

*2023 ESO TRAUMA INDEX*

# INSIGHTS AND BEST PRACTICES FOR TRAUMA SYSTEMS

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# GOING BEYOND THE BEDSIDE: 2023 TRAUMA INDEX

The healthcare industry is rapidly evolving, incorporating more and more data to monitor, measure, and improve care. Through deeper insights, communities are working to better understand blind spots that may cause disparities in care beyond the bedside — across age, race, gender, and social constructs that can ultimately impact patient outcomes. This shift will directly benefit people in vulnerable situations who historically haven't received proper care.

The 2023 ESO Trauma Index drills down into some of these potential blind spots in equitable care and more — the areas ripe for improvements and deeper analysis in each organization. From penetrating trauma and whole blood usage to injury severity score breakdowns, trauma centers of all sizes can use this information to better understand how their organization stacks up against national benchmarks.

We hope this year's Index helps drive change beyond the bedside from pediatrics to older adult care and everyone in between, empowering more informed decisions that lead to improved performance and, ultimately, better patient outcomes for all.

Here are a few questions we hope the Index helps you work towards answering using your own data:



**How many trauma patients meet the need for blood transfusion based on the Early Blood Transfusion Needs Score (EBTNS)? What percent received whole blood?**



**What is the time to administration of antibiotics for trauma patients with open long bone fractures?**



**What is the time to surgical repair of hip fractures in the older adult population?**



**What percentage of penetrating trauma victims have a systolic blood pressure (SBP) less than 90 mmHg or shock index (SI) greater than one?**



**What's the frequency of occurrence for key hospital events?**



**What is the breakdown of patient injury severity scores (ISS) by trauma center level?**



**Is my organization aligned with others nationally when it comes to patient care measures included in this index?**



**What are the best practices for each measure in the Index?**

The appropriate metric for evaluating your hospital system's success will vary depending upon a number of factors, including the size of the population served and geographic location. However, we believe an objective look at aggregate data across the United States gives a good idea of how you perform compared to your peers.

This Index serves as a point of reference for hospitals and trauma centers to identify which areas are aligned and which represent an opportunity for improvement — or at least further assessment and evaluation. This quantitative approach to measuring performance gives hospital systems a framework to continually refine tactics, improve efficiency and outcomes, and allocate resources appropriately.

# LIMITATIONS

This Index is retrospective and looks at aggregate data from 2022 hospital admissions. There are no universal rules designed around these measures. The purpose of the Index is to be informative and directional, but it is not intended to be a scientific study nor comprehensive in nature. We hope it serves as a body of literature that adds to the discussion around best practices to improve patient outcomes surrounding these measures.



**968,538  
PATIENT  
RECORDS**

The Trauma Index uses ESO data compiled from 596 hospital systems and represents 968,538 patient records from January 1 through December 31, 2022. The ESO Trauma Index is created from the ESO Data Collaborative, the world's largest deidentified trauma registry data program that is available at no cost.

We hope you find this Index helpful, enlightening, and empowering. We're always here to answer any questions, clarify data, and share our expertise.

# THE KEY METRICS MEASURED



**WHOLE BLOOD AND PACKED RED BLOOD CELL USAGE FOR PATIENTS MEETING EBTRANS CRITERIA**



**TIME TO ANTIBIOTICS FOR PATIENTS WITH OPEN LONG BONE FRACTURES, INCLUDING PEDIATRICS AND OLDER ADULTS**



**TIME TO SURGICAL REPAIR OF HIP FRACTURES IN OLDER ADULTS**



**SYSTOLIC BLOOD PRESSURE AND SHOCK INDEX FOR PENETRATING TRAUMA INJURIES**



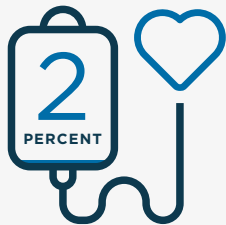
**OCCURRENCE OF HOSPITAL EVENTS**



**INJURY SEVERITY SCORE (ISS) SUMMARY**

# KEY FINDINGS

At a macro level, the data revealed the following:

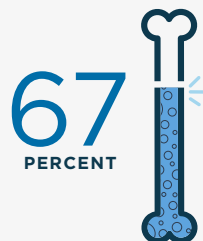
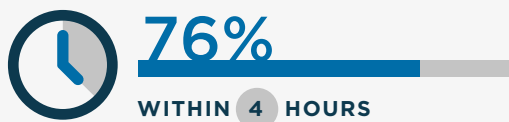


**Whole Blood Usage:** Slightly less than 2% of patients meeting the EB-TNS definition for blood transfusion received only whole blood.

**94%** WITHIN 24 HOURS

**Surgical Repair of Hip Fractures:** 94% of the older adult population who required surgery for a hip fracture were moved from the ED to the Operating Room (OR) within 24 hours. The majority of the remaining 6% were in the OR within 48 hours.

**Blood Component Timing:** 76% of those who received packed red blood cells (PRBC) and met the EB-TNS definition for blood transfusion received PRBC within four hours of hospital arrival.

