Trauma Surgery Registry Report 2024-2025

Hospital Tuanku Ja’afar Seremban

www.htjssurgery.org

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Abbreviations

AIS	Abbreviated Injury Scale
AOR	At own risk
ED	Emergency Department
GCS	Glasgow Coma Scale
HTJS	Hospital Tuanku Ja'afar Seremban
ICU	Intensive Care Unit
NISS	New Injury Severity Score
NOM	Non-operative management
NTL	Non-therapeutic laparotomy
OM	Operative management
RTA	Road Traffic Accident
TBI	Traumatic Brain Injury
TRISS	Trauma and Injury Severity Score
TTA	Trauma Team Activation

FOREWORD

It is with great pride that I present the *HTJS Trauma Surgery Registry Report 2024–2025*, the first comprehensive account of trauma care performance since the establishment of the Trauma Surgery Unit at Hospital Tuanku Ja'afar Seremban (HTJS). This report represents far more than a compilation of statistics—it reflects a collective commitment to improving the care of the severely injured, strengthening clinical governance, and building the foundations of a mature trauma system for Negeri Sembilan.

The data contained herein capture the realities of trauma within our region: a persistently high burden of major injury, a predominance of young working-age victims, and the overwhelming impact of road traffic accidents. These findings reaffirm what has long been recognised internationally—that trauma is not merely a clinical challenge, but a public health priority requiring coordinated responses across multiple sectors.

Over the past year, we have witnessed significant improvement in trauma outcomes at HTJS, particularly a meaningful reduction in mortality following the implementation of structured system enhancements. The refinement of Trauma Team Activation, availability of Safe O blood in the Emergency Department, establishment of the Trauma Surgery Registry, adoption of standardised resuscitation protocols, and regular multidisciplinary morbidity and mortality reviews have together transformed the culture and capability of trauma care within the institution.

This progress was achieved through the dedication of clinicians, nurses, allied health staff, and administrators who embraced the principles of timely intervention, data-driven practice, and continuous learning. Their efforts underscore a fundamental truth: organised, well-led trauma systems save lives.

Yet much remains to be done. The challenges highlighted in this report—including under-triage, pre-hospital care gaps, and limitations in rehabilitation pathways—demand ongoing attention and investment. As we advance, the Registry will serve as a cornerstone for monitoring performance, identifying deficiencies, and guiding strategic improvements at hospital, state, and national levels.

I am confident that this report will catalyse further dialogue, collaboration, and innovation in trauma care. May it serve not only as a reflection of our current state but as a roadmap toward a safer, more responsive, and more resilient trauma system for Malaysia.

Dr (Mr) Izwan Ismail
Consultant Trauma & General Surgeon
Hospital Tuanku Ja'afar Seremban

About Us

“Get the right patient, to the right hospital, at the right time, to the right team.”

The **Trauma Surgery Unit** at Hospital Tuanku Ja’afar Seremban (HTJS) serves as the heart of Negeri Sembilan’s evolving trauma care system — providing coordinated, evidence-based, and timely management for severely injured patients. Established in **July 2024**, the Unit marks the beginning of HTJS’s journey towards becoming a **Level I Trauma Center**, the highest designation for comprehensive trauma care.

Led by **a dedicated Trauma Surgeon**, the Unit integrates multiple disciplines — including Emergency Medicine, Anaesthesiology, Orthopaedics, Neurosurgery, Radiology, Rehabilitation, and Transfusion Medicine — to ensure seamless, patient-centered trauma care from admission to rehabilitation.

As a cornerstone of the hospital’s Trauma Service, the Unit aims to improve survival and outcomes through organized teamwork, efficient processes, and continuous learning.

Executive summary

The HTJS Trauma Surgery Registry Report 2024–2025 presents the first full-year analysis since the formal establishment of the Trauma Surgery Unit at Hospital Tuanku Ja'afar Seremban (HTJS). Within just one year, the Unit has captured **585 trauma patients**, with **56.5% constituting major trauma**—a proportion significantly higher than other Malaysian state hospitals. This clearly establishes HTJS as a **high-volume, high-severity trauma centre** requiring sustained specialist-led coordination and system enhancement.

The demographic distribution mirrors national patterns: trauma predominantly affects young working-age males (85%) and is overwhelmingly caused by blunt mechanisms, with road traffic accidents (RTAs) accounting for 91% of all cases.

Motorcyclists remain the most vulnerable group, while pedestrians demonstrate the highest mortality (17.8%), reflecting high-energy transfer mechanisms.

The overall mortality rate for all trauma cases was 8.6%, which is lower than international averages.

Major trauma mortality stands at 14.9%, consistent with expected benchmarks for centres managing severe injuries.

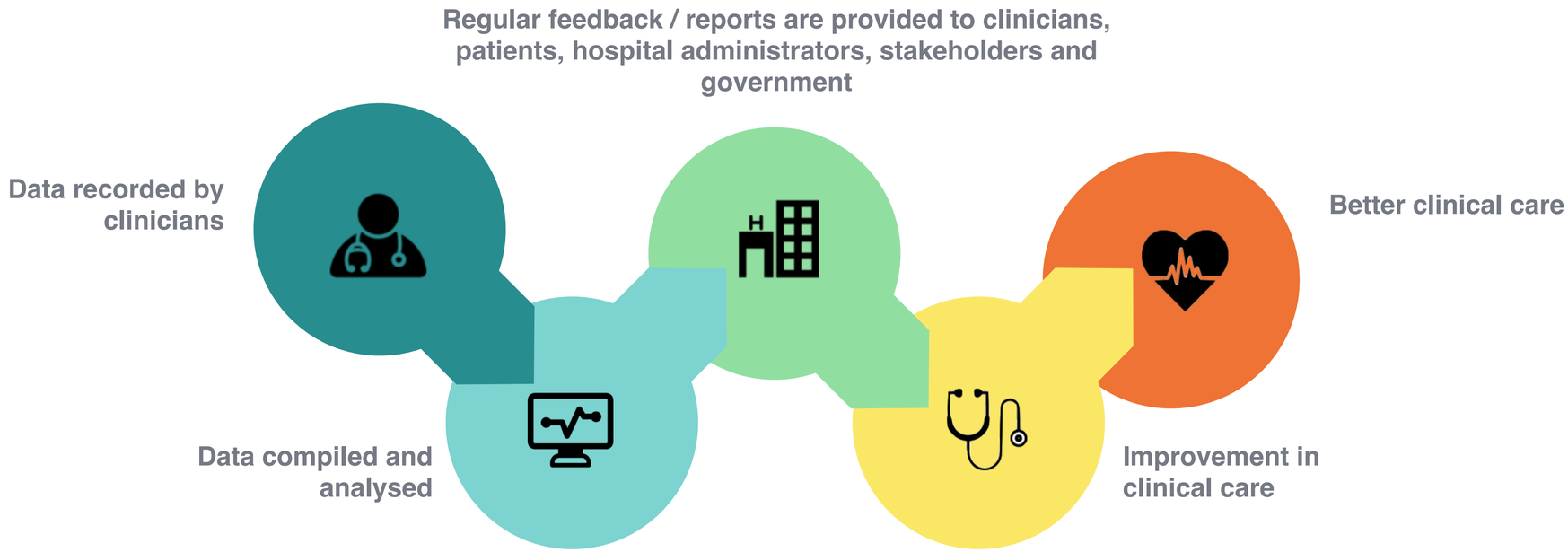
Traumatic Brain Injury (TBI) remains the leading cause of death (59.2%), reflecting HTJS's role as the regional neurosurgical referral hub.

Clinical performance indicators show major improvements over the year. Notably, both all-trauma and major-trauma mortality rates declined substantially after implementation of trauma system enhancements beginning in October 2024.

Despite significant progress, system gaps remain—most notably under-triage of major trauma (44%), delays in timely blood transfusion before Safe O availability in ED, and ongoing challenges in maintaining rapid access to OT and CT suite for critically injured patients. These findings underscore the need for continued investment and coordinated multi-agency efforts to support prevention, pre-hospital care, hospital readiness, and long-term recovery.

Overall, this report demonstrates that with structured leadership and system-wide interventions, measurable improvements in trauma survival can be achieved within a short period. HTJS is now positioned to evolve into a mature trauma centre with the potential to model best practices for other Malaysian hospitals.

Trauma Surgery Registry Report as a Clinical Quality Registry



Why is the registry important?

Our aim for the registry is to become the leading clinical quality registry driving continuous improvement in trauma care. We advocate for trauma to be recognised as a national health priority due to its significant disease burden, rising morbidity and mortality rates, escalating costs, and the suboptimal outcomes linked to inadequate trauma care. Evidence from developed nations shows that the establishment of organised trauma systems can reduce overall trauma mortality by 15–20% and preventable deaths by up to 50%. In Malaysia, a developing nation with a population of 34.1 million, road traffic accidents remain a major public health concern, accounting for 22.5 deaths per 100,000 population. Trauma is the fourth leading cause of death in the country—yet many of these deaths are preventable.

HTJS Trauma Surgery Registry

The Hospital Tuanku Ja'afar Seremban (HTJS) Trauma Surgery Registry was established in June 2024 and as of 30th June 2025 has 585 patients in the registry.

Entry criteria

Data is collected on all trauma patients admitted or referred to Trauma Surgery Service Hospital Tuanku Ja'afar Seremban with the following exceptions:

- Injury resulting from pathological conditions (i.e pathological fractures resulting from malignancy) and injury resulting from degenerative changes or medical illnesses.
- Hanging, drowning, burns and envenomation
- Very late presentations or transfers or referrals from other hospitals for conditions not as a direct result of the initial trauma insult where definitive treatment had been accomplished in the hospital of origin or sequelae of complications occurring temporally distant from the index injury.
- Isolated head and/or isolated skeletal fractures.

Data collection

Data is extracted from patient charts during daily ward round and recorded on a data collection form which is regularly reviewed and updated while the patient is in the hospital.

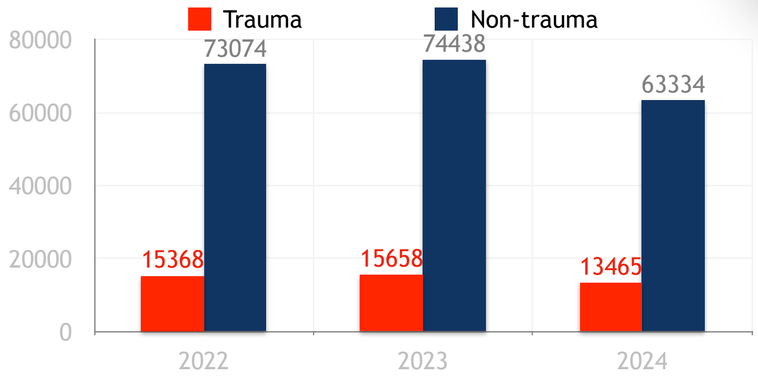
We use the Abbreviated Injury Scale (AIS) version 1990 updated 1998, this determines our New Injury Severity Score (NISS)

- AIS assigns a numerical value between 1 and 6 according to the severity of injury (1 least, 6 most) for injuries in each region of the body. NISS takes the scores from the three highest AIS score, squares them and adds them together. NISS can range from 1 (least and not usually requiring admission to hospital) and 75 (most and usually fatal). NISS is not normally distributed and is non-ordinal in that not every score between 1 and 75 is possible.
- The dataset is specifically configured to the requirements of HTJS. Data is entered into the registry from the collection form after the patient has been discharged from hospital.
- The Trauma Surgery Registry assists in the study of trends in the region and injury prevention.

Major Trauma

Using AIS1990/98, major trauma is defined as those patients with an NISS score of 16 or greater. This means every patient with a single AIS 4 or 5 score qualifies as having suffered major trauma. In addition the NISS≥16 criteria are met by a patient with two AIS 3 scores or an AIS 3 score and 2 AIS 2 scores. Our institutional definition also includes any head injury, any admission to ICU as well as any death in ED regardless of the NISS to be classified as Major Trauma.

