

Committee on Emergency Medicine, Intensive Care and
Trauma Management of the German Trauma Society (DGU)

AUC - Academy for Trauma Surgery



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General Annual Report



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Publication of data from the own hospital are excluded from approval. Data from this annual report can also be used without further notification, but with reference to the data origin. (Citation format: Sektion NIS of the DGU & AUC (2025) 'Annual Report 2025 TraumaRegister DGU®')

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Preface

Dear readers,

We are pleased to send you the TraumaRegister DGU® **2025 annual report**. This year's annual report features several new content additions.

The mortality prediction model has been updated from the previous RISC-II model to the more recent RISC-III model. Consequently, all analyses have been revised using RISC III, which may lead to changes in the results. Chapter 12.3 provides a detailed explanation of the RISC III model and the reasons for switching models.

In addition, this report includes the new PICUP prediction model for the first time. For surviving patients, PICUP estimates the probability of a prolonged ICU stay (> seven days) and compares this predicted value with the actual observed outcome.

Furthermore, since April 2024, the completion rate of the documentation has been determined for each case during online data entry. This means that data completeness can now be objectively quantified and transparently presented for the first time. Initial evaluations indicate that achieving a completion rate of 100% is rarely feasible. Using the average completion rate across the entire registry as a benchmark allows you to assess your own data quality.

This report comprises analyses of data from severely injured patients in 2024 (basic group), documented by participating hospitals in the TraumaRegister DGU® by the end of March 2025. The data quality can once again be described as very good this year. Quality improvements have even been recorded in the areas of capnometry and the completeness of the RISC parameters. We would like to extend our sincere and heartfelt thanks to everyone involved in data collection and documentation for their tireless and invaluable work!

At the end of 2024, a total of 684 hospitals were participating in the TraumaRegister DGU®. In addition to the 614 hospitals from Germany, hospitals from eight other countries are currently participating in the registry. This includes, 41 from Belgium, 8 from Switzerland and 5 hospitals come from Austria.

We sincerely hope that the annual report will again provide you with findings that contribute to the further improvement of care for severely injured patients, in regards to quality assurance and health services research. In 2024, 21 scientific papers were published using data from the TraumaRegister DGU®. We would like to thank the authors, reviewers and all contributing clinicians for their commitment.

Sincerely yours,



Sebastian Imach



Heiko Trentzsch



Rolf Lefering



Christine Höfer



Stefan Huber

1 Number of cases

Inclusion criteria for documenting a patient in the TraumaRegister DGU® (TR-DGU) are admission via the emergency room and the need for intensive care. Patients who died before ICU admission should also be included. This pragmatic criterion was chosen to avoid complicated score calculations in the emergency room and to limit the documentation to patients with relevant, serious injuries.

However, the number of documented patients with only minor injuries has continuously increased over the years. This is not only unnecessary work for the hospitals, but more importantly it makes it difficult to draw comparisons both between hospitals and over time. Therefore, in 2015 a **basic group** was defined and nearly all analyses presented in this report refer to this patient group only (i.e. not to all documented patients).

The severity of each injury is described using the Abbreviated Injury Scale (**AIS**), which classifies severity from 1 (minor) to 6 (maximal). Using these severity grades, more sophisticated measures like the maximum AIS (**MAIS**), the Injury Severity Score (**ISS**) or the New ISS (**NISS**) can be derived. The **basic group** of the TR-DGU is defined as:

All patients with MAIS ≥ 3 AND all MAIS 2 patients who died or were treated in the intensive care unit.

Unless another patient cohort is explicitly specified, the analyses in this report only refer to the basic group.

The following flowchart gives an overview of the composition of the basic group.

