcomes.

The distribution of transfers across trauma center levels reveals an important truth about how trauma systems function in practice: The majority of inter-facility transfers originate from the community and regional facilities that serve as the front door of trauma care for most of the population.

The reasons driving inter-facility transfers reflect the full spectrum of specialized care needs that community and regional trauma centers are unable to provide in-house. Neurological and neurosurgical needs, primarily driven by traumatic brain injury and spinal cord and column injuries, represent the single largest transfer category at 22%, underscoring the critical role of neurosurgical capability in trauma system planning. Orthopedic and musculoskeletal needs account for an additional 19%, driven by complex fractures of the pelvis, hand, and long bones requiring subspecialty surgical expertise. Pediatric specialty care transfers represent 15% of the total, reflecting the reality that many facilities receiving injured children lack the infrastructure to provide definitive pediatric trauma care.

**FIGURE M3-1**

### Transfers by trauma center level

Level 3 trauma centers account for 58% of all transfers in this dataset, more than all other levels combined, reflecting their position at the critical intersection of initial trauma reception and triage to definitive care. Level 2 centers contribute 18% of transfers and Level 4 centers 17%, while Level 1 centers account for just 7%, consistent with their role as receiving rather than transferring facilities in most trauma systems.

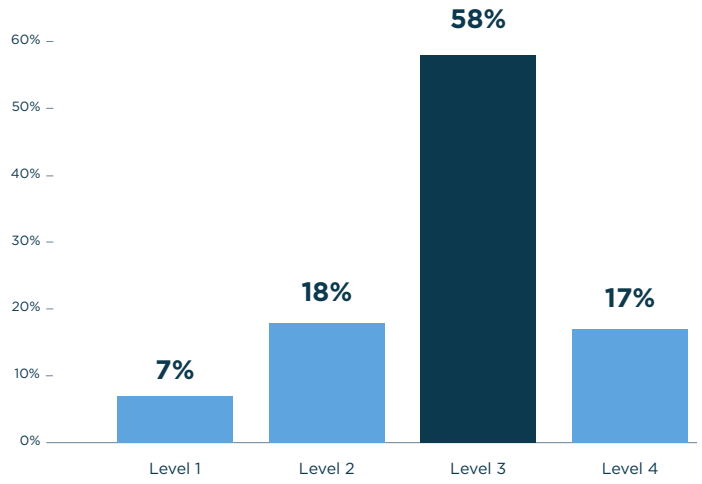
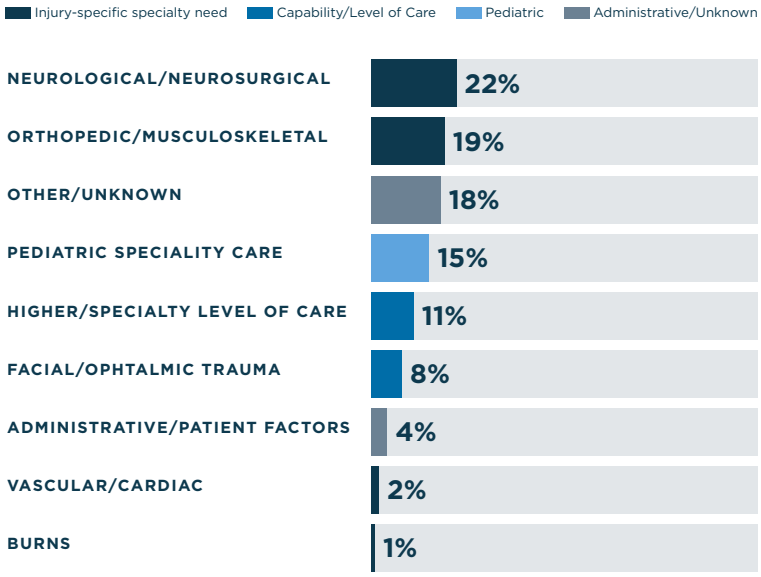



**FIGURE M3-2**

### Transfer reasons by category



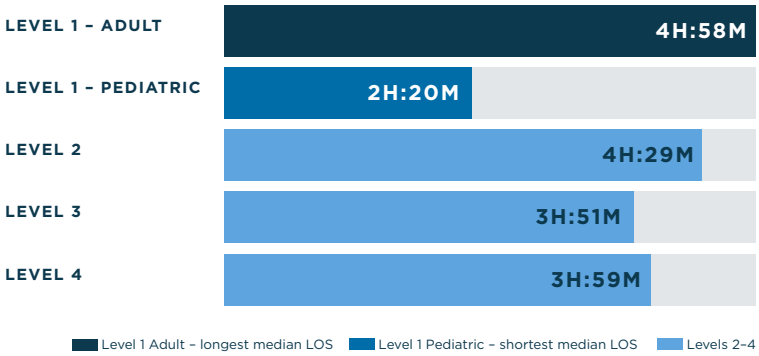
Once the clinical decision to transfer has been made, the work of actually moving a patient to another facility begins – and the data suggest this operational phase represents a meaningful opportunity for improvement. The median time from discharge order to physical departure was 89 minutes, or nearly one and a half hours. This interval captures the full logistical burden of the transfer process: arranging transport, completing documentation, communicating with the receiving facility, and physically preparing the patient for departure.