HTJS EMERGENCY DEPARTMENT ATTENDANCE (2022-2024)



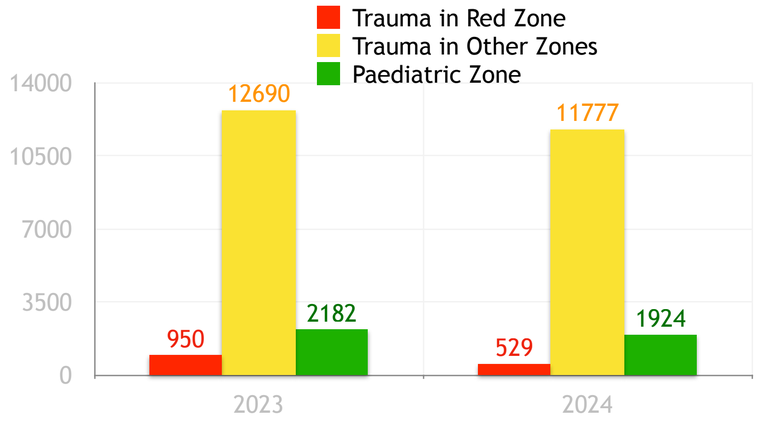


Figure 1: Emergency Department Attendance (2022-2024)

TRAUMA CASES IN EMERGENCY DEPARTMENT

TRAUMA CASES UNDER TRAUMA SURGERY SERVICES

We cover trauma involving:
- Neck injury
- Thoracic injury
- Abdominal injury
- Pelvic injury
- Vascular injury

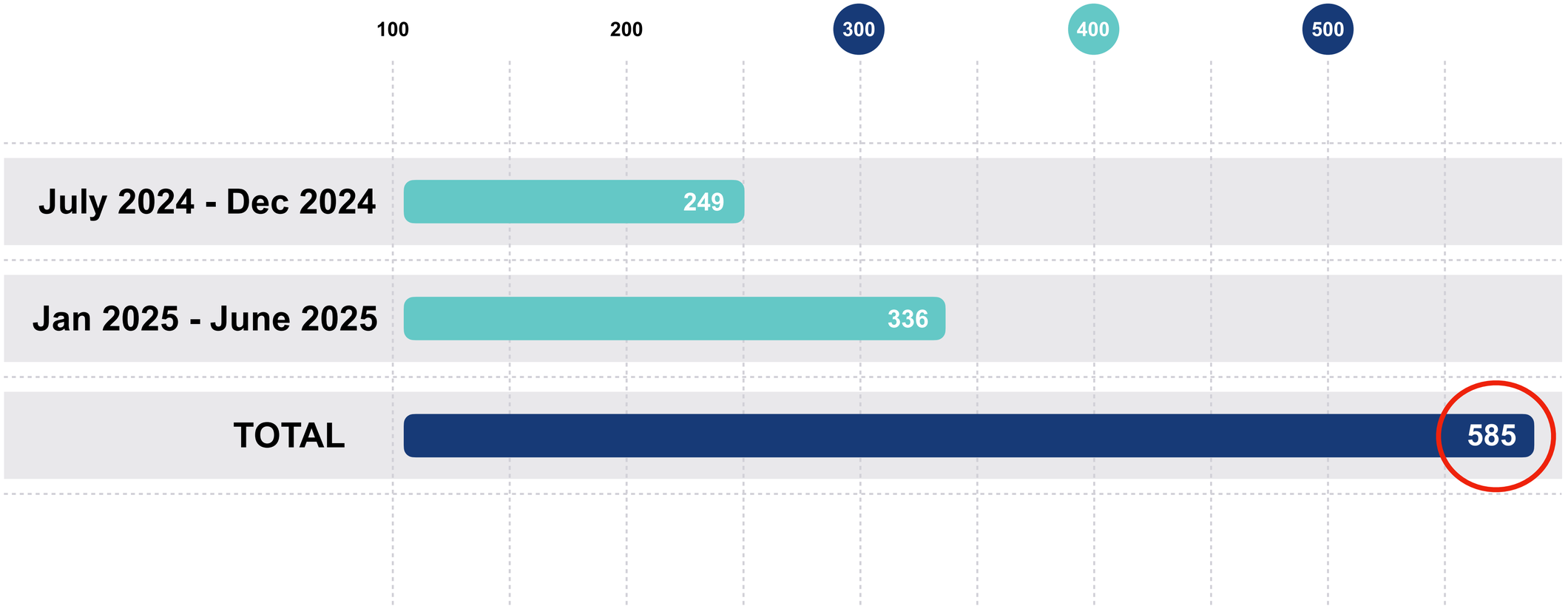
TRAUMA CASES UNDER OTHER SERVICES

- NEUROSURGERY
- ORTHOPAEDIC
- ORAL MAXILLOFACIAL
- OTORHINO-LARYNGOLOGY

Patient Characteristics

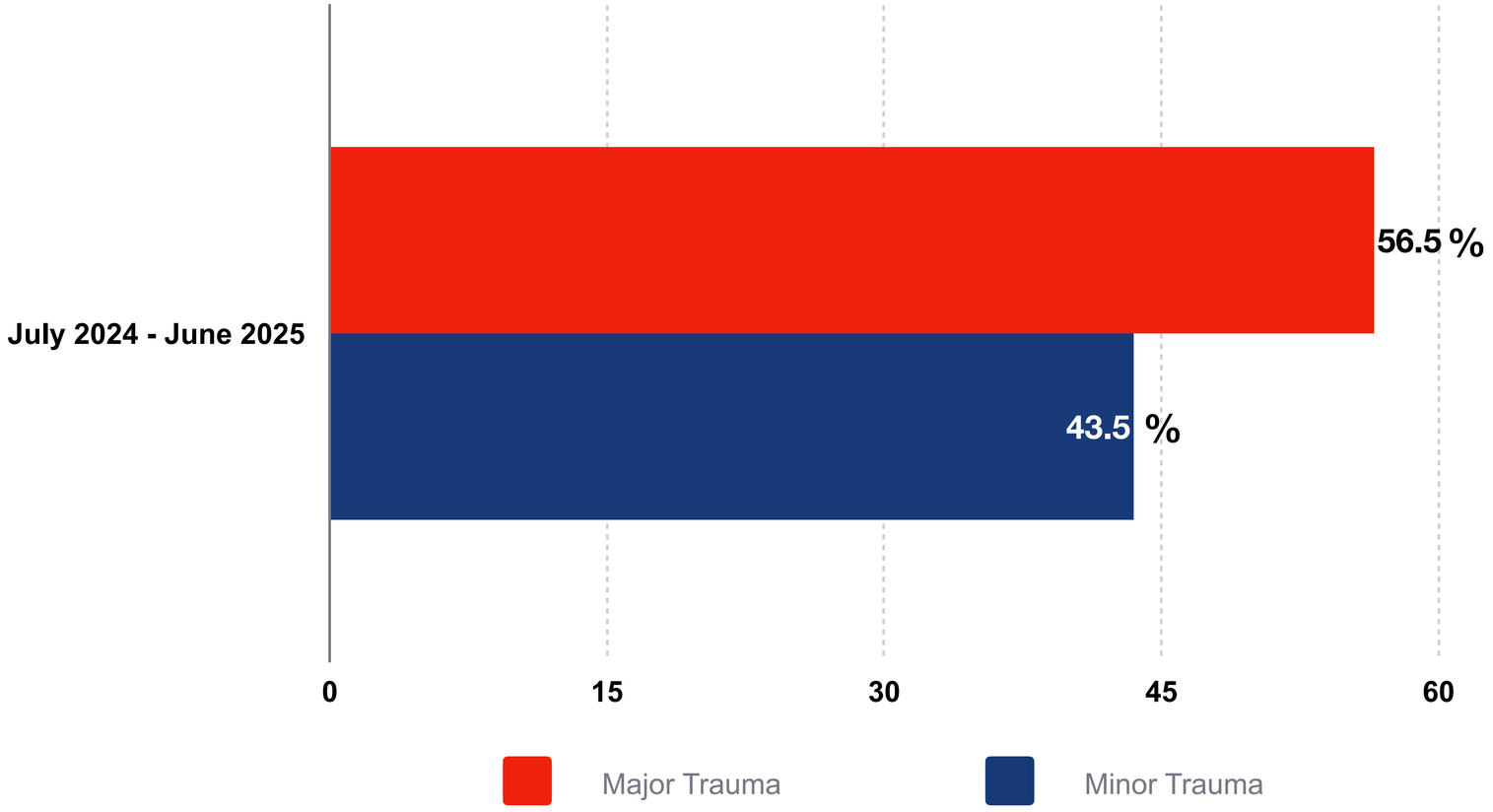
ALL TRAUMA SURGERY ADMISSIONS

Figure 2: Overall admission from July 2024 - June 2025 (n)



MAJOR TRAUMA ADMISSIONS

Figure 3: Major Trauma admission (%)



Major Trauma Cases

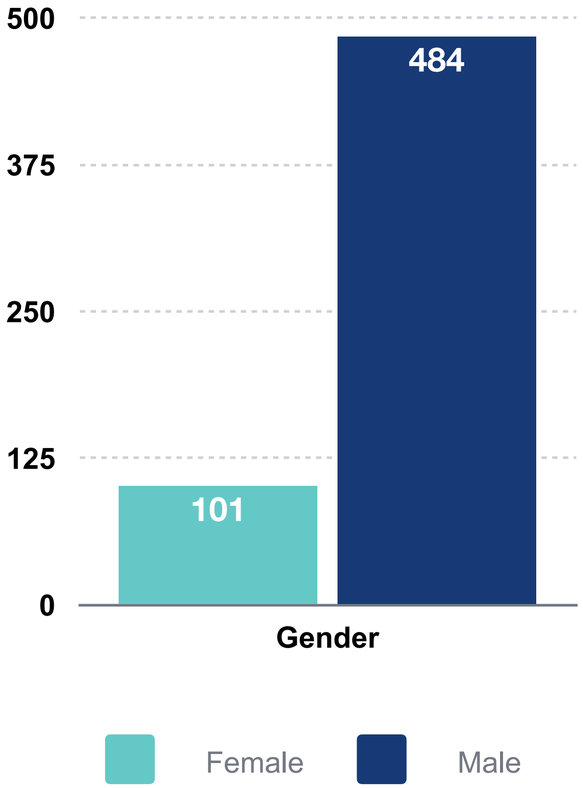
In 2024/2025, **major trauma admissions (NISS ≥16)** constituted **56.5% of all trauma surgery cases** managed at Hospital Tuanku Ja'afar Seremban. This proportion is notably higher compared to other state hospitals in Malaysia, indicating a substantial burden of severe injuries within the institution's catchment area.

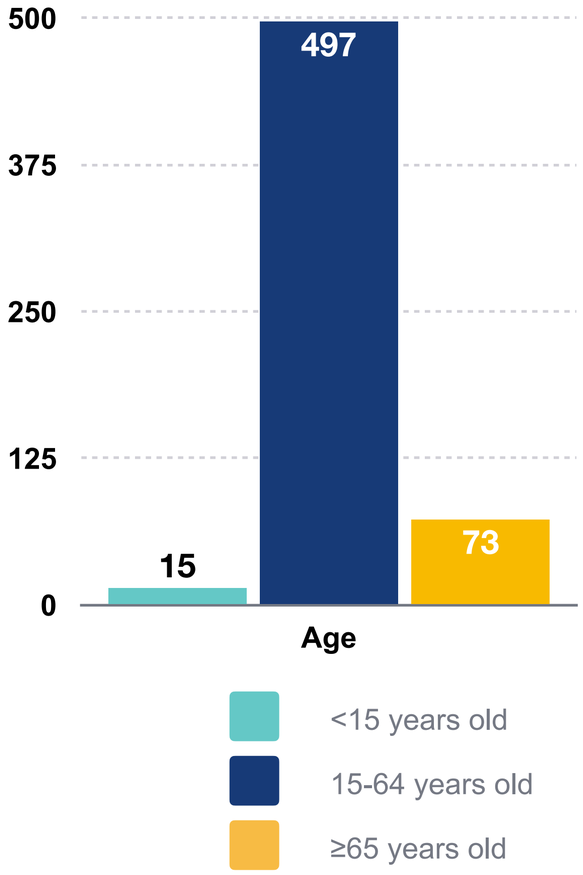
Hospitals with a high incidence of major trauma necessitate the presence of a dedicated **Trauma Surgeon** to oversee the coordination, optimization, and quality improvement of trauma care services.

The appointment of a Trauma Surgeon at Hospital Tuanku Ja'afar Seremban is therefore **well substantiated and aligned with the clinical demands and service requirements** of a high-volume trauma centre.