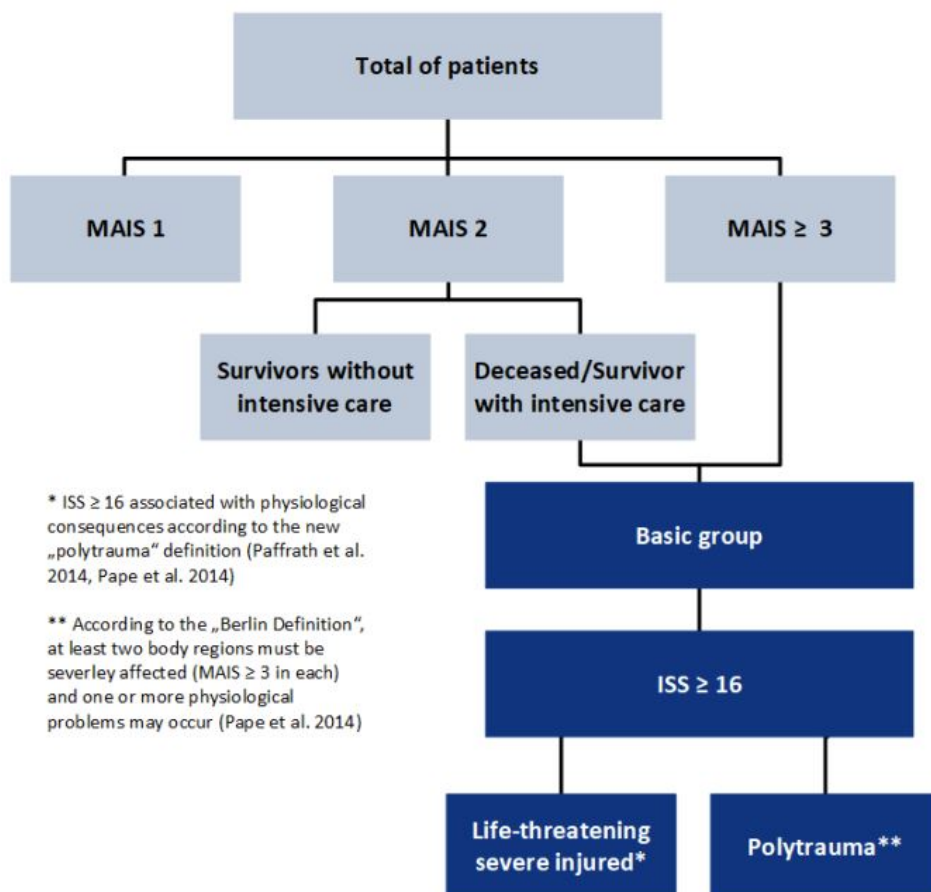


Figure 1: Flowchart describing the composition of the basic group

The following table shows the data of groups as defined in figure 1. The table is broken down by the MAIS criteria as well as the basic group and selected subgroups.

Table 1: Number of cases in 2024 from the TR-DGU

	TR-DGU 2024	Primary admitted	Transfer in	Early transfer out
Total number of documented patients.	36,809	31,998	2,657	2,154
MAIS 1 For these patients, the most severe injury was AIS grade 1 (MAIS = 1). Thus, they were not severely injured. Furthermore, the RISC III* prognostic score has not been validated for these cases and they were excluded from all further analyses (except chapter 5.3).	2,958 (8 %)	2,848	29	81
MAIS 2 survivors without intensive care The most severe injury was of AIS grade 2. These patients survived and did not receive intensive care.	3,101 (8 %)	3,881	190	123
MAIS 2 deceased or survivors needing intensive care The most severe injury was of AIS grade 2. The patients died or survived but required intensive care.	4,336 (12 %)	3,979	196	123
MAIS ≥ 3 The most severe injury was of AIS grade 3 or more (MAIS 3+). This criteria is also used by the EU as an internationally agreed to definition of a „serious injury“ in the context of road accidents.	26,373 (72 %)	22,382	2,365	1,626
Non-basic group Patients with MAIS 1 as well as patients with MAIS 2 that survived without intensive care.**	6,031 (16 %)	5,544	84	403
From this point onward all absolute numbers and percentages refer only to the basic group				
Basic group This definition includes all MAIS ≥ 3 patients and MAIS 2 patients who died or were treated on the intensive care unit. Patient age must also be documented.	30,754	26,434	2,570	1,750
Intensive care Patients admitted to the ICU.	24,641 (80 %)	21,710	2,283	648
Deceased Patients who died in the acute care hospital.	3,889 (13 %)	3,569	320	0
ISS 16+ The definition ISS ≥ 16 (or > 15) is commonly used to define a serious injury.	17,057 (55 %)	14,162	1,769	1,126
Life-threatening severe injury Injury severity of ISS ≥ 16 in conjunction with physiological problems according to the „polytrauma“ definition (Paffrath et al. 2014, Pape et al. 2014).	10,108 (33 %)	8,628	891	589
Polytrauma According to the „Berlin Definition“, two body regions are severely affected and one or more physiological problems are present (Pape et al. 2014).	4,573 (15 %)	3,994	348	231