Level 1 centers, while representing just 7% of all transfers, offer an instructive look at why even the highest-designated trauma centers transfer patients out. Pediatric care accounts for 23% of Level 1 transfers and insurance repatriation accounts for an additional 12%, where transfer is driven by payer network requirements rather than clinical need.

**FIGURE M3-3**

### Median length of ED stay prior to transfer

Across center levels, the median ED length of stay (LOS) prior to transfer ranged from 140 minutes at Level 1 pediatric centers to 298 minutes at Level 1 adult centers – a nearly twofold difference that highlights the variability in transfer efficiency across the system. Level 3 centers, which originate the majority of transfers, achieved a median ED length of stay of 231 minutes, while Level 4 centers were comparable at 239 minutes. The notably faster times at Level 1 pediatric centers likely reflect the influence of dedicated pediatric transfer protocols and established referral relationships with receiving pediatric facilities.




## BEST PRACTICES

### 1 Treat transfer time as a quality metric with the same rigor as clinical outcomes.

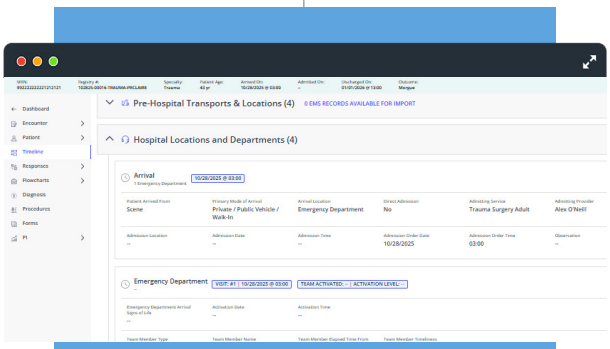
ED length of stay prior to transfer is measurable and improvable. Centers should track their median transfer time by level, mechanism, and injury type – and set internal improvement targets with the same discipline applied to door-to-CT or time-to-OR metrics.

### 2 Focus improvement efforts on the order-to-departure window.

The 89-minute median gap between discharge order and physical departure is the most actionable segment of transfer time. Unlike the clinical evaluation phase, this window is driven by operational factors – transport coordination, documentation, and logistics – that are amenable to process redesign. Centers should map their specific bottlenecks and target them systematically.

### 3 Study your Level 1 pediatric transfer process as a model.

The 140-minute median ED LOS for Level 1 pediatric transfers – compared to 298 minutes for Level 1 adult transfers – suggests that dedicated pediatric transfer protocols produce meaningfully faster throughput. Centers should examine what drives this efficiency and consider whether similar approaches can be applied to adult transfer workflows.




### ESO IN ACTION

**The clock doesn't stop at the discharge order. ESO Patient Registry** captures ED arrival, discharge order, and physical departure times, giving your team the data points needed to calculate both total transfer time and the order-to-departure interval. That operational window is where logistics, coordination, and documentation bottlenecks live – and where process improvement efforts have the most direct impact on how quickly patients reach definitive care.

READ MORE

# Open long bone fracture

**KEY FINDING**

Of 3,190 patients with open long bone fractures, 91% received antibiotics at some point during their care. Among those treated in the ED, the median time to first antibiotic dose was 28 minutes, with 74% receiving their first dose within the 60-minute clinical target. The 9% without documented antibiotic administration warrants audit, but documentation gaps and case-mix factors likely account for a portion of that gap.

## OPERATIONAL DEFINITION

This measure examines antibiotic administration in patients with open long bone fractures, identified using the TQIP Open Fracture Quality Measure code set: a standardized list of AIS 2015 codes spanning upper and lower extremity open fractures. The primary metrics examined in this section are antibiotic administration and timing: what proportion of patients received antibiotics, and how quickly relative to injury and arrival. This analysis includes prehospital antibiotic administration, recognizing the growing role of EMS in early open fracture management and the potential to meaningfully compress time to first dose.