GENDER AND AGE

Figure 4: Gender and age (n)





Male

The majority were male (484 patients, 82.7%), while female patients accounted for 101 cases (17.3%).

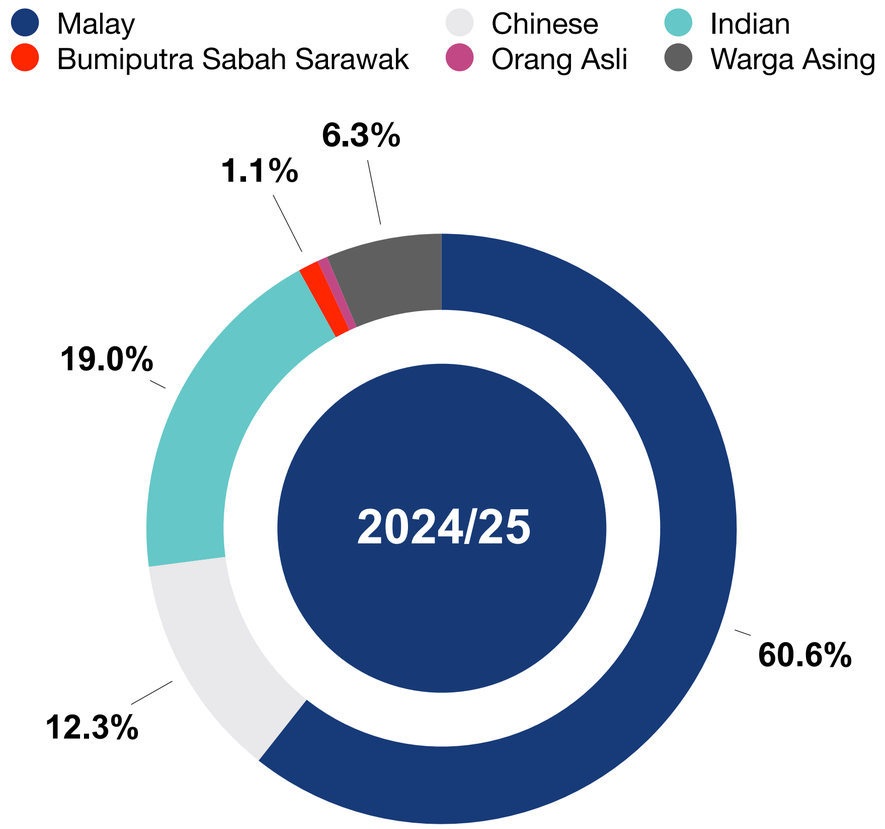
Working age

In terms of age distribution, patients aged 15–64 years represented the largest group (497 cases, 85.0%).

This pattern demonstrates that **trauma predominantly affects the male working-age population**, consistent with national and global trends. The smaller proportion of paediatric and elderly trauma cases likely reflects differences in exposure risk and activity levels across age groups.

ETHNICITY

Figure 5: Ethnicity (%)



The figure illustrates the ethnic distribution of trauma admissions for the year 2024/2025. The majority of patients were **Malay (60.6%)**, followed by **Indian (19.0%)** and **Chinese (12.3%)**. **Foreign nationals (Warga Asing)** accounted for **6.3%**, while **Bumiputra Sabah and Sarawak** constituted **1.1%** of admissions. **Orang Asli** represented the smallest proportion, with less than **1%** of total cases.

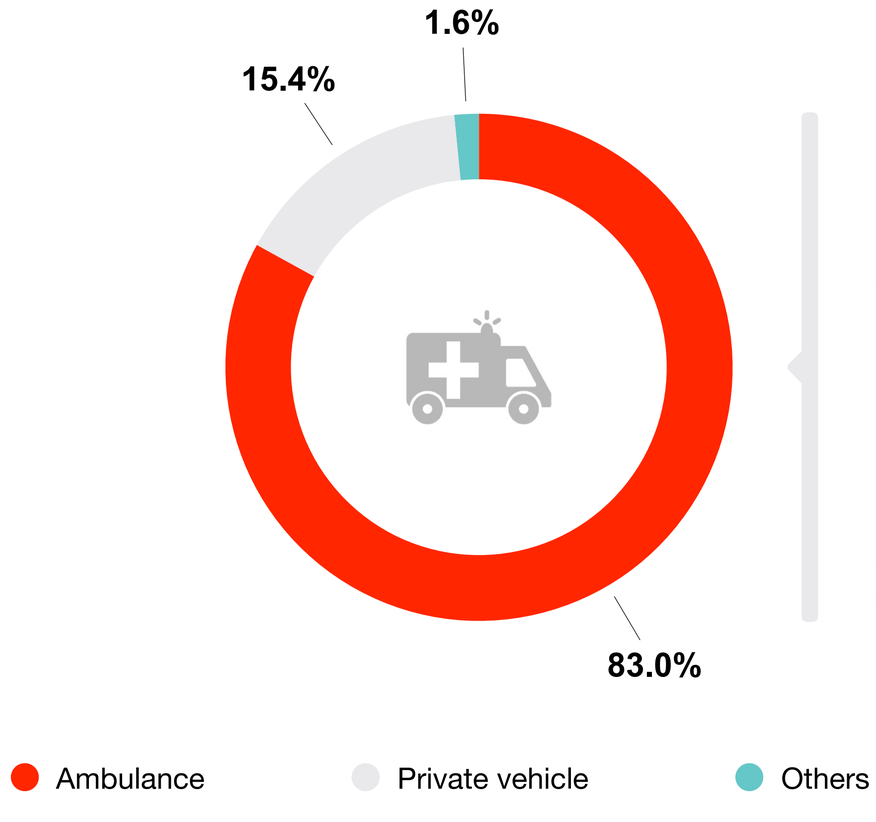
This distribution reflects the demographic composition of the hospital's catchment population, with Malays comprising the predominant group among trauma admissions.

	Malaysia* (34.1 Million)	N.Sembilan State^ (1.2 Million)	Seremban District^ (692,283)
Malay	58.1%	62.4%	59.7%
Other Bumiputera	12.3%	2.0%	1.5%
Chinese	22.4%	21.1%	23.9%
Indian	6.5%	14.0%	15.8%
Others	0.8%	0.5%	0.6%

* Population in 2024, ^ Population in 2024 (Department of Statistics Malaysia)

MODE OF TRANSPORT TO HOSPITAL

Figure 6: Mode of transport to hospital (%)



83.0%

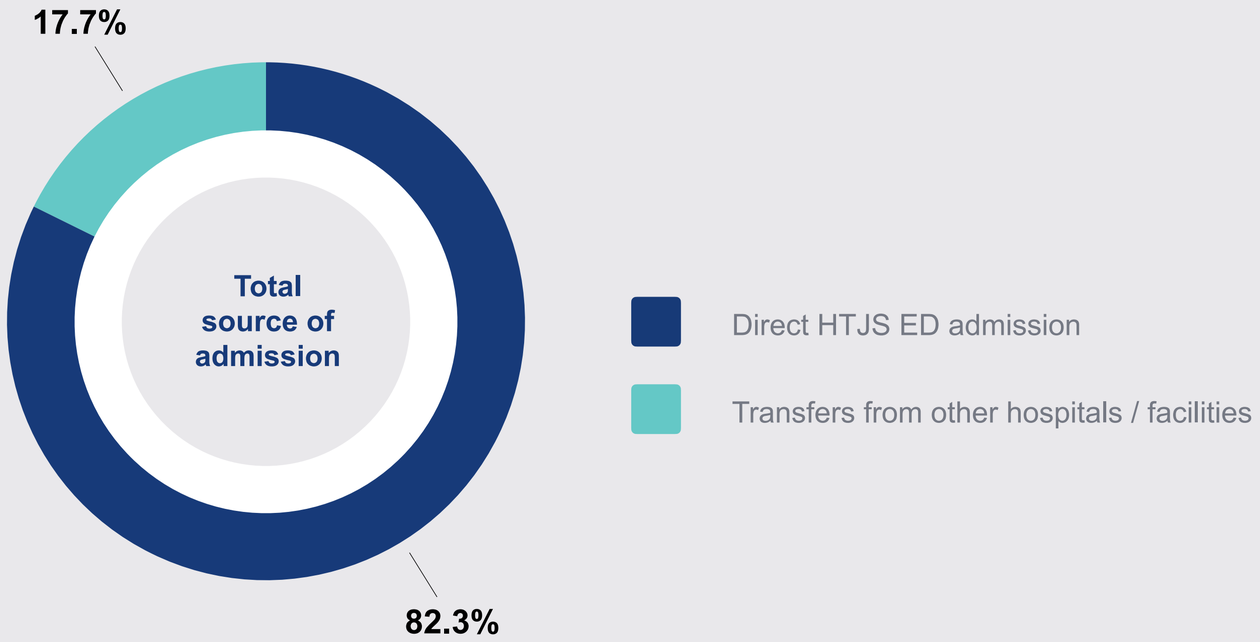
AMBULANCE TRANSPORT

The majority of trauma patients (83.0%) were transported to the hospital by **ambulance services**, highlighting the pivotal role of pre-hospital care in trauma outcomes. This finding emphasizes the urgent need to strengthen the pre-hospital response system, particularly in areas of response time, communication, triage accuracy, and on-scene clinical management.

Investment in **pre-hospital infrastructure, training, and coordination between emergency medical services and hospital trauma teams** is essential to ensure timely and effective trauma care. Improving this component of the trauma system will directly contribute to better survival and functional outcomes for severely injured patients.

SOURCE OF ADMISSION

Figure 7: Source of admission (%)

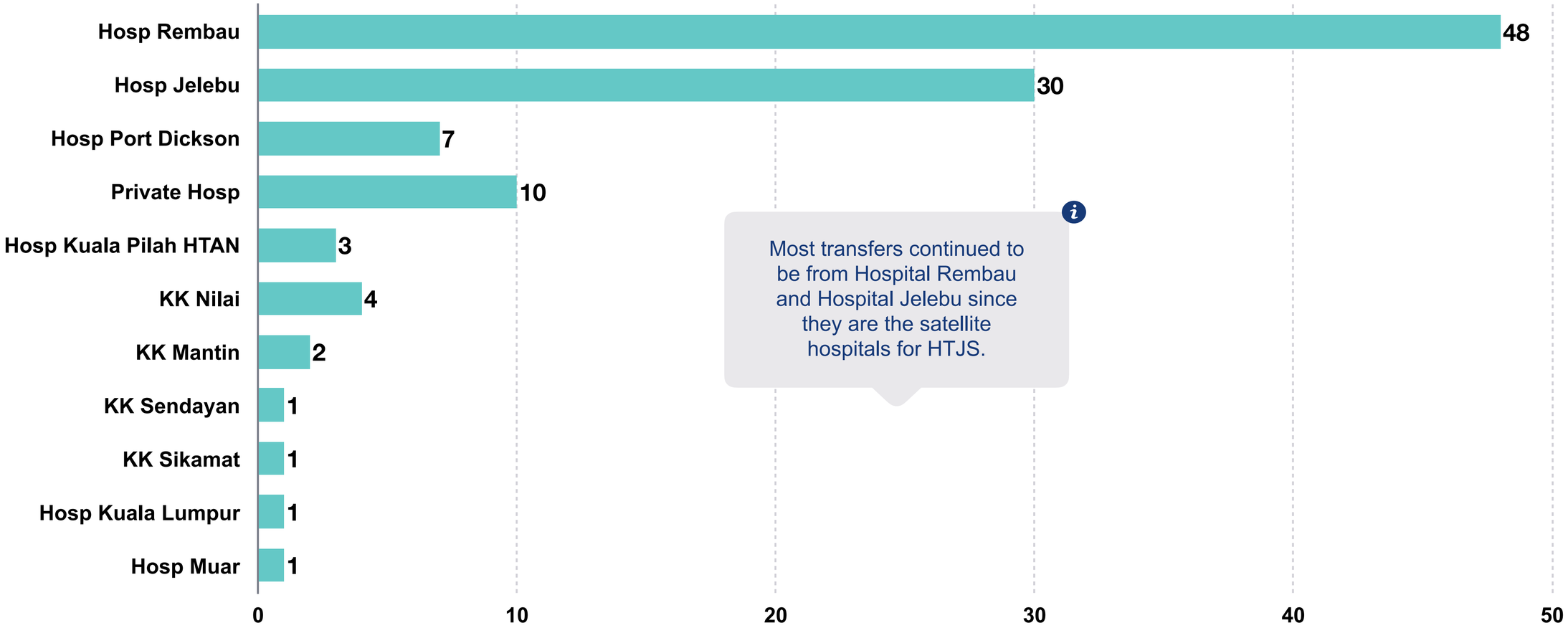


The majority of trauma patients (**82.3%**) were **direct admissions through the Emergency Department (ED)** of Hospital Tuanku Ja'afar Seremban (HTJS). The remaining **17.7%** were **transfers from other hospitals or healthcare facilities**.