* RISC III: Revised Injury Severity Classification: Lefering et al., manuscript in preparation

**Exclusive cases that are documented as part of TR-DGU modules

2 Observed and expected outcome

A central element of quality assessment in the TraumaRegister DGU® is the comparison of observed and expected outcomes. In addition to comparing mortality with prognosis derived from injury severity, a similar comparison for long-stay ICU patients has been introduced in 2025.

2.1 Comparison of Mortality and Its Prognosis

To calculate the mortality prognosis, the **RISC III** (Revised Injury Severity Classification: Version 3) is used. This score can be calculated for all primarily admitted patients. (patients deceased within the first week with a patient's volition are no longer excluded from the RISC III calculation). Further information on **RISC III** can be found in Chapter 11.3.

No. of basic group patients documented in the TR-DGU in the last 10 years (2015-2024)	n = 320,238
- of these, documented last year (2024)	n = 30,754
- of these, only primary cases (no transfer in; no early transfer out)	n = 26,434

Comparisons of mortality and risk of death prognosis will be performed for **primary admitted patients** only (Figure 2). For patients **transferred in** from another hospital (n = 2,570 in 2024), the initial status from primary admission is missing; for patients **transferred out early** (within 48 hours after admission; n = 1,750 in 2024), no final outcome is documented.

The mean age of the remaining patients was 55.3 years and 69 % were male. The mean ISS was 18.2 points. Of these patients 3,569 died in hospital, which is **13.5 %** (95 % CI: 13.1 - 13.9). The risk of death prognosis based on RISC III is **13.4 %**. You find these values for the TR-DGU in figure 2.