**3,190**
Open fracture patients

**91%**
Received antibiotics

**74%**
Within the 60-minute window

## CONTEXT

Open fractures represent one of the most time-sensitive injuries in trauma care. When bone is exposed to the external environment, the risk of deep wound infection, osteomyelitis, and limb loss escalates rapidly with each passing hour. Prompt antibiotic administration is the cornerstone of early open fracture management and remains the most measurable and benchmarkable early intervention across the prehospital and ED settings.

Among the 3,190 patients identified with open fractures in 2025, 91% received antibiotics at some point during their care. This high overall administration rate reflects strong baseline adherence to open fracture management guidelines across participating centers and suggests that antibiotic administration is well established as a standard component of open fracture care in this patient population.

The remaining 9% of patients without documented antibiotic administration warrants attention, though context matters in interpreting this figure. Incomplete documentation, early patient death before treatment, comfort care designations, and known antibiotic allergies may all contribute to the gap without necessarily reflecting a failure of care. Centers reviewing this metric should examine their non-administered cases to distinguish true gaps in treatment from documentation or case-mix factors before drawing conclusions about care quality.

As shown in Figure M4-3, antibiotic administration for open fractures occurs across the full continuum of care, though the emergency department accounts for the substantial majority of administrations at 2,165 – reflecting its role as the primary point of initial wound assessment and treatment.

Among ED patients, the median time from arrival to first antibiotic dose was 28 minutes, with 74% receiving their first dose within the 60-minute window. This represents strong ED workflow performance, suggesting that when antibiotics are ordered for open fracture patients, they are generally being delivered promptly. The 26% of patients who fell outside the 60-minute window represent a meaningful improvement opportunity. Centers should examine whether delays in this group reflect diagnostic uncertainty, competing resuscitation priorities, pharmacy turnaround time, or documentation gaps.

**FIGURE M4-1**

### Antibiotic administration

91% of open fracture patients received antibiotics at some point during their care, a strong baseline rate that sets the stage for examining where and how quickly they were administered.

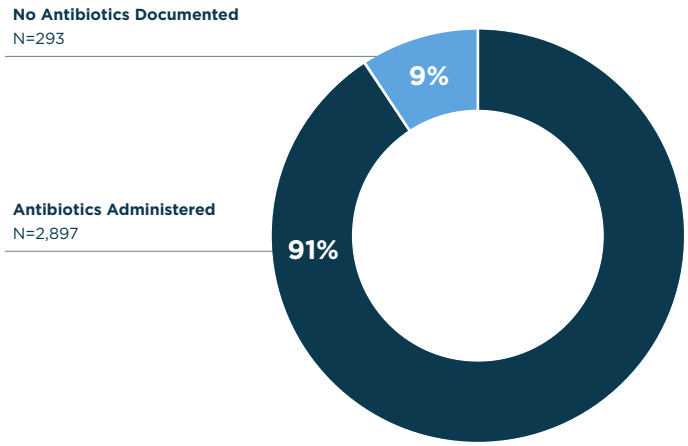



**FIGURE M4-2**

### Time to antibiotic administration

This metric reflects the speed of antibiotic delivery once the decision to treat has been made in the ED, and should be interpreted alongside the overall administration rate – recognizing that patients who did not receive antibiotics at all, or received them exclusively in another setting, are not captured in this timing calculation.

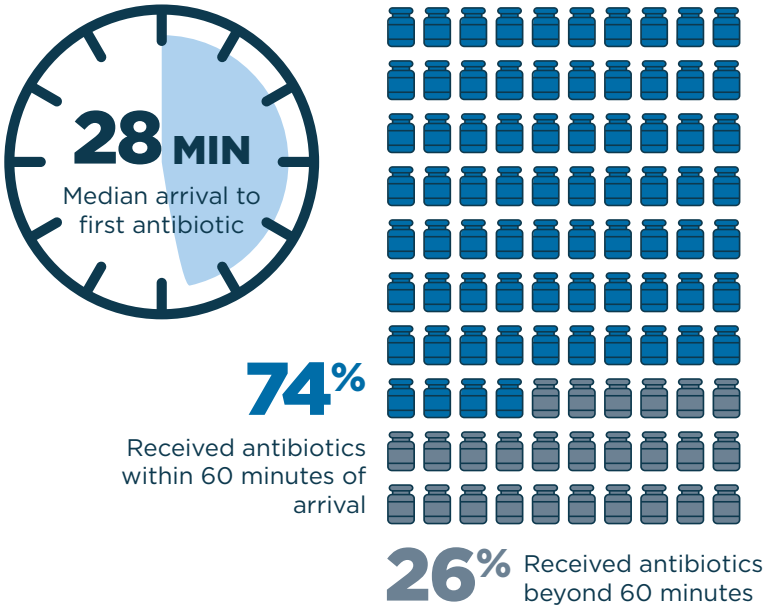


FIGURE M4-3

## Antibiotic administration across the care continuum

128 patients received antibiotics in the prehospital setting via EMS, representing an important early intervention opportunity that compresses the time from injury to first antibiotic dose. An additional 276 patients had antibiotics documented at a referring facility prior to arrival, indicating that a meaningful proportion of transfer patients were already receiving treatment before reaching the receiving center.