This distribution reflects HTJS's role as a **regional referral centre** for trauma, receiving both **primary trauma cases** from within its immediate catchment area and **secondary transfers** of complex cases requiring higher-level surgical or critical care services. The high proportion of direct admissions also highlights the **significant trauma burden** managed at the hospital's emergency department.

ORIGINATING HOSPITAL

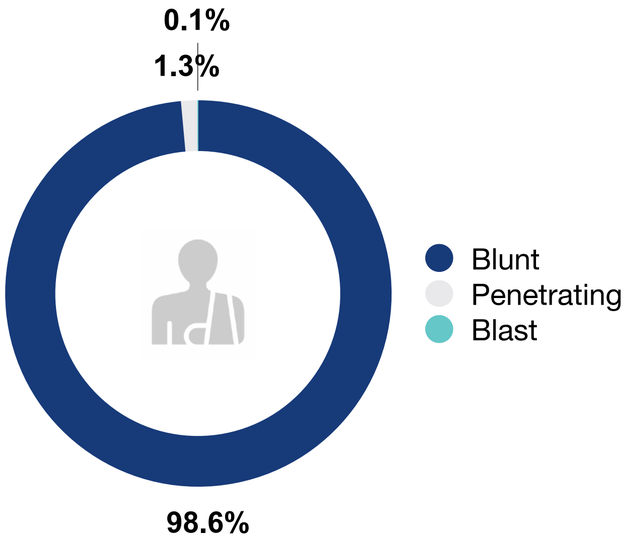
Figure 8: Numbers of patients from originating hospital (n)



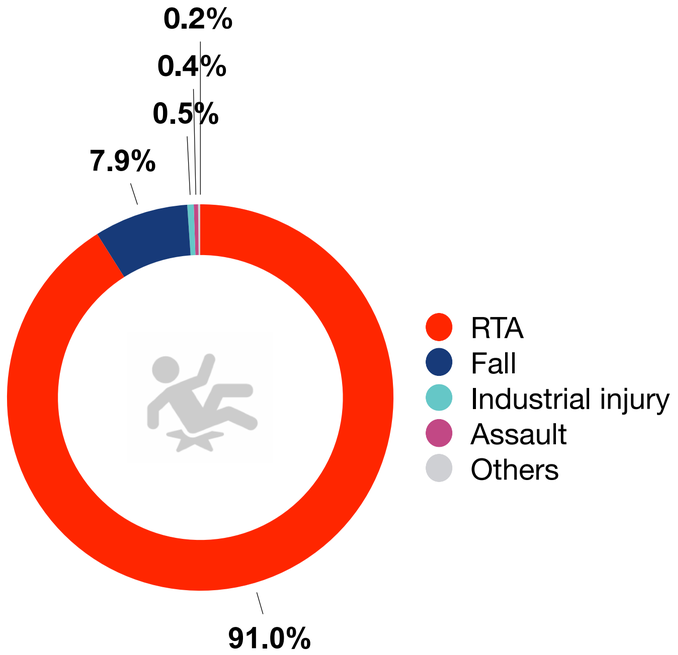
Trauma Characteristics

CAUSES OF INJURY

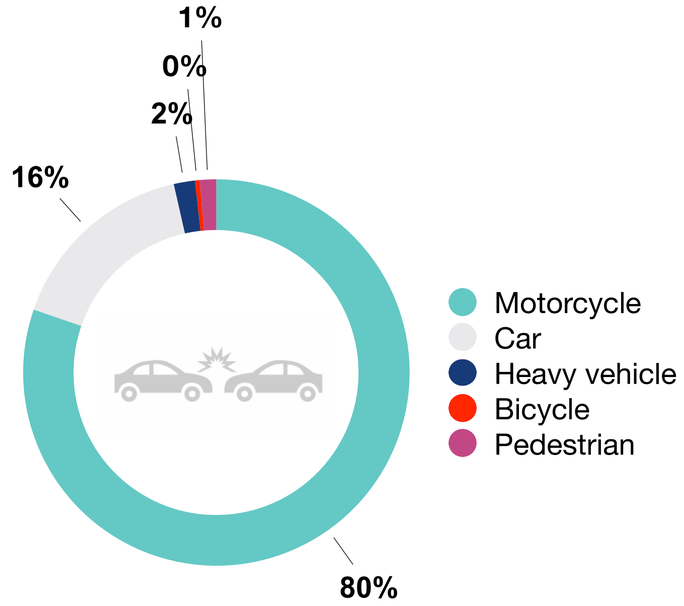
Figure 9: Causes of injury (%)



Mechanism of Injury



Breakdown of Blunt Trauma



Breakdown of RTA

Blunt trauma accounted for the vast majority of injuries (98.6%). Among these cases, road traffic accidents (RTA) were the leading cause, contributing 91.0% of all blunt trauma, followed by falls at 7.9%. Within RTA-related injuries, motorcyclists were the most affected group, representing 80% of all RTA cases.

Major trauma in our population is therefore strongly driven by road-related mechanisms, with falls making up only a smaller proportion. This pattern reflects the close relationship between injury severity and the kinetic energy involved: high-speed road incidents generate significantly greater energy transfer than other mechanisms, resulting in more severe injuries.

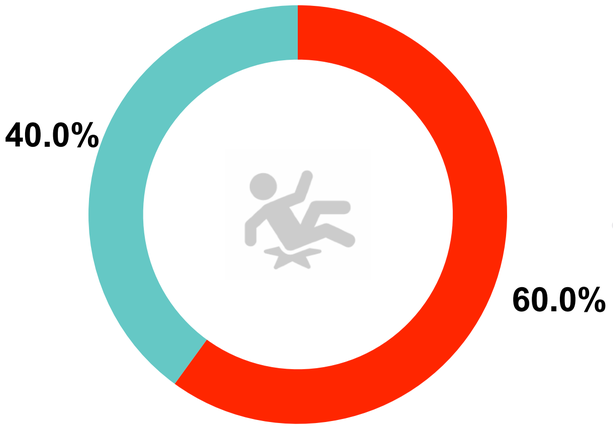
	N.Sembilan State
2018	25,123
2019	25,838

Number of road traffic accidents (Department of Statistics Malaysia)

FALL

Figure 10: Fall (%)

Less than 2 metres (Domestic)

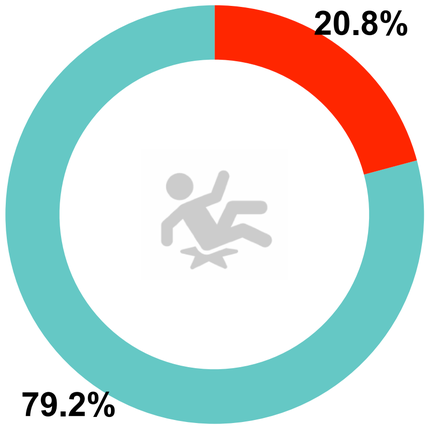


60%

DOMESTIC FALL IN ELDERLY

An astounding 60% of our elderly patients sustained domestic falls —significantly higher than the 20–40% reported in developed countries. As the second leading cause of unintentional injury deaths worldwide, falls contribute substantially to morbidity, mortality, and reduced quality of life, making them a major public health concern.

More than 2 metres (Work related)



79.2%

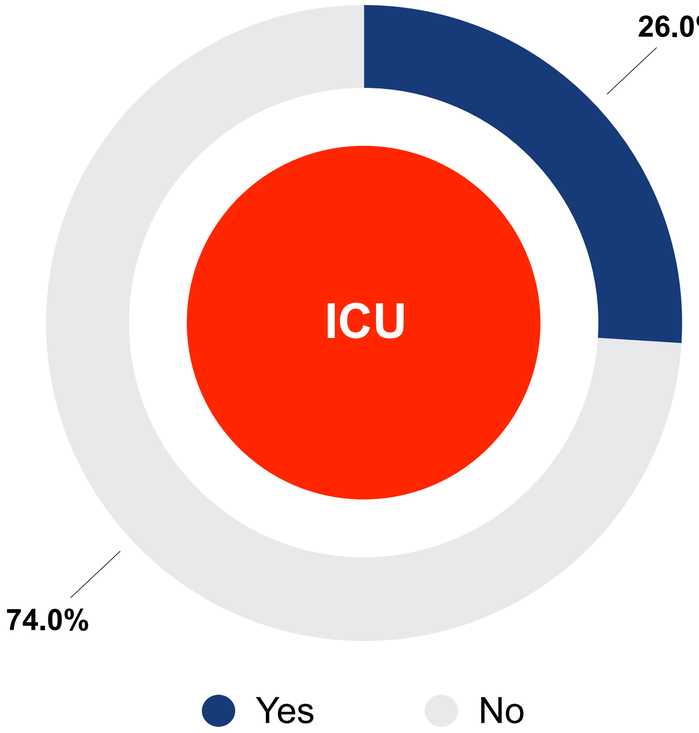
WORK-RELATED IN WORKING AGE GROUP

An alarming 79.2% of falls were work-related. This underscores the need for stronger workplace safety measures and more effective fall-prevention strategies.

≥65 (Old age) 15-64 (Working age)

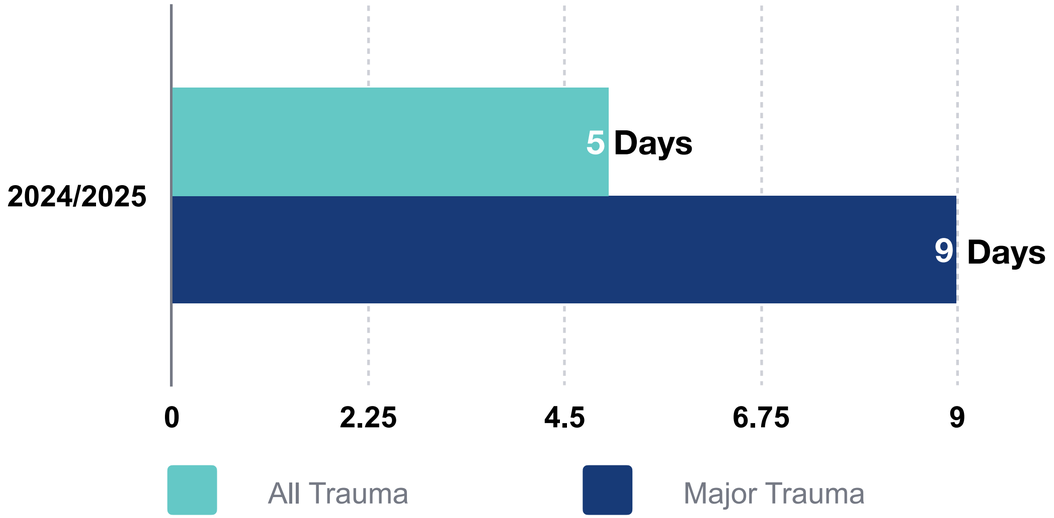
ICU ADMISSION & LENGTH OF STAY

Figure 11: ICU admission (%) and length of hospital stay



ICU Admission

A quarter (26%) of trauma patients required ICU admissions.