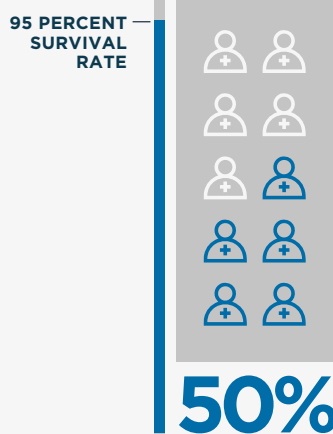
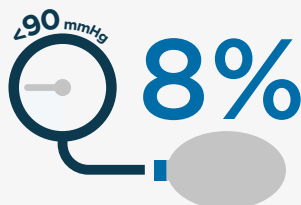


**Antibiotics and Open Long Bone Fractures:** 67% of patients suffering from an open long bone fracture received antibiotics within 60 minutes of ED arrival.

**Hospital Events:** 8% of encounters involved at least one reported hospital event. The most reported events included unanticipated admission to the ICU, delirium, unplanned intubation, cardiac arrest with CPR, and an unplanned visit to the OR.



**Penetrating Trauma:** 8% of patients suffering from penetrating injuries had a systolic blood pressure of less than 90mmHg, and 13% had a shock index greater than one.



**Injury Severity Score (ISS):** Almost 50% of patients with trauma-related injuries received treatment at a Level I trauma center, and these patients had a nearly 95% survival rate based on crude mortality. As expected, patients with the most severe injuries (ISS scores greater than or equal to 25) experienced the highest mortality rates at 29% or greater, regardless of trauma center level.

# INDEX METRIC: BLOOD



For this Index, “blood” includes whole blood and packed red blood cells (PRBC) metrics. The whole blood measure looks at how many trauma patients with an Early Blood Transfusion Needs Score (EBTNS) greater than five received whole blood at the hospital. In contrast, the PRBC measure examines the proportion of patients meeting the EBTNS criteria who received a PRBC transfusion who received such a transfusion within four hours of arrival at the trauma center.

Traumatic injuries stand as the fourth leading cause of mortality in the United States,<sup>1</sup> with hemorrhage accounting for more than 30% of trauma-related deaths — equivalent to approximately 50,000 lives annually.<sup>2</sup> The data shows the lifesaving impact of using blood for traumatic hemorrhage. Recent advancements, particularly within the military population,<sup>3</sup> highlight the advantages of whole blood over component-based treatments with PRBC, influencing community-based trauma programs nationwide for civilian trauma resuscitations.<sup>4</sup> As we gain a stronger understanding of the efficacy and benefits of whole blood, research indicates that its administration by emergency medical services is linked to lower incidents of adverse events and transfusion reactions.<sup>5</sup> Recent studies have also revealed that when whole blood is used for trauma resuscitation, it is associated with lower red blood cell usage and cost.<sup>6</sup> It must be recognized that while the adoption of whole blood remains somewhat limited in both prehospital and hospital settings nationwide, its usage is on the rise. In this year’s Trauma Index, 5% of patients meeting the EBTNS definition for blood transfusion received whole blood, marking an increase from last year’s 4%. Mortality from hemorrhage is a global problem, resulting in almost 2 million worldwide. Of those 2 million hemorrhagic deaths, 1.5 million deaths can be attributed to a traumatic injury.<sup>7</sup>

EBTNS is a metric designed to identify trauma patients needing a blood transfusion. It simplifies scoring by using criteria accessible to prehospital clinicians.<sup>8</sup> Recognizing its importance, in this Index, we used the EBTNS to identify which patients may have benefitted from an early blood transfusion. We looked at patients with an EBTNS greater than five, eliminating records where no score was calculated.

8% (n=67,185) of 968,538 trauma patients had an EBTNS score greater than five, thus identifying them as patients who would potentially benefit from a blood transfusion.

The chart below shows that out of the 67,185 patients who had an EBTNS score greater than five, 2% received only whole blood, 20% received only PRBCs, 3% received both whole blood and PRBCs, and 75% did not receive any blood.

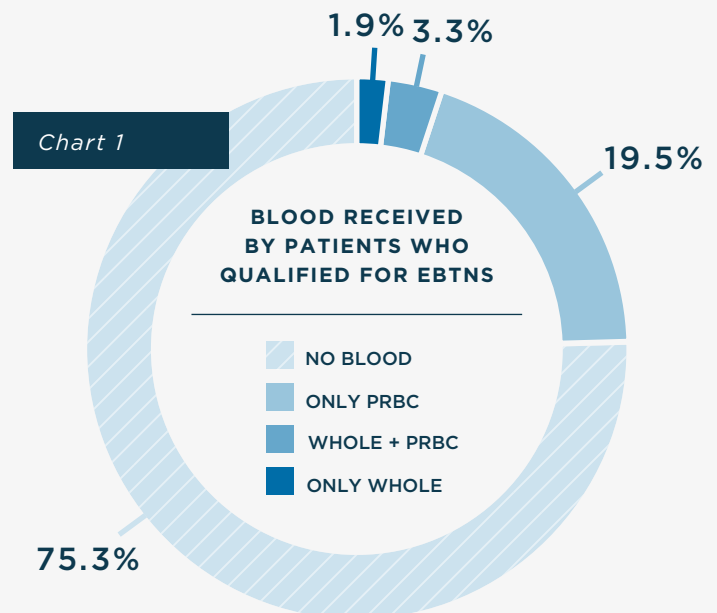
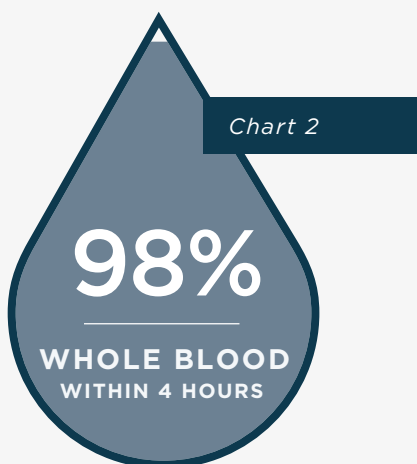


Chart 1: Whole blood and PRBC usage for trauma patients with EBTNS greater than 5.