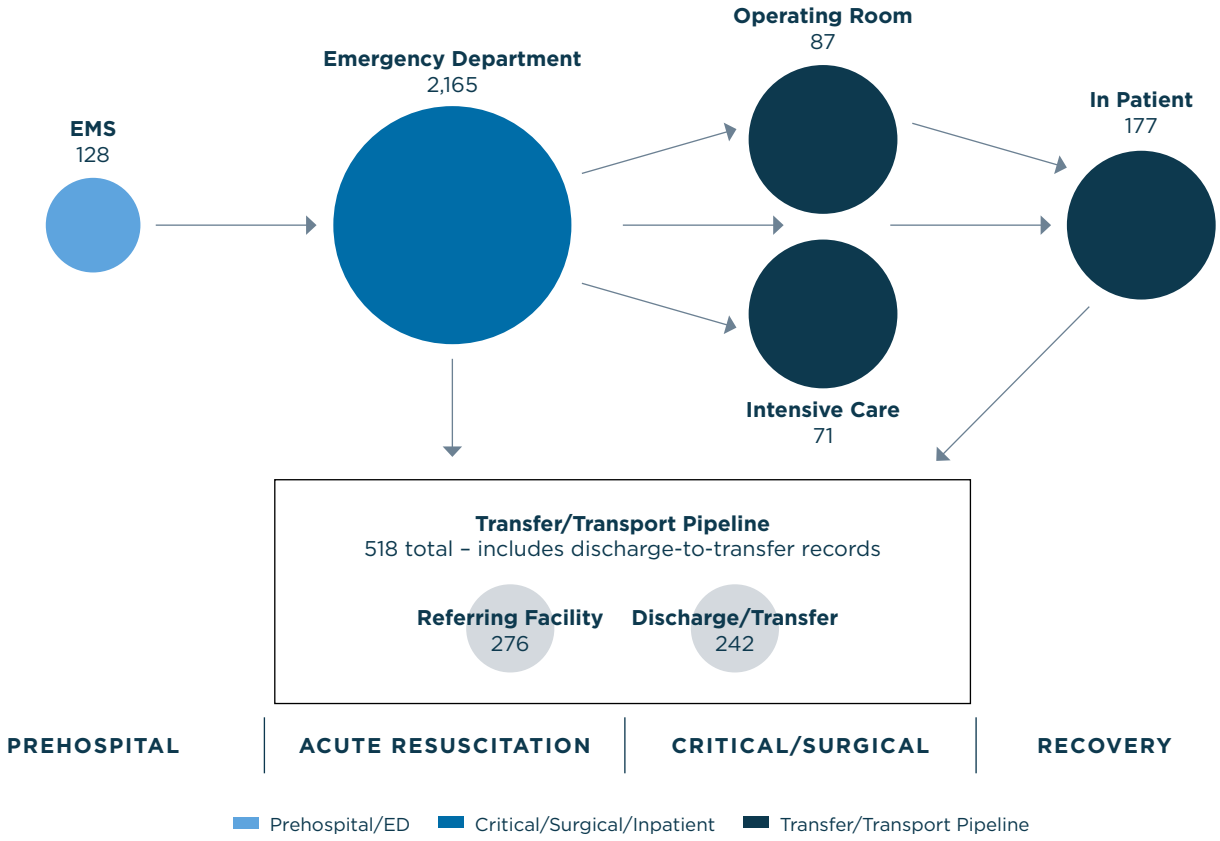
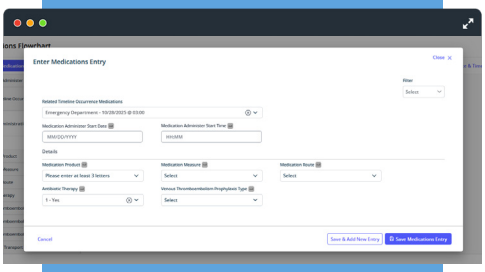