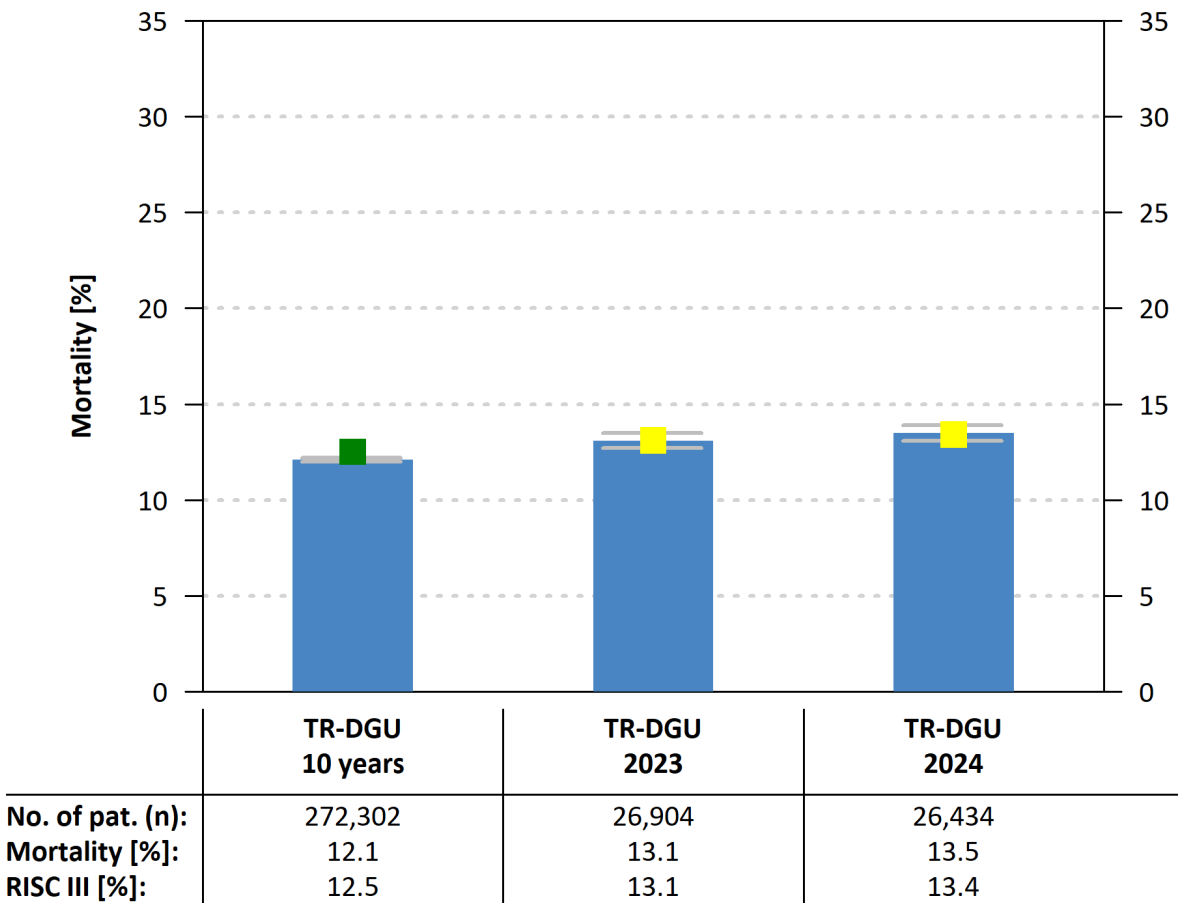


Figure 2: Observed mortality and risk of death prognosis (RISC III)

Expanded information for Figure 2:

The bars represent the observed mortality rate; percentages are given in the table at the bottom of each bar. The predicted mortality rate, RISC III, is given as a **yellow box**. This box turns to **green** or **red** in case that the observed mortality is significantly lower (= better) or higher (= worse) than expected, respectively. For the interpretation of the results, it must be considered that these findings depend on statistical uncertainty. Therefore, the 95 % confidence interval (CI) for the observed mortality rate is given as well (grey vertical error bars). The 95 %-CI describes a range of values which covers the „true“ value with a high probability (95 %). The more patients a value is based on, the narrower the CI.

Data quality for the risk of death prognosis

The validity of a prognosis depends on the quality and the completeness of the variables required for its calculation. In the TR-DGU two different documentation types are used, the standard and the QM dataset. The standard dataset includes all parameters that are recorded by the registry. The QM dataset is a reduced version of the standard dataset. The risk of death prognosis **RISC III score**, developed for the TraumaRegister DGU®, is based on 13 different variables. Since the revision of the dataset in 2015, all 13 required variables are recorded by both datasets. Even though the only mandatory components are age and injury severity, every additional piece of information increases the accuracy of the outcome prediction.

Therefore, additional information on the data quality of the variables used for the prognosis is provided here. If all data required for calculation of the RISC III score were recorded, or if only one value was missing, then this patient was considered as a „**well documented**“ case. The percentage of well documented patients (per hospital) is then used to quantify the data quality of outcome prediction. The following applies:

-  **more than 95 %** of cases were well documented,
-  **80 - 94 %** of cases were well documented,
-  **less than 80 %** of cases were well documented.

Table 2: Data quality for the calculation of the RISC III score

	TR-DGU 10 years	TR-DGU 2023	TR-DGU 2024
Total cases (n)	272,302	26,904	26,434
„Well documented“ (n)	219,442	21,934	22,678
„Well documented“ (%)	81	82	86
Data quality colour code			
Average number of missing values per patient for the calculation of the RISC III	0.8	0.8	0.6

Mortality vs. risk of death prognosis

Figure 3 compares the **observed mortality** of each hospital with their respective **RISC III prognosis for all the hospitals participating in the TR-DGU in 2024**. The **deviation** of the observed mortality from the expected prognosis is plotted against the number of patients. Negative values correspond to mortality rates lower than expected. The funnel shaped line represents the 95 % confidence interval. Hospitals with **fewer than 5 patients** are not included due to the large statistical uncertainty.