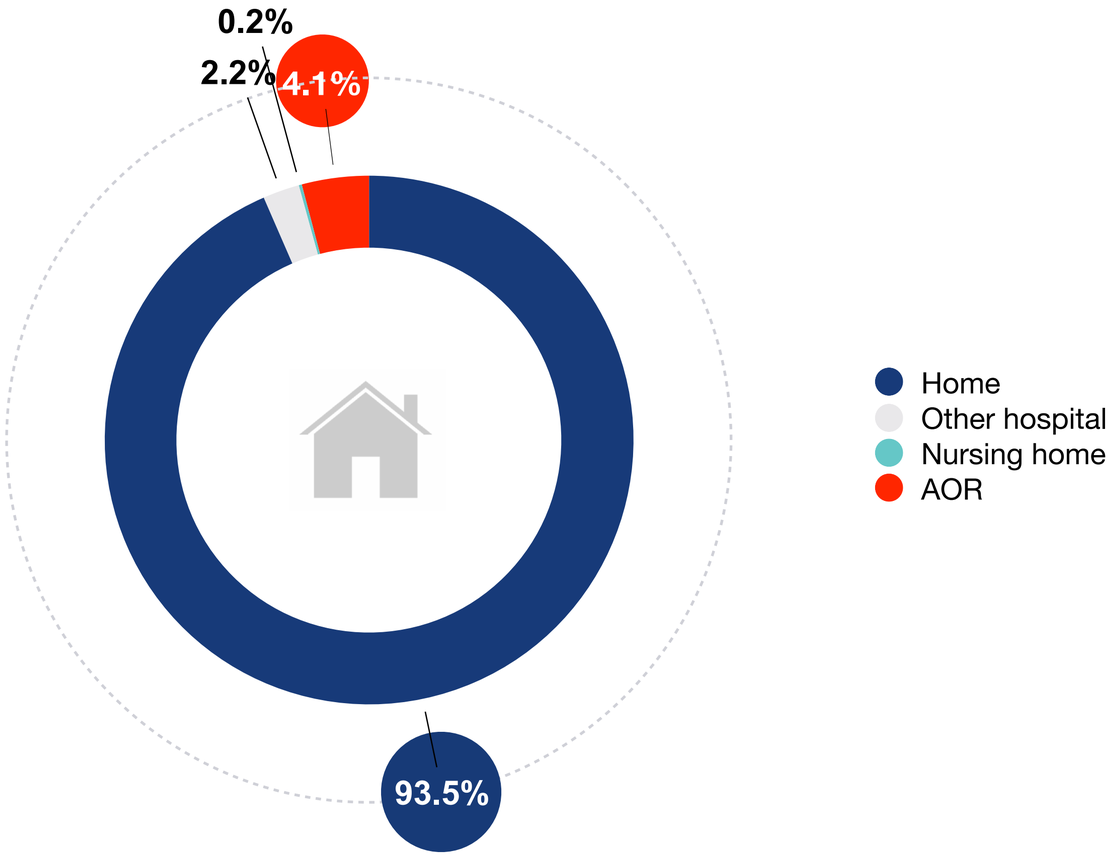


Length of Hospital stay

Length of stay generally increases with injury severity, as demonstrated in our data. Certain injury patterns—such as pelvic fractures or combined injuries—require prolonged bed rest, whether due to the injury itself or postoperative recovery, contributing to longer admissions. Delays in accessing rehabilitation services and the need for extended recovery in patients with severe physical injuries also lengthen hospital stays. Overall, the median length of stay remains stable at **5 days for all trauma admissions** and **9 days for major trauma cases**.

DISCHARGE DESTINATION

Figure 12: Discharge destination (%)



Discharge

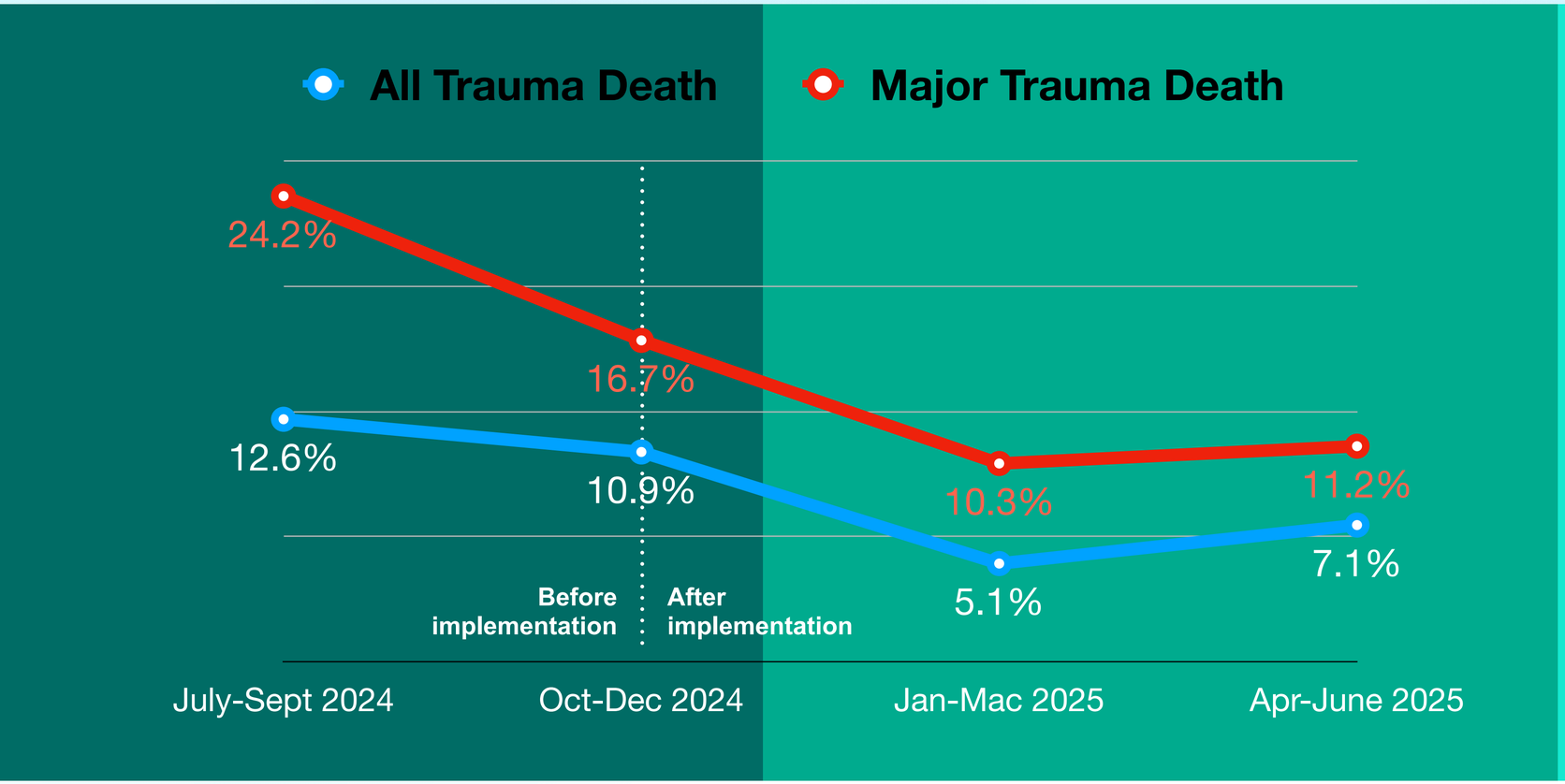
Most patients were discharged home with only a small number discharged to another hospital for continuation of care. Four percent of patients choose to be discharged “at own risk” (AOR).

It is worth commenting that we are still lacking in rehabilitative facilities or centres in Malaysia which will help patients’ recovery post trauma and surgery.

Highlights

MORTALITY RATE TREND BY QUARTER

Figure 13: Mortality rate trend by Quarter (%)



The first dedicated Trauma Surgeon joined HTJS on 1st July 2024, initiating a structured transformation of trauma care. From October 2024 onwards, key system enhancements were implemented step by step, including:

- Refinement of the Trauma Team Activation protocol
- Establishment of the Trauma Surgery Registry
- Implementation of Trauma Resuscitation & Massive Transfusion Protocols
- Strengthening of inter-hospital transfer processes
- Publication of trauma guidelines and algorithms
- Regular trauma teaching sessions and M&M meetings
- Availability of Safe O blood in the ED for immediate transfusion

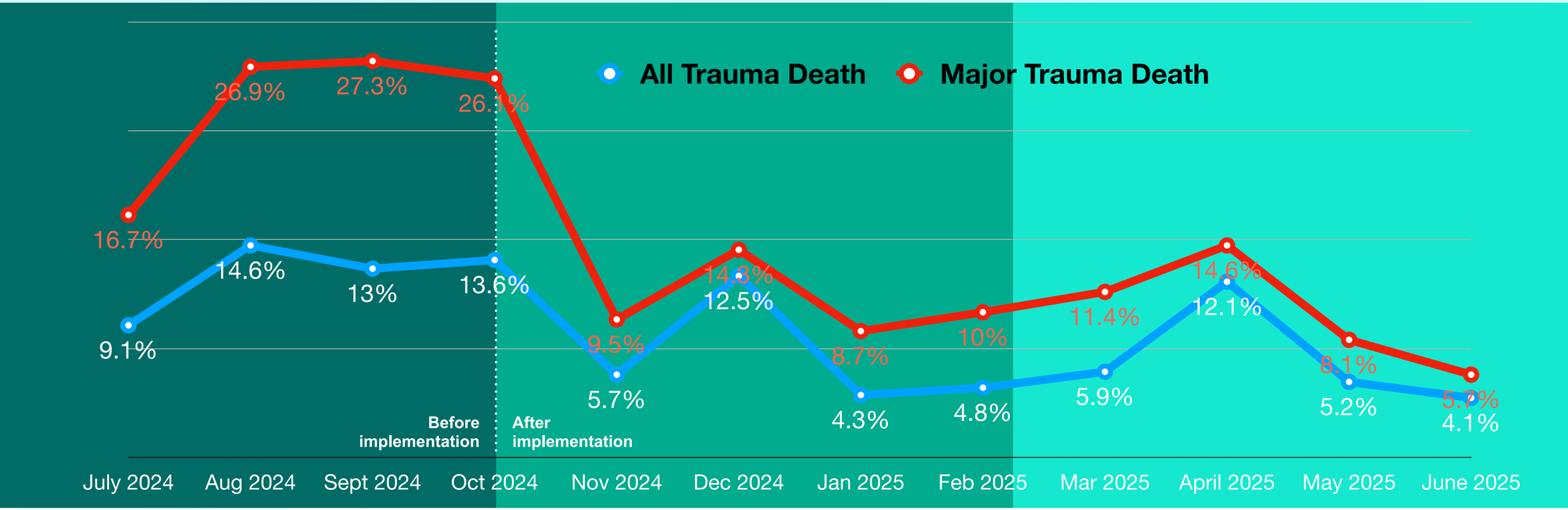
These measures improved early recognition, standardised care, and accelerated resuscitation, contributing directly to a significant reduction in trauma mortality.

Mortality for both all trauma and major trauma shows a clear decline after the baseline period (Jul–Sept 2024).

Although there was a slight rise in Apr–Jun 2025, mortality remained far lower than baseline, indicating sustained improvement.

MORTALITY RATE TREND BY MONTH

Figure 14: Mortality rate trend by Month (%)



Overall, the trend shows a clear transition from high and unstable mortality (Jul–Oct 2024) to markedly lower and more stable rates from November 2024 onward, reflecting the effectiveness of the trauma system enhancements implemented during that time.

TIMING OF SAFE O BLOOD TRANSFUSION

Figure 15: Timing of Safe O blood transfusion

Timing of Safe O transfusion from Trauma Activation (minutes)			
	Total	**Alive**	**Death**
November 2024	11		
Mean (SD)	50.7 (27.4)	48.8 (25.1)	55.7 (38.7)
Median (range)	45.0 (15-99)	41.5 (24-99)	60 (15-92)

Safe O delay

We conducted an audit of Safe O blood transfusion timing for Trauma Activation patients in November 2024. The findings showed longer delays in Safe O transfusion among patients who did not survive, highlighting the need to further optimise rapid access to blood products and strengthen time-critical resuscitation processes.