FIGURE M4-4

## AIS codes for open long bone fracture

| AIS CODE Range | Body Region | Injury Type |
|---|---|---|
| **711000–711012** | Shoulder/Clavicle | Open Fractures |
| **713000–713003** | Forearm/Radius/Ulna | Open Fractures |
| **751101–751901** | Humerus | Open Fractures – proximal, shaft, distal |
| **752112–752801** | Radius/Ulna/Wrist | Open Fractures – multiple locations and severity levels |
| **753201** | Hand/Metacarpal | Open Fracture |
| **811000–811012** | Hip/Pelvis | Open Fractures |
| **813000–813003** | Tibia/Fibula | Open Fractures |
| **853001–853372** | Femur | Open Fractures – proximal, shaft, distal |
| **854001–854472** | Tibia/Fibula/Ankle | Open Fractures – including pilon and bimalleolar variants |




## ESO IN ACTION

**Time to first dose starts before the ED. ESO Patient Registry** records antibiotic administration across multiple care settings: prehospital, ED, referring facility, so your quality team can measure time-to-first-dose against established targets and pinpoint exactly where in the continuum delays are occurring.

READ MORE

# BEST PRACTICES

## 1 Treat antibiotic administration as a time-critical intervention.

Evidence consistently demonstrates that delays beyond 60 minutes from injury to first antibiotic dose are associated with increased rates of deep wound infection and osteomyelitis. Centers should establish open fracture antibiotic protocols with the same urgency framework applied to time-sensitive conditions like sepsis: with a clear trigger, a defined agent, and a measurable time target.

## 2 Audit your non-administration rate before assuming a care gap.

Not every patient without documented antibiotic administration represents a missed treatment opportunity. Known allergies, early mortality, comfort care designations, and documentation failures all contribute. Centers should categorize their non-administered cases to distinguish true gaps from legitimate clinical or administrative explanations.

## 3 Leverage the prehospital window.

The prehospital setting represents an underutilized opportunity to compress time to first dose, particularly for patients with prolonged transport times or those transferred from rural environments. Centers and their EMS partners should evaluate whether prehospital antibiotic protocols for open fractures are feasible for their patient population.

## 4 Target the 26% beyond 60 minutes with process improvement.

Centers should examine the specific bottlenecks causing delayed administration, whether pharmacy response times, ED crowding, competing resuscitation priorities, or diagnostic delays. Even modest improvements in this group could meaningfully reduce infectious complications across the population.

NEW!

MEASURE 5

# Traumatic brain injury

**KEY FINDING**

The 2026 ESO Trauma Index identified 12,662 patients with traumatic brain injuries, representing 15% of all encounters. Nearly all had at least one GCS score documented. Severe TBI patients faced a 44% mortality rate – 15 times higher than mild TBI – yet mild TBI patients generated 337 deaths in absolute terms, reinforcing that improvement opportunities exist across the full severity spectrum.

## OPERATIONAL DEFINITION

This measure examines patients with traumatic brain injury (TBI), defined as an Abbreviated Injury Scale (AIS) body region 1 severity score of 3 or greater. Within this cohort, the Glasgow Coma Scale (GCS) is used to stratify injury severity into three bands: mild (GCS 13–15), moderate (GCS 9–12), and severe (GCS 3–8). For patients in the severe band, the measure also examines intracranial pressure (ICP) monitoring, a cornerstone of evidence-based severe TBI management. The Brain Trauma Foundation (BTF) guidelines recommend ICP monitoring for all patients with severe TBI as a means of guiding targeted therapy, maintaining cerebral perfusion pressure, and detecting secondary neurological deterioration.

**12,662**
TBI patients

**99%**
GCS documentation rate

**44%**
Mortality rate for severe TBI

## CONTEXT

Traumatic brain injury (TBI) represents one of the most consequential and resource-intensive challenges in trauma care. Among the most severely injured patients in any trauma registry, those with significant head injuries demand early recognition, rapid intervention, and sustained multidisciplinary management across the continuum of care. TBI is a major cause of trauma-related death and disability in the United States[2], and the quality of care delivered in the hours immediately following injury has a direct and measurable impact on survival and long-term neurological outcomes.[3]

By examining this cohort through the lens of prehospital care, emergency department management, and outcomes, the Index aims to surface patterns that can inform quality improvement efforts, benchmark performance across trauma systems, and ultimately contribute to better outcomes for one of trauma's most vulnerable patient populations.

The TBI cohort in the 2026 ESO Trauma Index includes 12,662 patients, representing 15% of all encounters. Blunt trauma is overwhelmingly the dominant mechanism of injury in this population, accounting for 95% of encounters, consistent with the predominance of falls and motor vehicle collisions as the leading causes of significant head injury.

Almost all patients had one or more Glasgow Coma Scale (GCS) scores documented, reflecting strong neurological assessment capture across participating centers.