Among patients with an EBTS score greater than five who received whole blood, their median time to whole blood administration was 11 minutes with an interquartile range (IQR) of six to 21 minutes.

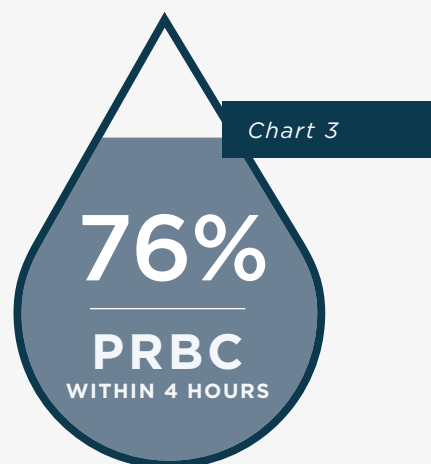
**Chart 2** shows the timing for whole blood transfusions for trauma patients who received such transfusions. Among those that received whole blood, 98% of trauma patients (n=3,331) with an EBTS greater than five received whole blood within four hours, while 2% received whole blood more than four hours later.



*Chart 2: Whole blood transfusions within four hours of arrival at the hospitals for trauma patients with EBTS greater than five. (Excludes missing data)*

A total of 23% of patients (n=15,343) who also met the EBTS criteria received PRBC. The median time to PRBC administration was 25 minutes, with a wide IQR of 10 to 219 minutes.

**Chart 3** illustrates the timing of PRBC transfusions for trauma patients who received such transfusions. 76% of trauma patients with an EBTS greater than five who received PRBC, received it within four hours. This is a significant increase from last year's findings, where just 46% of qualifying trauma patients received PRBC within four hours of arrival.



*Chart 3: PRBC transfusions within four hours of arrival at the hospitals for trauma patients with EBTS greater than five. (Excludes missing data)*



## BLOOD INSIGHTS

Approximately 30% of trauma-related deaths in the U.S. and 40% worldwide are due to bleeding or the consequences of uncontrolled hemorrhage, establishing it as the most common cause of preventable death in trauma.<sup>9</sup>

As more research becomes available on the use of whole blood and PRBCs — and the effects of each on timing, frequency, and patient outcomes — our understanding of the overall effect whole blood usage has on patients of all types grows. In one study, both whole blood and PRBC transfusions saw improvements in coagulation over time, but the type and time of transfusion greatly affected coagulation status.<sup>10</sup> When one-fourth of all severely injured trauma patients experience massive and sustained bleeding associated with impaired blood clotting, a condition commonly referred to as trauma-induced coagulopathy (TIC), it becomes more imperative to track the effects of time, volume, ISS, and blood usage for patients.<sup>11</sup>

Recent research supports the usage of whole blood in prehospital settings: Trauma patients who receive prehospital low titer O+ whole blood transfusions had a more significant improvement in shock index (SI) and a reduction in early mortality,<sup>12</sup> and prehospital whole blood was associated with improvement in SI, mortality rates, and length of stay (LOS). Prehospital whole blood patients also received fewer packed red blood cells, fresh frozen plasma, and platelets units across their LOS, but total units and volumes were similar. Finally, prehospital whole blood patients had fewer Massive Transfusion Protocol (MTP) activations despite a similar requirement of Critical Administration Threshold (CAT) score of three or higher (CAT3+) upon arrival to a hospital.<sup>13</sup>

Despite its effectiveness, whole blood remains expensive and challenging to manage due to its short shelf life, screening and testing requirements, temperature-controlled transportation and storage needs, compatibility issues, and more. These challenges need to be addressed to ensure timely and safe administration in trauma situations where whole blood is necessary.

While the early administration of whole blood is crucial, its availability and ability to administer it quickly can vary depending on the healthcare setting. Protocols in place to assess the patient's needs and minimize delays are imperative for more successful patient outcomes.



## BLOOD BEST PRACTICES

These practices are continually evolving based on ongoing research and advancements in the use of blood in trauma care.



Rapidly assess blood loss and hemodynamics, continuously monitoring for changes to ensure timely whole blood administration within the initial 60 minutes of a traumatic injury, considering individual circumstances.



It's essential to monitor treatment outcomes for patients in hemorrhagic shock and administer timely transfusions of whole blood or PRBCs.



Use whole blood to help improve outcomes for patients experiencing severe hemorrhage and shock.



By closely monitoring the availability of blood products during massive transfusions, healthcare providers can identify key areas for improvement, ultimately leading to better outcomes.



Implement MTP for trauma patients with severe hemorrhage.



Since last year, the evidence base for administering prehospital blood by EMS has continued to grow. While there are logistical challenges, peer-reviewed publications have documented best practices to overcome these hurdles.