Median

45 minutes (15-99)

World Standard

Immediate Safe O Transfusion upon ED arrival for Unstable Trauma patients

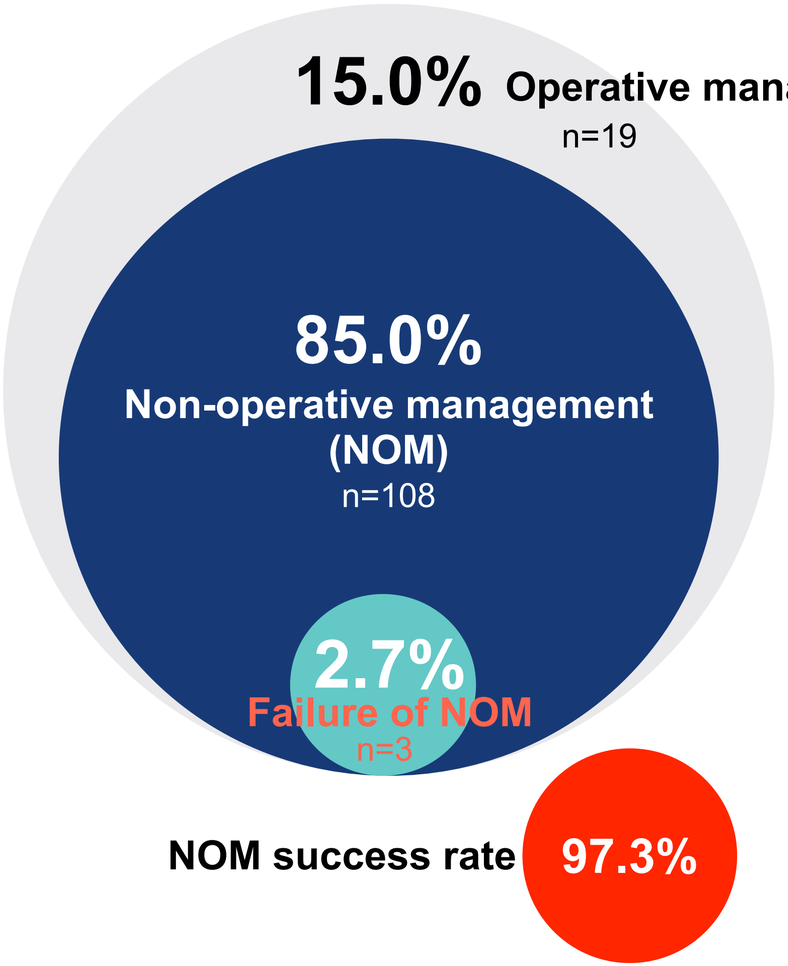
Solution

Bring the blood bank to the frontline. A Safe O blood fridge in the ED means no waiting, just transfusing.

Now no more Safe O delay!

BLUNT ABDOMINAL SOLID ORGANS INJURY

Figure 16: Blunt liver / spleen / kidney injury, July 2024-June 2025



Total number of patients with at least one blunt solid organ injury **127**

Injured Organ	AAST Grade	Total (n)
Liver	I - II	58
	III - V	24
Spleen	I - II	28
	III - V	33
Kidney	I - II	16
	III - V	22

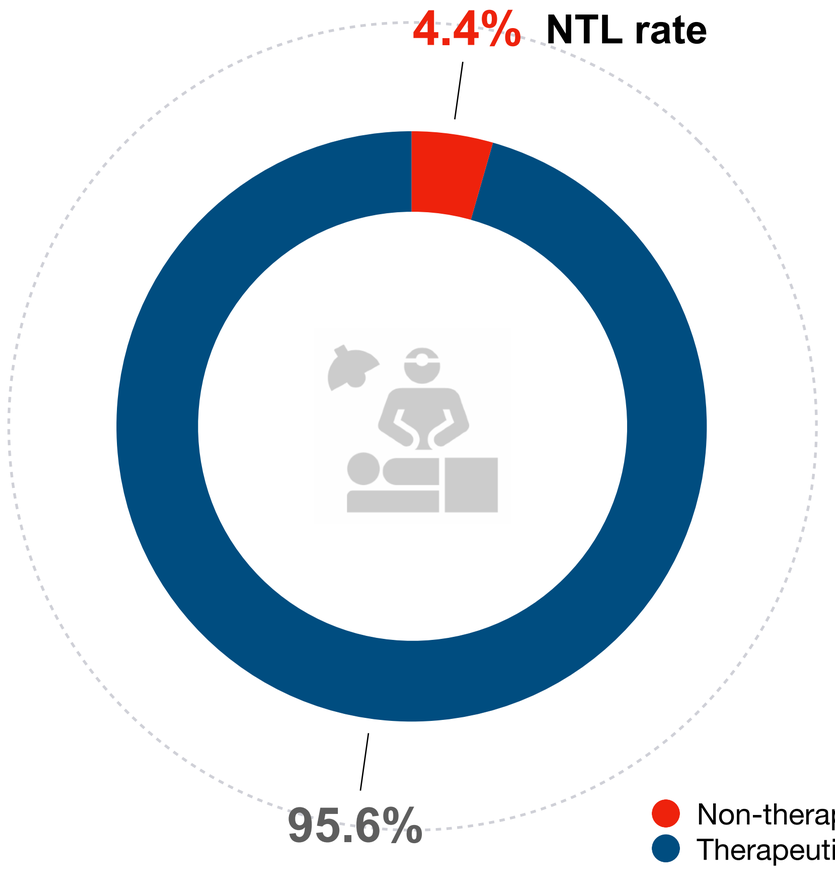
20

Selective non-operative management in blunt abdominal trauma has become a favourable trend and well-established standard of care even in severe liver, spleen, and kidney injuries. Success rates of NOM were reported to be as high as 95%. Other centres demonstrated that around 80-94% of patients with liver or splenic injuries and 93% with renal injuries can successfully be treated non-operatively.

In line with this, our results showed 97.3% NOM success rate. Failure of NOM amounts to 2.7%, caused by haemodynamic instability due to secondary bleeding and sepsis.

NON-THERAPEUTIC LAPAROTOMY

Figure 17: Non-therapeutic laparotomy (%)



The trend in favour of Non-Operative Management (NOM) has resulted in sharp decline of Non-Therapeutic Laparotomy (NTL) rates. The incidence of NTL ranges from 20-40% across different institutions but significantly lower rate (3.2-5%) was reported in trauma centres practising the NOM policy.

This corresponds well with our centre's NTL rate of 4.4% over a one year period. Non-therapeutic laparotomies are associated with higher cost and significant morbidity.

OPERATIVE PROCEDURES

Figure 18: Operative procedures (n)

Operative Procedures				
	Total	**Alive**	**Death**	**Mortality**
Laparotomy	45	42	3	6.7%
Diagnostic Laparoscopy	7	7	0	0
Video-Assisted Thoracoscopic Surgery (VATS)	7	7	0	0
Thoracotomy	1	1	0	0
Rib plating	2	2	0	0
Vascular extremity injury	1	1	0	0
Tracheostomy	23	19	4	17.4%

Laparotomy	
	Total
Splenectomy	18
Bowel resection / anastomosis / stoma creation	14
Liver packing	2
Liver resection	2
Extraperitoneal packing (EPP)	4
Distal pancreatectomy	2
Bladder repair	2
Duodenal repair	2
Diaphragmatic repair	1
Haemostasis	5

TRAUMA TEAM ACTIVATION (TTA)

ACTIVATION CRITERIA

TRAUMATIC ARREST	
ABC COMPROMISE	• Airway compromise (i.e unable to secure airway, destructive upper airway injury) • SPaO2 < 90% • SBP < 90 mmHg at any time
MECHANISM CRITERIA WITH ABC COMPROMISE	• Fall > 4 meters in height • Vehicle rollover • MVA with the occupant of the same vehicle dead on the scene
ANATOMIC CRITERIA	• Pelvic fracture (with ABC compromise) • Mangle limb (with ABC compromise) • Any penetrating wound to the cardiac box • Any penetrating wound to torso, neck, or extremity (with ABC compromise)

OR

As requested by the Emergency Physician based on current judgment of situation (i.e mass casualties)

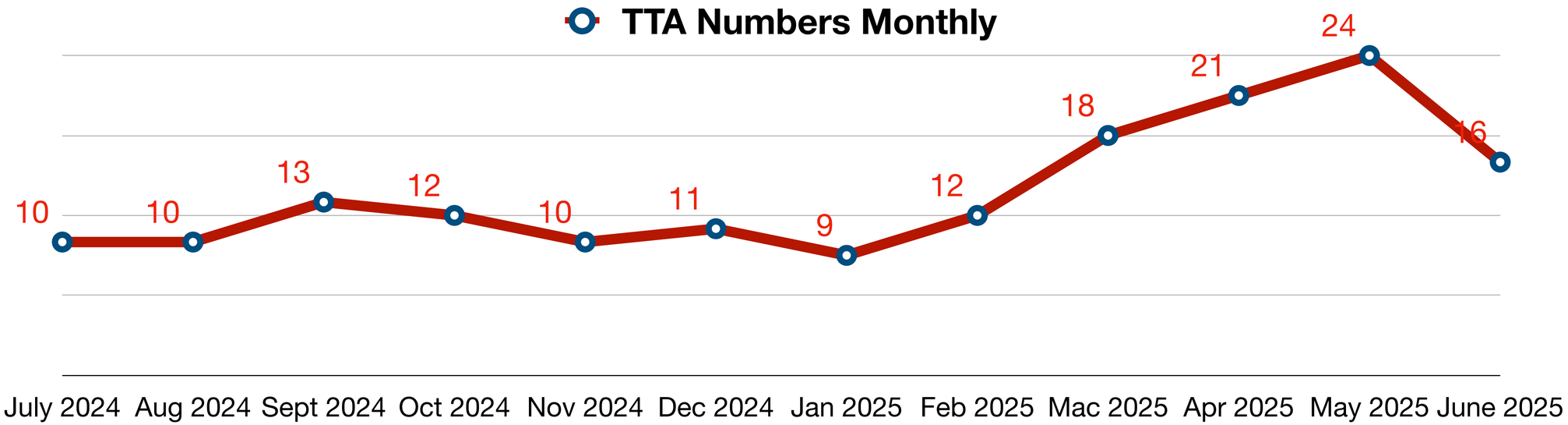
The trauma team activation (TTA) was refined in **August 2024** with a 2 tiered activation. The activation is initiated by ED team according to the TTA protocol.

QUALITY INDICATORS

TEAM MEMBERS RESPONSE after **"Trauma Activation"** Attendance and arrival times will be recorded on the Trauma Team Activation Form.	**≤15 MINUTES**
CT REQUEST TO SCAN TIME	**≤1 HOUR**
OT BOOKING TO INCISION TIME	**≤1 HOUR**

TRAUMA TEAM ACTIVATION (TTA)

Figure 19: Trauma team activation numbers (n)

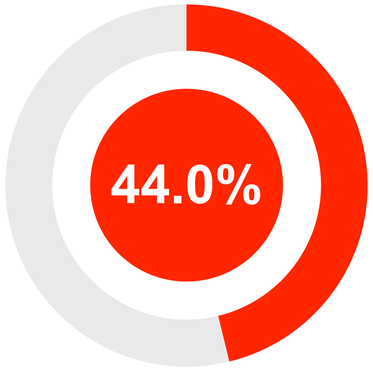


TRAUMA TEAM ACTIVATION (TTA)

Figure 20: Trauma team activation triage (%)

	Minor Trauma NISS ≤15	Major Trauma NISS ≥16	Total
Trauma Team Activation (TTA)	22	144	166
No TTA	227	179	406

UNDER-TRIAGE



The figure shows an under-triage of cases. The acceptable range of under-triage is ≤ 10%.

There is still room for improvement, especially in raising the level of awareness on this system amongst our ED staff as ED has discretionary authority for activation. We hope in the future there will be a higher level of responsiveness and less under-triaging.