**FIGURE M5-1**

### Mechanism of injury among TBI patients

Penetrating trauma represents 3% of the TBI cohort – notably lower than its 7% share of the overall registry population, suggesting that while penetrating injuries carry disproportionate hemorrhagic burden, blunt mechanisms account for the vast majority of serious traumatic brain injury in this dataset. The remaining 1% includes burn and other unspecified mechanisms.

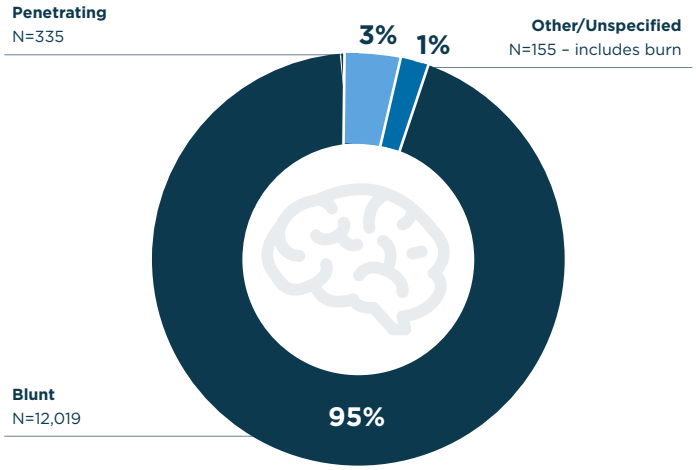



**FIGURE M5-2**

### First GCS documentation

This near-complete GCS documentation rate is a meaningful data quality signal. GCS is both a primary triage tool and a foundational input for risk adjustment in TBI benchmarking, and its consistent capture is a prerequisite for meaningful severity-stratified analysis.

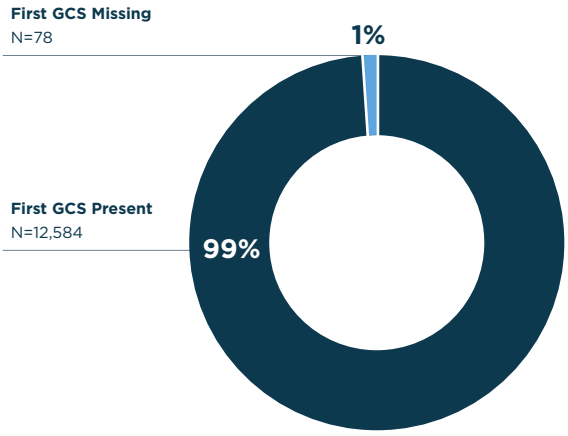
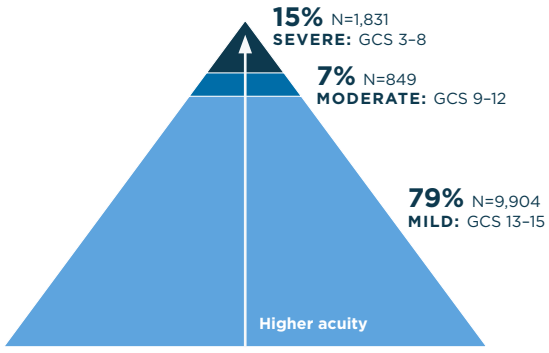



**FIGURE M5-3**

### TBI distribution by GCS severity band

Among patients with GCS documented, the majority presented with mild injury, and a smaller but critically important subset at the severe end of the spectrum. Mild TBI accounts for 79% of the cohort, reflecting the predominance of concussion-spectrum injuries among patients meeting the TBI threshold. Moderate TBI represents 7% of the cohort, a clinically significant group that carries meaningful deterioration risk and warrants close neurological monitoring. Severe TBI accounts for 15% of the cohort, representing the highest-acuity subset where the quality and speed of clinical intervention most directly determines survival.



## MORTALITY

The mortality data tells a stark story. Patients with severe TBI die at a rate of 44% compared to 12% for moderate TBI and just 3% for mild TBI. It is also worth noting that despite a 3% mortality rate, the sheer volume of mild TBI patients generates 337 deaths – more than three times the 100 deaths in the moderate cohort – reinforcing that improvement opportunities exist across the full severity spectrum, not only at the extremes.

Among the 1,831 severe TBI patients in this cohort, ICP monitoring was documented in 11% of patients. This figure warrants careful interpretation before drawing conclusions about care quality. Centers reviewing this metric should cross-reference their procedure coding practices against their clinical documentation to ensure accurate capture before benchmarking against peers.

The 11% rate represents an important starting point for quality improvement conversations. Centers should examine their severe TBI population to identify patients who met BTF criteria for monitoring and did not receive it, and evaluate whether barriers are clinical, logistical, or documentation-related.