Early administer tranexamic acid (TXA), preferably within three hours of injury, to help reduce mortality in patients with significant bleeding.



When appropriate, consider implementing changes that facilitate clinicians' use of whole blood for patients with life-threatening hemorrhages.



Implement point-of-care coagulation testing, utilizing rapid coagulation tests, such as thromboelastography (TEG) or rotational thromboelastometry (ROTEM) to guide blood transfusion therapy based on the patient's specific coagulation profile, while tracking data with trauma registry.



Balance resuscitation strategy, often in a 1:1:1 ratio of PRBCs with fresh frozen plasma (FFP) and platelets.



# INDEX METRIC: FRACTURES



We examined two metrics regarding patients with fractures. First, the amount of time it takes for a patient with an open long bone fracture to receive antibiotics once they arrive at the trauma center. Second, the amount of time it takes to begin surgical repair of a hip fracture for patients 65 years and older. For these data, we included “negative times” (potentially indicating EMS administration of antibiotics prior to hospital arrival) for administration of antibiotics prior to hospital arrival.

For patients with open long bone fractures, it’s critical to begin antibiotic treatment quickly to minimize the risk of infection.<sup>14</sup> We know these patients are at increased risk for infection due to compromised disruption of skin and tissues as well as potential contamination from the external environment.

**Chart 4** shows the percentage of patients with open long bone fractures receiving antibiotics within 60 minutes or prehospital (67%).

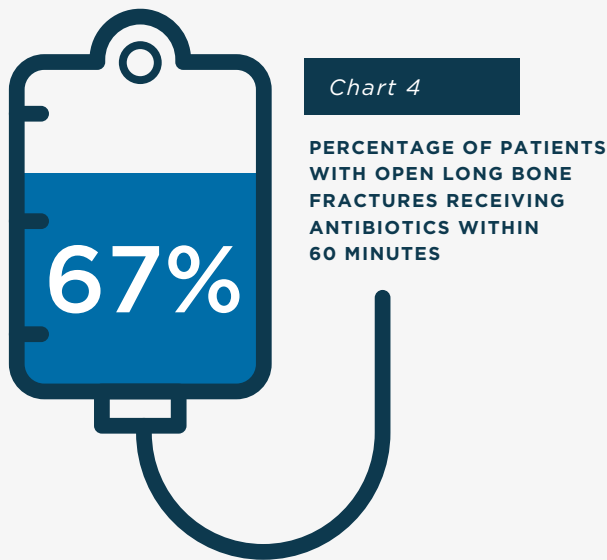


Chart 4: Percent of patients with open long bone fractures receiving antibiotics within 60 minutes.

Similar to last year’s data, pediatric patients (younger than 18) and the older adult population (65 or older) received antibiotics less frequently than adults aged 18-64.

**Chart 5** shows that pediatric patients received antibiotics within 60 minutes 62% of the time, the older adult population 61% of the time, and adults 18-64 69% of the time.

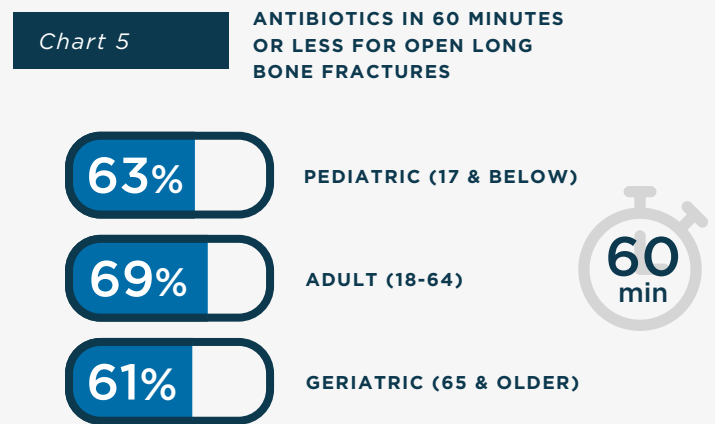


Chart 5: Antibiotic administration in less than 60 minutes by age group. (Excludes missing data)

**Chart 6** highlights the percentage of the older adult population with hip fractures moving from the ED to OR in 24 hours or fewer (94%) and 48 hours or fewer (99%+).

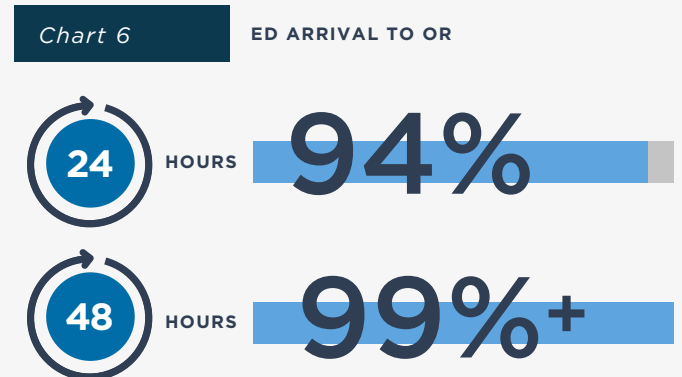


Chart 6: The older adult population (65 and older) patients with hip fracture from ED to OR.