TRIAGE ASSESSMENT

	Minor Trauma	Major Trauma	Total	Over-triage
Highest level of TTA	A	B	C	A/C x 100%
Mid level TTA	D	E	F	Under-triage
No TTA	G	H	I	(E+H) / (F+I) x 100%

ACCEPTABLE RANGE FOR:

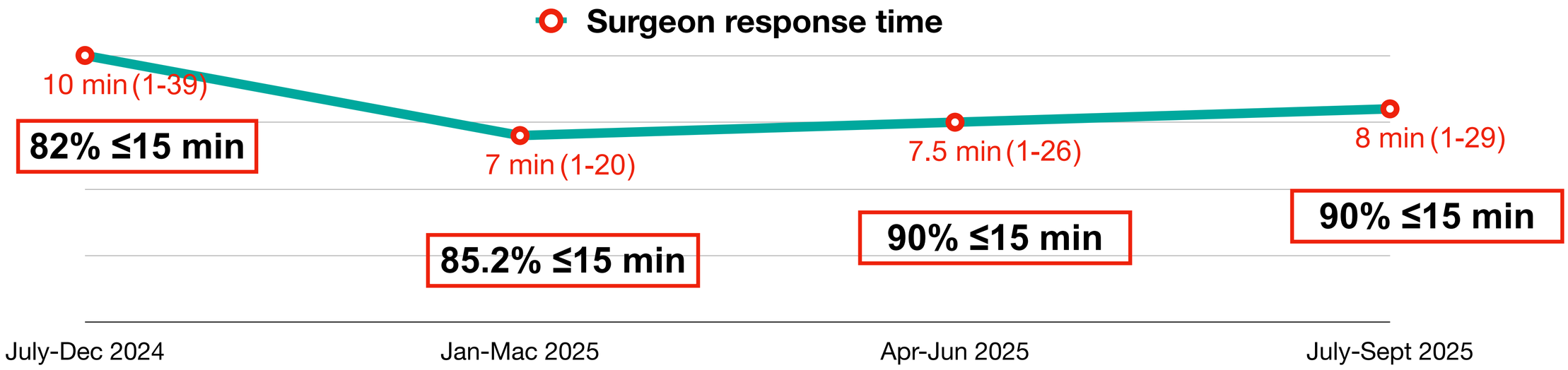
OVER-TRIAGE : 25 - 35 %

UNDER-TRIAGE : ≤ 10 %

From ACS Resource for Optimal Care of The Injured Patient 2014

TTA - SURGEON RESPONSE TIME

Figure 21: TTA - Surgeon response time [median (minute)]

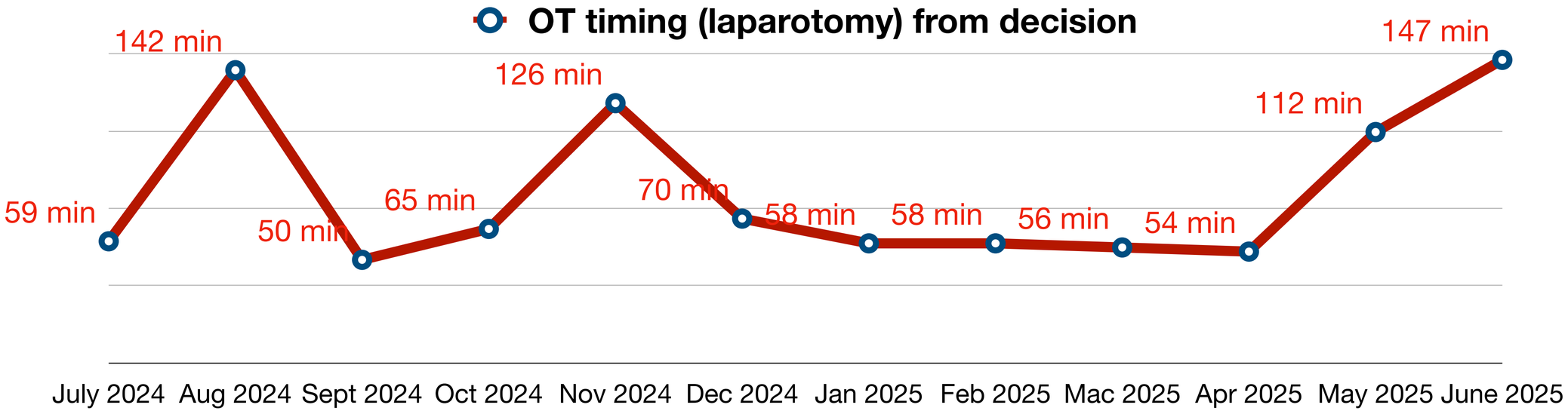


The graph presents median surgeon response times for TTA cases from July 2024 to September 2025. Response times remain **consistently fast**, with **steady improvement** in meeting the ≤15-minute standard.

Overall, the trend shows improving compliance and reliable surgeon availability for trauma activations.

TTA - OT TIMING FROM DECISION

Figure 22: TTA - OT timing from decision [median (minute)]

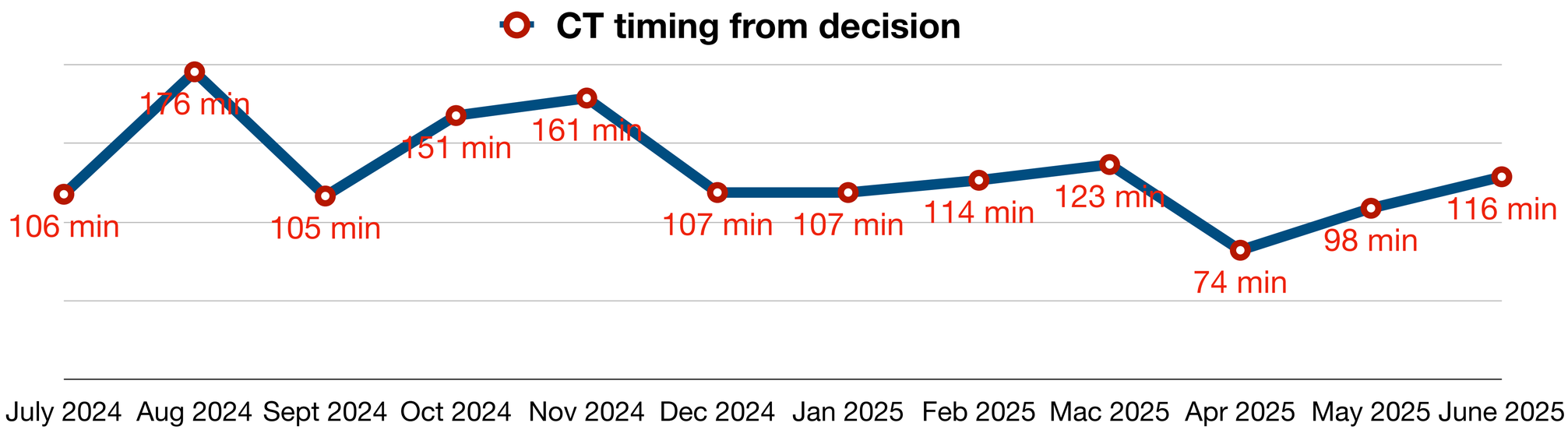


The line graph shows the **median time from decision to operating theatre (OT)** for **laparotomy** in TTA patients from **July 2024 to June 2025**. Overall, OT timings fluctuate throughout the year but generally remain close to the **≤60-minute target**.

The time peaked in **August 2024 (142 minutes)** and again in **June 2025 (147 minutes)**. The best performance occurred between **January and April 2025**, with times consistently between **54–58 minutes**, meeting the target threshold. Despite periods of good performance, the variability indicates ongoing challenges in maintaining rapid access to OT for critically injured patients, likely influenced by the ongoing upgrade of the main OT complex and the need for ambulance transfers between the ED and the temporary OT facility.

TTA - CT TIMING FROM DECISION

Figure 23: TTA - CT timing from decision [median (minute)]



The median **decision-to-CT times** show notable month-to-month variability from July 2024 to June 2025, with several months **exceeding the ≤60-minute target.** The best performance was in **April 2025 (74 minutes)**, but overall timings remain **inconsistent**, indicating the need for further process optimisation.

Patient Outcomes

OUTCOME OF ALL & MAJOR TRAUMA

Figure 24: Outcome of all and major trauma

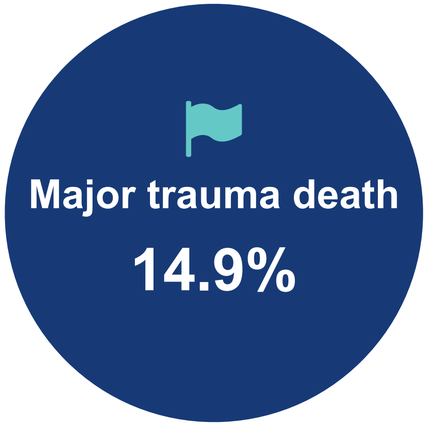
Patient outcome - All Trauma				
	Total	**Alive**	**Death**	**Mortality**
Blunt	558	509	49	8.8%
Penetrating	13	13	0	0
Blast	1	1	0	0
TOTAL	**572**	**523**	**49**	**8.6%**

Patient outcome - Major Trauma				
	Total	**Alive**	**Death**	**Mortality**
Blunt	315	267	48	15.2%
Penetrating	7	7	0	0
Blast	1	1	0	0
TOTAL	**323**	**275**	**48**	**14.9%**

Mortality rate

The overall mortality among all trauma patients was 8.6%, which is lower than the reported global average of 9–10% in other trauma centres.

Major trauma had higher mortality at 14.9%.



OUTCOME OF RTA & FALL

Figure 25: Outcome of road traffic accident and fall

Patient outcome - Road traffic accident (RTA)				
	Total	**Alive**	**Death**	**Mortality**
Motorcycle	1937	1786	151	7.8%
Car	441	421	20	4.5%
Heavy vehicle	44	41	3	6.8%
Bicycle	21	19	2	9.5%
Pedestrian	90	74	16	17.8%

Patient outcome - Fall				
	Total	**Alive**	**Death**	**Mortality**
Less than 2 metres	20	19	1	5.0%
More than 2 metres	24	17	7	29.2%

Mortality rate

Highest mortality was recorded among pedestrians and those who fell for more than 2 metres.

The high impact of RTA to pedestrian is associated with higher speeds and energy patterns than other forms of injury.

The bodily damage caused by a fall is due to the absorbed energy at impact. Higher height will have higher absorbed energy at impact causing more severe injuries.

Pedestrian death

17.8%

Fall more than 2 metres death

29.2%

OUTCOME BY AGE & ETHNICITY

Figure 26: Outcome by age and ethnicity

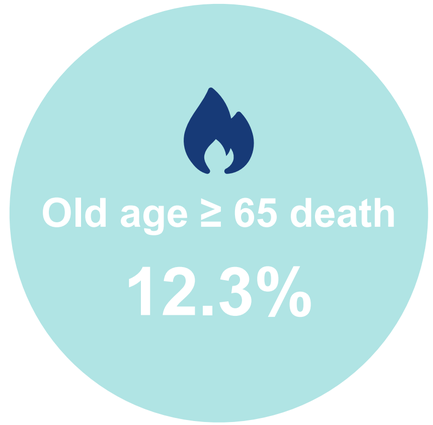
Patient outcome - Age				
	Total	**Alive**	**Death**	**Mortality**
0 - 14 (Young age)	15	15	0	0
15 - 64 (Working age)	497	457	40	8.0%
≥65 (Old age)	73	64	9	12.3%

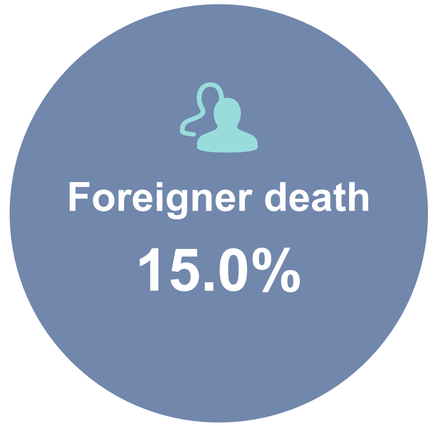
Patient outcome - Ethnicity				
	Total	**Alive**	**Death**	**Mortality**
Malay	349	325	24	6.9%
Chinese	74	66	8	10.8%
Indian	113	102	11	9.7%
Bumiputra Sabah Sarawak	6	6	0	0
Orang Asli	3	3	0	0
Warga Asing	40	34	6	15.0%

Mortality rate

Elderly trauma patients generally have **higher rates of complications and mortality** compared to younger patients. **Increasing age** is a recognised risk factor for poorer outcomes due to reduced physiological reserve and associated comorbidities.

Foreign nationals accounted for the **highest proportion of trauma-related deaths** among all ethnic groups. Many were involved in **high-risk manual occupations** often classified as *3D jobs* (dirty, dangerous, and demeaning). A subset comprised **undocumented workers** without valid identification or medical insurance. Limited resources within government hospitals may affect the **accessibility of intensive care services** for foreign nationals, as **priority for critical care admission** is generally accorded to Malaysian citizens.