## TBI CODING AND THE AIS 2015 TRANSITION

The transition from AIS 2008 to AIS 2015 had meaningful implications for TBI classification. Key changes affecting TBI coding include:

- **Subdural and epidural hematoma** coding was refined to incorporate thickness and volume thresholds, resulting in severity score reassignments for a subset of these injuries.
- **Diffuse axonal injury (DAI)** descriptors were restructured, with revised severity assignments that may affect how this population is captured in AIS ≥3 cohort definitions.
- **Cerebral contusion and laceration** codes were reorganized with greater anatomical specificity, which can affect severity scoring depending on injury location.

As a result, centers that transitioned to AIS 2015 at different points in time may show apparent shifts in their TBI severity distribution that reflect coding changes rather than true changes in patient population or care quality.

FIGURE M5-4

### Mortality rate by GCS severity

Nearly one in two severe TBI patients does not survive, a mortality rate 15 times higher than mild TBI. This underscores why GCS-stratified analysis is essential for meaningful benchmarking in this population.

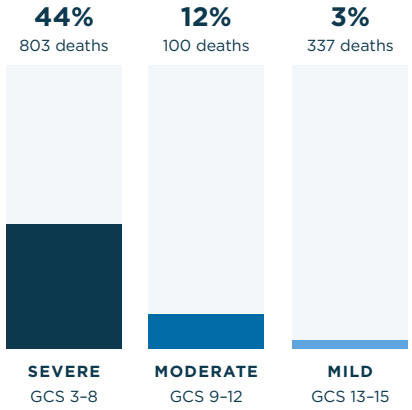
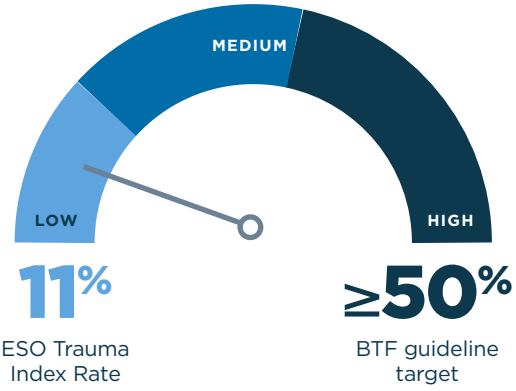



FIGURE M5-5

### ICP monitoring rate

Several factors may contribute to a lower documented rate than national benchmarks suggest:

- Patients who die shortly after arrival may not survive long enough for monitor placement.
- Those designated comfort care or with documented medical futility are appropriately excluded from ICP monitoring.
- ICD-10-PCS procedure coding for parenchymal monitors and EVDs is inconsistently applied across centers, meaning true utilization may be undercounted due to documentation practices.



## BEST PRACTICES

### 1 Prioritize GCS documentation as a foundational data quality metric.

With 99% GCS completion in this dataset, near-complete neurological assessment capture is achievable. Centers falling below this threshold should audit whether gaps reflect clinical workflow issues, documentation timing problems, or medical record configuration barriers.

### 2 Stratify your TBI population by GCS band before drawing any conclusions.

The 44% mortality rate in severe TBI patients versus 3% in mild TBI patients illustrates why aggregate TBI metrics without severity stratification are misleading. A center's overall TBI mortality rate means little without knowing how many GCS 3–8 patients it treated.

### 3 Don't underestimate mild TBI volume and complexity.

At 79% of this cohort, mild TBI patients generate significant clinical workload and, despite a 3% mortality rate, account for 337 deaths in absolute terms. Centers should ensure that concussion protocols, observation criteria, and repeat neurological assessment pathways are as well-developed as their severe TBI protocols.


## ESO IN ACTION

**Aggregate TBI mortality numbers only tell half the story. ESO Patient Registry** captures GCS documentation, TBI severity classification, and procedure coding – including ICP monitoring – giving trauma centers the data foundation to group patients by injury severity before drawing any conclusions. **ESO Insights** surfaces those patterns in dashboards your team can use to ensure you're comparing your outcomes against the right peers and targeting quality improvement where it will have the most impact.

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## BEST PRACTICES (CONTINUED)

### 4 Audit ICP monitoring utilization against your severe TBI case mix.

The 11% ICP monitoring rate in this dataset is a conversation-starter, not a verdict. Centers should cross-reference their procedure coding practices with clinical documentation and examine what proportion of their GCS ≤8 patients with abnormal CT received monitoring – and why others did not.