## FRACTURES INSIGHTS

Open long bone fractures represent complex injuries within the trauma system. Targeted antibiotic treatment reduces the risk of infection when soft tissue and bone are exposed to the environment due to these types of fractures.<sup>15</sup>

Administering antibiotics early has been found to significantly decrease infection,<sup>16</sup> with guidelines recommending that antibiotics should be given within 60 minutes of the patient's arrival at the trauma center.<sup>17</sup> Research has shown that implementing an open fracture working group and protocols surrounding antibiotic prophylaxis can significantly reduce the time it takes to administer them.<sup>18</sup>

Since time is of the essence in treating these types of fractures, it's important to also look into the prehospital implementation of antibiotics. A recent study has found that EMS personnel were able to administer the antibiotic prophylaxis for patients without complication. It is likely that further training would lead to even higher rates of successful prehospital antibiotic administration for open fractures.<sup>19</sup>

## FRACTURES BEST PRACTICES



Early administration of antibiotics for open long bone fractures could help significantly decrease infection.



Create a working group and protocols surrounding long bone fractures to decrease the time it takes to administer antibiotics.



Reduce the risk of infection and complications for trauma patients with open fractures by giving antibiotics within 60 minutes of ED arrival.



Encourage the training of prehospital personnel to provide antibiotics for patients with open fractures before arrival at trauma centers, decreasing both the time to antibiotics and infection rates.



Surgical interventions within 48 hours of hip fracture substantially reduce morbidity and mortality in the older adult population.<sup>20</sup>



Time surgical repair of hip fractures to impact patients' LOS. Surgically intervene sooner to decrease hospital stay length.

# INDEX METRIC: PENETRATING TRAUMA



Penetrating trauma remains a persistent challenge within trauma care and places significant stress on the trauma system across the United States, both in terms of resources and societal impact.

Characterized by a foreign object entering the body and breaking the skin, penetrating trauma includes injuries such as stab and gunshot wounds. The severity of the case depends on which body organs were involved, the object, and the force transmitted.<sup>21</sup> Penetrating trauma is both affected by and contributes to disparities in healthcare. These disparities can be influenced by various factors such as socioeconomic status, race, ethnicity, geographic location, and access to healthcare and trauma center resources. Over the past few decades, multiple studies have shown an increase in penetrating trauma mortality rates nationally, with areas limited in access to trauma centers often seeing worse outcomes. This is particularly true in rural areas or underserved urban neighborhoods due to the time it takes to reach a healthcare facility, which can be crucial in determining the patient's outcomes. In 2022, there were 86,811 reported incidents of penetrating trauma within the ESO Data Collaborative.

Systolic blood pressure (SBP) is a critical factor in the initial assessment of the severity and outcomes of penetrating trauma cases.<sup>22</sup> The measurement and interpretation of SBP guides resuscitative efforts and decision-making surrounding treatment, such as transport and surgical interventions. The National Trauma Triage Protocol published by the American College of Surgeons' Committee on Trauma (ACS-COT) in collaboration with the Centers for Disease Control (CDC) uses SBP as one

of the essential physiologic criteria when identifying if an injured patient should be taken to a trauma center.

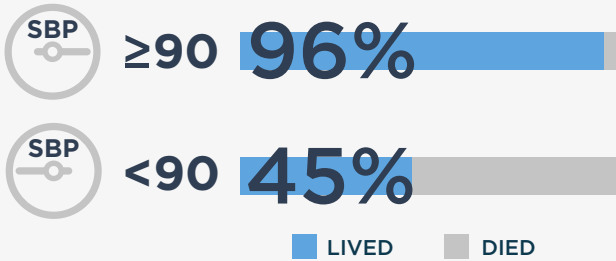
The approach to penetrating patients with SBP less than 90 mmHg differs significantly from those with higher SBP readings, and continuous vigilance is required due to the potential for rapid change in a patient's condition, leading to death. A SBP less than 90 mmHg often indicates hemorrhagic shock, a condition where severe blood loss leads to inadequate tissue perfusion and oxygenation. Trauma patients with an SBP less than or equal to 90 mmHg generally require rapid interventions, including the administration of blood products, fluid resuscitation, and possible surgical exploration, to identify and control the source of bleeding. SBP less than 90 mmHg is also associated with higher mortality rates, underscoring the importance of prompt intervention and stabilization in trauma patients.<sup>23</sup>

We should not underestimate SBP's significance in management for overall treatment and prognosis, which is why this year's Trauma Index reports on the number of penetrating cases and first-recorded SBP. Of the reported incidents, 8% of penetrating trauma cases featured a first-recorded SBP below 90 mmHg.

**Chart 7** shows that there was a significant difference in mortality when comparing penetrating trauma victims with a first-recorded SBP greater than or equal to 90 mmHg to those patients with SBP less than 90 mmHg.