OUTCOME BY GCS & ICU ADMISSION

Figure 27: Outcome by GCS and ICU admission

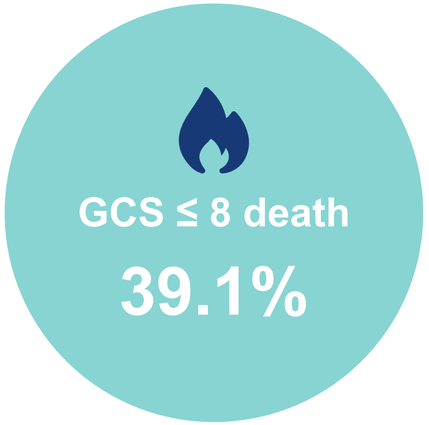
Patient outcome - Glasgow Coma Scale (GCS)				
	Total	**Alive**	**Death**	**Mortality**
≤8	69	42	27	39.1%
≥9	503	481	22	4.4%

Patient outcome - ICU / NDHU admission				
ICU	**Total**	**Alive**	**Death**	**Mortality**
Yes	150	119	31	20.7%
No	423	405	18	4.3%

Mortality rate

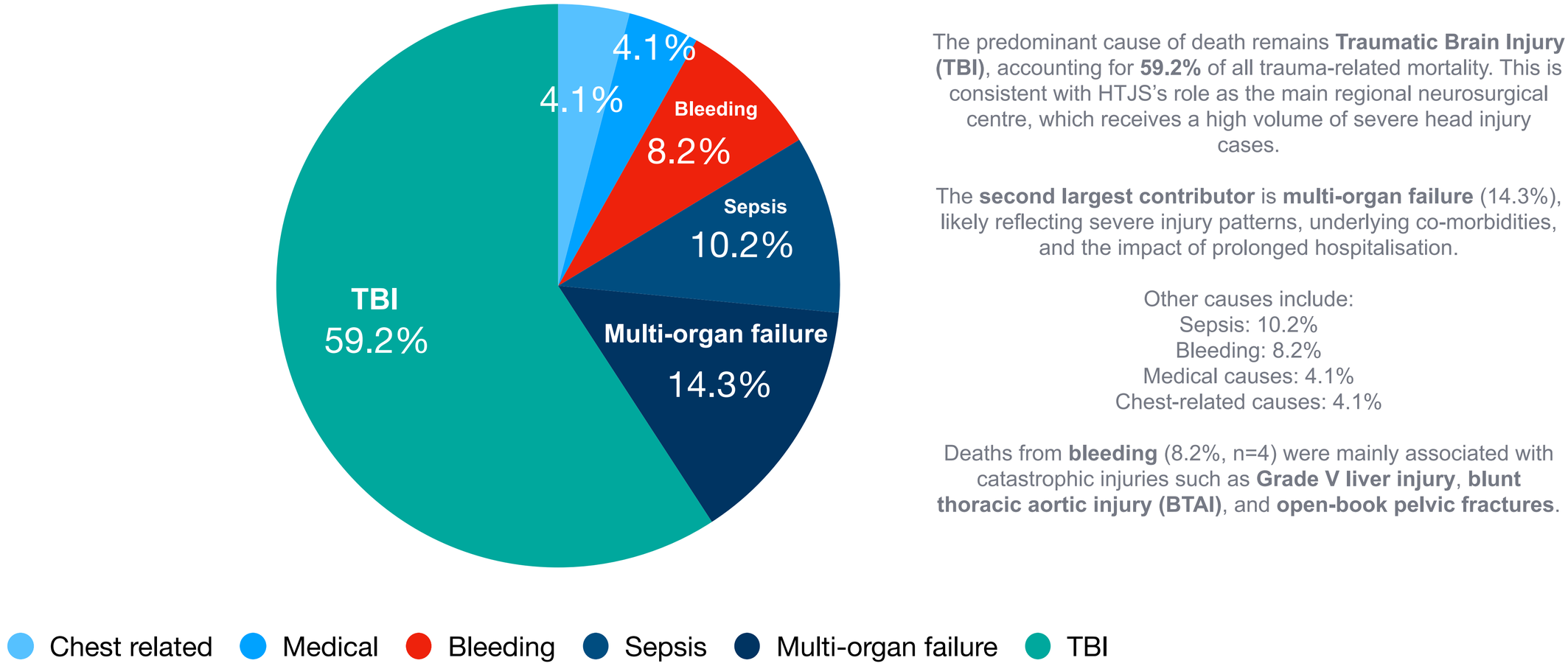
Low GCS is a well-known risk factor for poor outcomes in trauma patients. As expected we recorded 39.1% of death in patient with GCS ≤8.

Most major trauma patients needed ICU admissions due to the severity of injuries. Higher mortality rate from these admissions were expected, as shown by 20.7% of death from our records.



TRAUMA DEATHS

Figure 28: Death type - overall (%)



The predominant cause of death remains **Traumatic Brain Injury (TBI)**, accounting for **59.2%** of all trauma-related mortality. This is consistent with HTJS's role as the main regional neurosurgical centre, which receives a high volume of severe head injury cases.

The **second largest contributor** is **multi-organ failure** (14.3%), likely reflecting severe injury patterns, underlying co-morbidities, and the impact of prolonged hospitalisation.

Other causes include:
Sepsis: 10.2%
Bleeding: 8.2%
Medical causes: 4.1%
Chest-related causes: 4.1%

Deaths from **bleeding** (8.2%, n=4) were mainly associated with catastrophic injuries such as **Grade V liver injury**, **blunt thoracic aortic injury (BTAI)**, and **open-book pelvic fractures**.

RISK STRATIFIED MORTALITY

Figure 29: Mortality per NISS and TRISS grouping

	NISS Score			
	Minor Trauma	Major Trauma (Low)	Major Trauma (Moderate)	Major Trauma (Severe)
	≤15	16-24	25-40	41-75
Alive	248	169	87	19
Death	1	8	29	11
Mortality	**0.4%**	**4.5%**	**25.0%**	**36.7%**

	TRISS Score	
	< 0.5 Expected Death	0.5 - 1.0 Expected Survivor
Alive	9	514
Death	17	32
Mortality	**65.4%**	**5.9%**

NISS ≥ 16

Mortality is strongly associated with higher NISS and lower TRISS score which is a threat to life. Mortality for those not meeting the criteria for major trauma (NISS<16) have low mortality risk, usually related to underlying co-morbidity.

TRISS < 0.5

TRISS combines physiological and anatomical injury severity as well as considers age and mechanism. It is expressed as Ps which is the probability of survival. This means that patients will fall into one of two groups with a 50/50 chance of survival. There were 5.9% of deaths in the group of patients which were predicted to have survived by TRISS and 34.6% of patients predicted to have died by TRISS but survived.

KEY RECOMMENDATIONS

RECOMMENDATIONS FOR HOSPITAL TRAUMA COMMITTEE (HTJS)

Strengthen Trauma Team Activation (TTA)

- Address 44% under-triage by enforcing strict adherence to TTA criteria.
- Implement regular simulation-based training or in-situ drills to enhance response readiness.
- Establish ED trauma bay standardisation to ACS Level 1 criteria

Standardise Early Resuscitation Pathways

- Maintain continuous availability of **Safe O blood** in the ED.
- Strengthen Massive Transfusion Protocol triggers and monitoring.
- Ensure early CT access and targeted turnaround time KPIs.

Enhance Clinical Governance

- Monthly Hospital M&M meetings with mandatory attendance from all relevant departments.
- Quarterly trauma performance review using benchmarks (e.g., TTA accuracy, Mortality outlier review, Time-to-CT & Time-to-OT performance).
- Institutionalise trauma guidelines and ensure multidisciplinary dissemination.

Improve Trauma Documentation & Data Quality

- Establish HTJS Trauma Registry
- Ensure full compliance with Trauma Registry data entry within 48–72 hours post-discharge.
- Create a Trauma Nurse / Data Manager post.

KEY RECOMMENDATIONS

RECOMMENDATIONS FOR HOSPITAL TRAUMA COMMITTEE (HTJS)

Promote Rehabilitation & Discharge Planning
- Establish early rehabilitation referral pathways.
- Implement pre-discharge functional assessments to facilitate community-based rehab or NGO partnerships.

Invest in Critical Trauma Infrastructure
- Permanent Safe O blood fridge in ED and OT.
- Upgrade ED trauma resuscitation bays to meet ACS Level I standards.
- Priority radiology access for trauma CT and interventional radiology support.

Strengthen Pre-Hospital Integration
- Collaborate with Non-KKM Pre-hospital (ambulance services) for:
  - Unified trauma handover format (MIST).
  - Joint drills and training.
  - Real-time notification systems.

Support Trauma Registry Sustainability
- Introduce digital data capture to reduce manual errors and delays.
- Allocate budget for software, training, and manpower for registry maintenance.
- Encourage institutional use of registry data for clinical and administrative decisions.

KEY RECOMMENDATIONS

RECOMMENDATIONS FOR NEGERI SEMBILAN STATE HEALTH DEPARTMENT (JKNNS)

Regional Trauma System Development
- Formally designate HTJS as the State Trauma Centre.
- Establish county-level trauma referral protocols for all district hospitals.

Improve capacity of District Hospitals
- Training in ATLS/Trauma First Response.
- Ensure essential equipment availability (pelvic binders, tranexamic acid, rapid infusers).
- Provide training and equipment upgrades to ensure pre-transfer stabilisation.

State-Level Road Traffic Injury Prevention Strategy
- Collaborate with MIROS, JPJ, and PDRM to map blackspot areas.
- Promote helmet compliance and safe riding campaigns.
- Target high-risk groups, especially motorcyclists, elderly and foreign workers.

RECOMMENDATIONS FOR MINISTRY OF HEALTH (MOH)

Recognise Trauma as a National Health Priority
- Establish a National Trauma System Blueprint with staged implementation.
- Standardise trauma care guidelines across Malaysian hospitals.

KEY RECOMMENDATIONS

RECOMMENDATIONS FOR MINISTRY OF HEALTH (MOH)

Develop the National Trauma Registry
- Expand HTJS registry model to all tertiary hospitals.
- Mandate minimum dataset reporting and quality indicators.

Strengthen Workforce Development
- Support establishment of international Trauma Surgery training courses such as DSTC, ASSET, and ATOM.
- Support local and international fellowship training placements.

Expand Rehabilitation Services Nationwide
- Establish regional rehabilitation hospitals or units.
- Strengthen community-based rehabilitation and home-based therapy programs.
- Provide financial support schemes for post-trauma disability.

National Road Safety and Fall Prevention Policies
- Cross-ministry collaboration to reduce Road Traffic Accidents, workplace falls, and elderly domestic falls.
- Funding for public health interventions targeting modifiable risk factors.

SUMMARY

This inaugural HTJS Trauma Surgery Registry Report marks an important step forward in strengthening trauma care within Hospital Tuanku Ja'afar Seremban and Negeri Sembilan. Within a year, the establishment of the Trauma Surgery Unit and the adoption of structured, evidence-based protocols have led to measurable improvements in outcomes, most notably a clear reduction in trauma mortality following system-wide enhancements.

The findings reinforce a central principle in trauma care: organised systems save lives. Despite a high burden of major trauma, improvements were achieved through timely recognition, protocolised resuscitation, rapid access to critical resources, and strong multidisciplinary collaboration. The severity of injuries we manage—over half meeting major trauma criteria—underscores the importance of sustaining these coordinated efforts.

At the same time, the report highlights areas requiring continued focus, including high under-triage rates, the need to optimise pre-hospital and neurosurgical pathways, and the persistent gaps in rehabilitation services. Moving forward, the Trauma Registry must continue to guide quality improvement, resource planning, and policy development as HTJS advances toward becoming a fully mature trauma centre. This report stands both as evidence of progress and as a call to action to further reduce preventable deaths and enhance the safety and resilience of our community.

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Trauma Surgery Service

Consultant Trauma Surgeon

Dr Muhamad Izwan Ismail

Trauma Nurse / Data Manager

Sr Rizasohaini Baseri

The Team (Rotation based)

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Dr Elyana, Dr Farrah Nina, Dr Luesvari,

Dr Puteri, Dr Satvinder, Dr Simran,

Dr Zaiasraf, Dr Najwa, Dr Razeen

Dr Syakir, Dr Hazeem, Dr Najjah, Dr Yassir

Dr Amilah, Dr Tamen, Dr Vegenesh,

Dr Farhanah, Dr Ilyana, Dr Aisyah

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