### 5 Use GCS trends, not single values, to guide clinical decisions.

A documented GCS at arrival is valuable, but a deteriorating GCS over time is the critical signal. Centers should evaluate whether their documentation practices capture serial GCS assessments that allow clinicians to detect neurological decline before herniation occurs.

# Conclusion

The ESO Trauma Index is designed to be the beginning of a conversation. The measures and findings presented here represent a starting point: a data-driven foundation from which trauma centers, EMS agencies, and trauma systems can begin asking better questions, challenging assumptions, and identifying opportunities that might otherwise remain hidden in the noise of daily operations.

Trauma care is complex, and no index can capture its full dimensions. These metrics are offered in that spirit – as a thoughtful set of signposts rather than definitive verdicts, developed with care but always open to refinement. What we do believe is that accurate, consistently collected data examined honestly and shared openly has the power to move the needle on patient outcomes in ways that intuition alone cannot. The patterns surfaced in this Index, from the disproportionate mortality burden of the most severely injured to the striking over-representation of penetrating trauma among transfused patients, are not endpoints. They are invitations to dig deeper.

We encourage you to take these findings back to your own data. Use your registry, your dashboard, and your clinical expertise to interrogate what you see here against what you know about your community. Adapt these measures to your context, build on them, push back on them, and make them your own. The value of a benchmarking tool is not in the benchmark itself – it is in the conversations it starts, the audits it motivates, and the improvements it ultimately inspires.

Trauma care saves lives. Data improves care. We hope the ESO Trauma Index serves as a catalyst to improve community health and safety outcomes through the power of data.


## ACKNOWLEDGMENTS

The 2026 ESO Trauma Index was produced by the ESO Research and Performance Improvement team. The authors thank the facilities that contribute data to the ESO Data Collaborative and the medical professionals whose documentation makes this analysis possible.


## REFERENCE


1 Holcomb, J. B., Tilley, B. C., Baraniuk, S., et al. (2015). Transfusion of Plasma, Platelets, and Red Blood Cells in a 1:1:1 vs a 1:1:2 Ratio and Mortality in Patients With Severe Trauma. *JAMA*. https://jamanetwork.com/journals/jama/fullarticle/2107789.

2 Centers for Disease Control and Prevention. (2025). Facts About TBI. *Traumatic Brain Injury & Concussion*. https://www.cdc.gov/traumatic-brain-injury/data-research/facts-stats/index.html.

3 Carney, N., Totten, A. M., O'Reilly, C., et al. (2017). Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition. *Neurosurgery*, 80(1), 6–15. https://doi.org/10.1227/NEU.0000000000001432.

## METHODOLOGY

Data for the 2026 ESO Trauma Index was compiled from facilities participating in the ESO Data Collaborative for calendar year 2025. The Collaborative includes agencies using ESO's electronic health record platform and agencies using other patient care reporting systems that contribute data under a data sharing agreement.

Each measure uses its own inclusion criteria, described in the operational definition at the beginning of that section.

This report is a descriptive analysis using retrospective data. It does not establish causation and should not be interpreted as a performance evaluation of any individual facility, provider, or patient population. Findings are intended to support center- and system-level quality improvement efforts to meet and exceed existing performance trends.

## LIMITATIONS

The ESO Data Collaborative is a large but non-random sample. Facilities that contribute to the Collaborative are not statistically representative of all trauma centers and hospitals in the United States, and findings should not be extrapolated as a precise national estimate. Trauma centers with more mature data infrastructure may be overrepresented relative to the broader national landscape.

Race and ethnicity data is reported as documented in the patient care record. Documentation rates vary by facility and by measure.

All measures in this edition are descriptive and observational. Observed correlations are presented as hypothesis-generating findings, not evidence of causal mechanisms. Year-over-year comparisons must account for dataset growth; this edition uses rate-based metrics wherever possible to mitigate this effect.

## ABOUT ESO

**ESO's mission is to improve community health and safety outcomes through the power of data. Founded and led by emergency responders and medical professionals since 2004, ESO advances the industry by combining deep domain expertise with innovative technology, impactful research, and the industry's largest integrated emergency outcome data asset. The company delivers the world's most trusted and connected emergency ecosystem – an open, interoperable platform that unites emergency medical response, fire, hospital, and government stakeholders across the full emergency continuum through real-time data exchange and embedded intelligence in frontline workflows. ESO's solutions deliver actionable insights to decision-makers, enable smarter coordination across the emergency continuum and uphold the highest standards of data security and patient privacy. The company helps customers around the world deliver measurable improvements in clinical, operational, and financial outcomes with dedicated teams in the United States, Canada, United Kingdom, Denmark, Czech Republic, India, and Costa Rica. For more information, visit www.eso.com.**