**Chart 7** SBP IN PENETRATING TRAUMA VICTIMS (P<0.001)



*Chart 7: The difference in mortality when comparing patients with a SBP greater than or equal to 90 mmHg to those with SBP below 90 mmHg.*

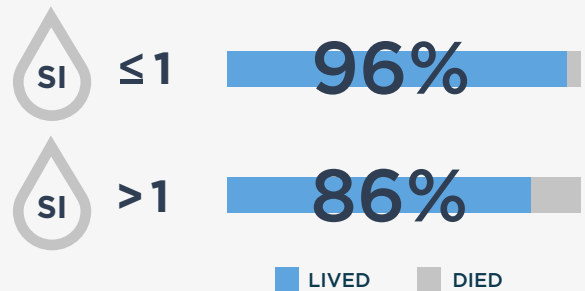
The shock index (SI) is a simple yet powerful tool that can be used to assess the severity of trauma (including penetrating trauma), predict patient outcomes, and guide clinical management decisions. In penetrating trauma care, SI is used in the assessment of blood loss and hypovolemic shock (which is common in these types of patients) and serves as a valuable predictor of outcomes. SI is calculated as the patient’s heart rate divided by SBP upon emergency department arrival and predicts blood loss and death.<sup>24</sup>

When predicting patient outcomes, higher SI values have been associated with increased severity of injury, greater need for blood transfusions, and higher mortality rates.<sup>25</sup> It has proven to be an excellent tool for triaging patients and prioritizing

those who need more urgent interventions. Changes in the SI during trauma resuscitation can provide real-time feedback on the patient’s response to treatment, allowing for adjustment in care management. In penetrating trauma, where over-resuscitation can be harmful, SI can assist with determining the appropriate level of fluid and blood product administration.

13% of all patients with documented penetrating trauma in the trauma center had a SI greater than one, which is an indicator of an increased risk of adverse outcomes and requires immediate clinical attention.<sup>26</sup> A significant difference in mortality was observed when comparing penetrating trauma victims with a SI of one or less to those with SI exceeding one as shown in **Chart 8** below.

**Chart 8** SI IN PENETRATING TRAUMA VICTIMS (P<0.001)



*Chart 8: The difference in mortality when comparing patients with a SI greater than or equal to one to those with a SI below one.*



## PENETRATING TRAUMA INSIGHTS

This Index highlights valuable insights into the management and outcomes of patients with penetrating trauma, especially when considering the role of SBP as a prognostic indicator. Here are some key insights based on data for patients with a SBP greater than or equal to 90 mmHg compared to those with a SBP less than 90 mmHg:

- The survival rate for patients is 96%, notably higher than those with a SBP less than 90 mmHg at 45%. This supports the idea that maintaining a SBP at or above the threshold of 90 mmHg is associated with a much better prognosis.
- A SBP greater than or equal to 90 mmHg in penetrating trauma strongly indicates better hemodynamic stability and potentially less severe hemorrhagic shock, leading to better patient outcomes. Please note that for patients with an SBP greater than or equal to 90 mmHg, resuscitation efforts might be less aggressive, focusing on maintaining stability rather than correcting hypotension.
- It's essential to collect blood pressure data to evaluate rapid assessment and management of the penetrating trauma patient and for maintaining or rapidly reporting SBP greater than or equal to 90 mmHg.
- Effective prehospital care, including data documentation, early interventions, and timely transportation, are crucial in preventing the SBP from dropping below 90 mmHg.
- Patients with an initial SBP greater than or equal to 90 mmHg still require close monitoring, as they can deteriorate, especially if they have ongoing internal bleeding or delayed recognition of injuries due to penetrating trauma; thus, registry data should include more than just the initial SBP within the first 30 minutes.
- There's a need to prioritize the triage of patients with an SBP of less than 90 mmHg for immediate and aggressive interventions.



## PENETRATING TRAUMA INSIGHTS (CONTINUED)

Understanding these outcomes helps allocate resources more effectively in trauma centers, especially in high-pressure situations. These data present insights that highlight areas for further research, particularly in optimizing resuscitation strategies to decrease mortality for patients with SBP less than 90 mmHg.

It should be pointed out that trauma registry professionals often focus on only collecting the initial SBP. Still, we strongly recommend that programs take advantage of data interoperability resources such as Fast Healthcare Interoperability Resources (FHIR) to integrate all SBP and vitals taken on all trauma patients, including penetrating trauma patients. These data show the need for rapid and effective trauma care, continuous monitoring, and tailored resuscitation strategies to improve outcomes, particularly for those patients with a SBP less than 90 mmHg.

Among all penetrating trauma patients, 28% required surgical intervention directly from the ED, regardless of vital signs. The data demonstrates that the SI is an important metric in the prognosis and management of penetrating trauma. A lower SI score, less than or equal to one, is associated with significantly better patient outcomes. This highlights the need for rapid assessment, appropriate interventions, and continuous monitoring, especially for patients with an SI greater than one.

Our 2023 Trauma Index highlights key insights for penetrating trauma center data from 2022, where patients with a SI less than or equal to one had a survival rate of 96%, compared to patients with an SI greater than one with a survival rate of 86%, suggesting that a lower SI is associated with better prognosis in penetrating trauma.

Using the SI to guide resuscitation and treatment, the data suggests the need for different resuscitation strategies. Patients with an SI greater than one may require more aggressive and immediate interventions from a trauma team. Please note that even with an SI equal to or greater than one, ongoing monitoring is essential due to the potential for rapid deterioration, especially in penetrating trauma due to internal bleeding.



## PENETRATING TRAUMA BEST PRACTICES



Quickly and efficiently triage to assess the extent of penetrating injuries and immediately stabilize. This includes controlling bleeding, ensuring adequate airway and breathing, and stabilizing vital signs, including blood pressure.



Control hemorrhage by stopping or rapidly controlling bleeding, both externally with tourniquets and pressure dressings and internally with surgical interventions.



Implement damage control resuscitation (DCR) using DCR principles, which focus on minimizing crystalloid use, administering blood products early, and controlling coagulopathy.



Provide access to Advanced Trauma Life Support® (ATLS®) training and education to ensure standardized and effective care, using the American College of Surgeons and ATLS systematic approach to assess and treat penetrating trauma patients.



Practice timely and skilled surgical interventions for penetrating injuries that require prompt surgical care.



Provide rapid access to blood products, including an emergency release, without a complete cross-matching process in critical time-sensitive situations.



Provide access to blood for timely transfusions and fluid replacement, particularly in the early stages of treatment.



Have a massive transfusion protocol (MTP) with predefined ratios of blood products for the management of blood loss in penetrating traumas.



Evaluate and identify areas with limited access to healthcare facilities, especially trauma centers.



Improve access to public health and injury prevention efforts. Communities with fewer resources often have limited public health programs focused on violence prevention and education, which are crucial for reducing the incidence of penetrating trauma.



Monitor response times. Significant variations in Emergency Medical Services (EMS) response times impact access to immediate lifesaving care for penetrating trauma patients.



Improve EMS access and administration of prehospital blood for penetrating trauma.



Train and educate teams treating penetrating trauma patients, emphasizing the importance of SI in trauma care and enhancing the ability of healthcare professionals to assess and respond based on patients' needs quickly.



Collect key clinical data beyond the first 30 minutes, such as vitals, SBP, and heart rate. Trauma registry professionals need to ensure that clinical practice guidelines and key performance indicators are achieved for trauma patients, especially penetrating trauma patients.

# INDEX METRIC: HOSPITAL EVENTS



There were 74,645 patient records in 2022 with at least one documented hospital event, for a total of 104,911 unique events. It's important to reduce and mitigate these types of adverse events to improve patient outcomes.

**Chart 9** below shows the top five most common hospital events by raw number of events; this includes patients experiencing multiple events or the same event more than once.

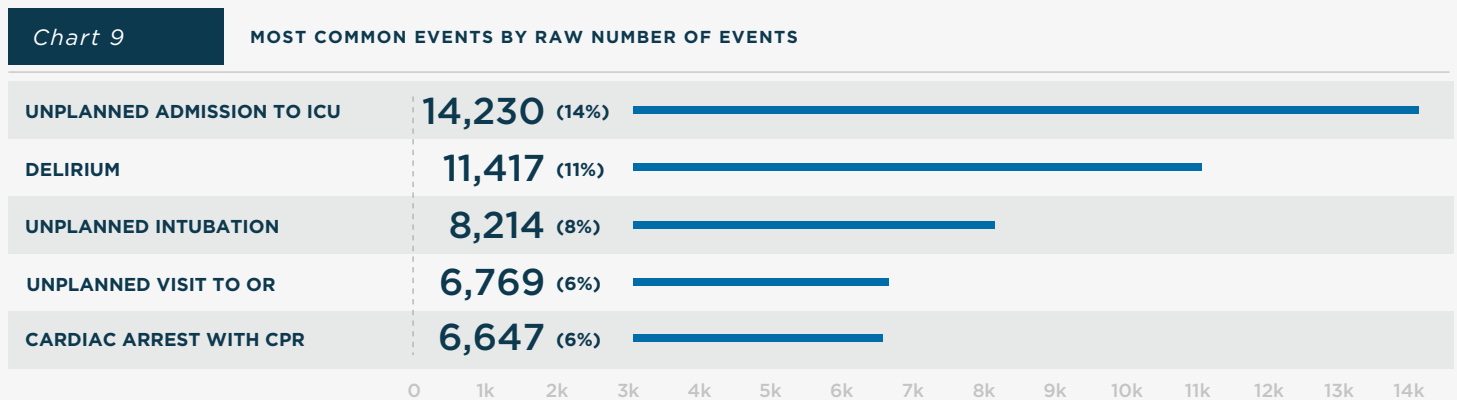


Chart 9: Top 5 most common hospital events. Please note that hospital events were similar among all trauma centers.

## HOSPITAL EVENTS INSIGHTS

Nearly 8% of hospital patients experienced an adverse hospital event, some leading to a preventable death. The majority of these events are experienced by society's most vulnerable, including the older adult population, those from low-income backgrounds, and children.<sup>27</sup> Outside of their tragic nature, the financial impact of these events is staggering, reaching into the millions.

## HOSPITAL EVENTS BEST PRACTICES



Create processes for identifying hospital events concurrently.



Analyze data to determine the best practices for incorporating "early warning signs" that allow care teams to anticipate and thus prevent hospital events before they occur.



Prioritize validating prospective data and accurately benchmarking hospital events.



Establish a non-punitive event review process to identify areas of improvement.



Implement projects to improve performance and address systematic issues.



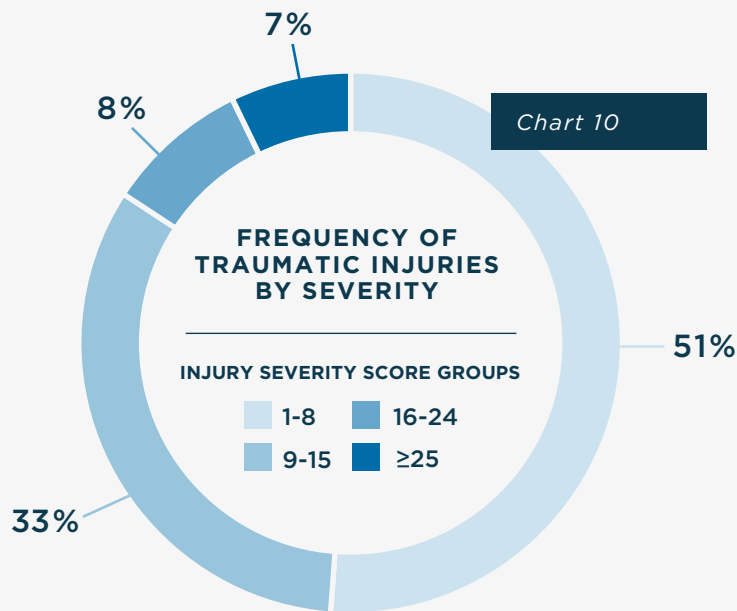
Collaborate to improve trauma data quality.



# INDEX METRIC: INJURY SEVERITY SCORE SUMMARY



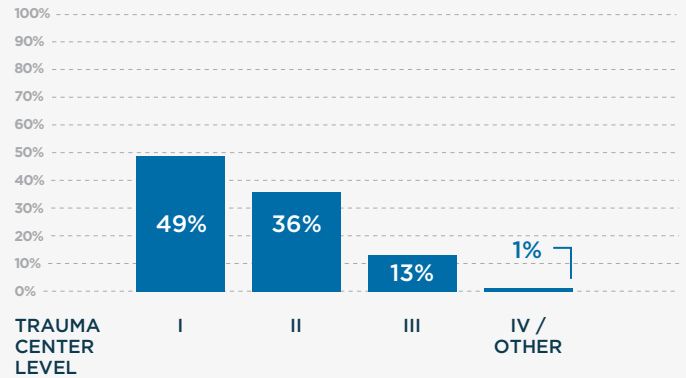
The Injury Severity Score (ISS) was developed by Susan P. Baker, MPH to determine the severity of a traumatic injury, with increasing scores indicating greater severity. This metric explores the frequency of scores across different ranges (see **Chart 10**), including the trauma level most frequently transported to (see **Chart 11**), the survival rate, and the mortality rate based on severity (see **Chart 12**).



Almost 50% of trauma patients receive treatment at a Level I trauma center, regardless of the injury severity score.

*Chart 11*

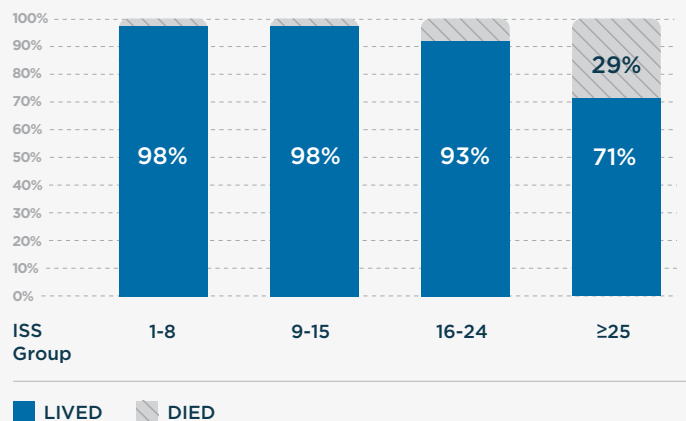
## LEVEL OF TRAUMA CENTER RECEIVING PATIENTS



Mortality rates are highest for patients with the most severe injuries, with those having an ISS score greater than 25 experiencing at least 29% mortality rate among all trauma center levels.

*Chart 12*

## MORTALITY RATES BY INJURY SEVERITY SCORE



# CONCLUSION

## SO, WHAT DO THESE FINDINGS MEAN?

We're seeing solid performance across several metrics, including time to surgery for the older adult population with hip fractures. However, there's room for improvement in other areas, including:

- Closely monitoring the availability and utilization of whole blood products during major trauma to identify key areas for improvement within the transfusion process can help lead to better outcomes for trauma patients.
- See where you stand by measuring against this national benchmark for the administration of antibiotics for patients with an open long bone fracture. We only see antibiotics administered within 60 minutes of arriving at the trauma center 67% of the time.
- Trauma centers within the ESO data collaborative are successfully moving the older adult population with hip fractures to the OR within 48 hours over 99.7% of the time.
- SBP and SI are critical indicators of increased mortality risk for patients suffering from penetrating trauma.
- Compared to 2021, patients experiencing a hospital event remained steady across all systems at 8%. Hospital events can be debilitating to both hospitals and patients.
- ISS is closely correlated with patient mortality.

# METHODOLOGY

The dataset for the ESO Trauma Index is real-world, deidentified data compiled and aggregated from 596 hospital systems across the United States that use ESO services and agreed to have their data used for research purposes. These data are based on 968,538 anonymized patient records between January 1 and December 31, 2022, representing a full calendar year.

## WHAT SHOULD YOU DO WITH THESE INSIGHTS?

The insights in this Index are by no means an exhaustive list of outcomes. Consider this data as the foundation to better understanding which metrics and drivers are making the greatest impact on both your patients and your organization as a whole. Since every organization is unique in its goals, strength, and structure, your results may differ from another's due to a wide range of variables. Use these insights as the basis for your own analysis or as the model for exploring other outcomes.

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