TR-DGU 2024: Patients in the basic group: **26,434** primary admitted cases

Deviation between mortality and prognosis: **+0.1 %**

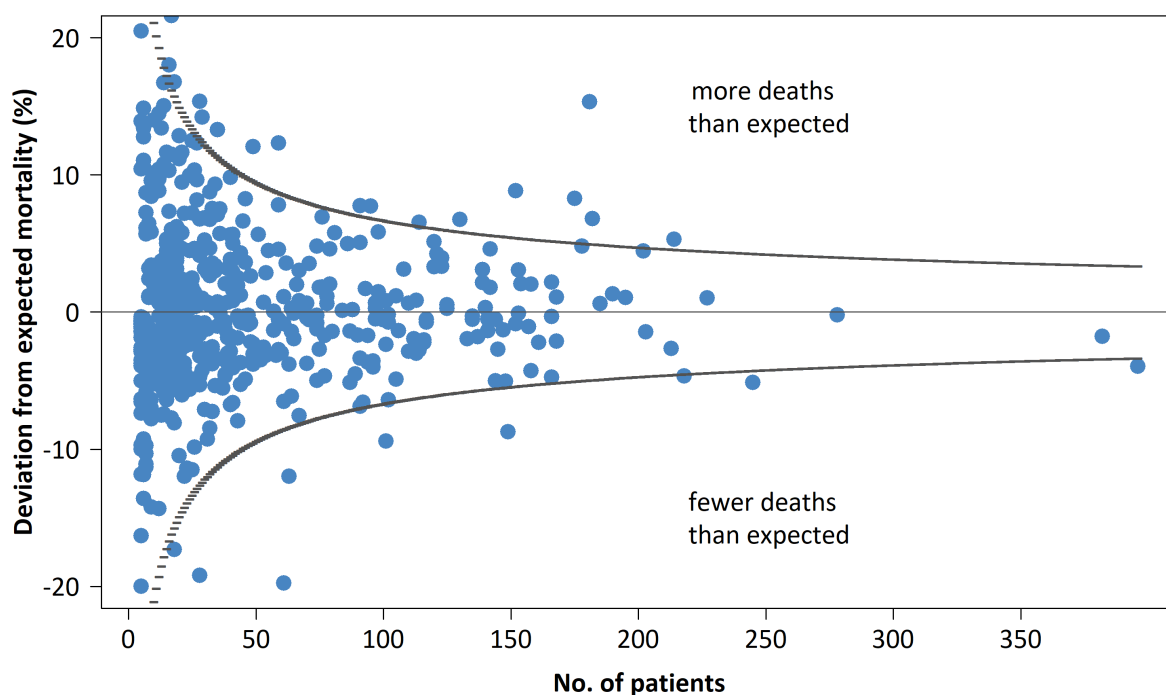


Figure 3: Deviation between the observed mortality and the risk of death prognosis (RISC III) of every hospital participating in the TR-DGU with more than 5 cases in the year 2024

In addition to the difference between observed and expected mortality, a 'Standardized Mortality Ratio' (SMR) can also be calculated from these two values. The SMR is determined by dividing the observed by the expected rate. If both rates are equal, the result is 1. If more patients have died than expected, the value is greater than 1; if fewer deaths have occurred, the SMR is less than 1. The SMR for the past 10 years is presented in chapter 6.2.

2.2 Prolonged ICU stays

A new element of quality assessment in the TraumaRegister DGU® is the prediction of a prolonged intensive care unit stay in surviving patients. A **prolonged ICU stay (PICUS)** is defined here as more than 7 days. Complications such as sepsis or (multi-)organ failure can lead to a prolonged ICU stay, but so can the successful treatment of a severely injured trauma patient. Therefore, similar to mortality, it is necessary to calculate a probability (prognosis) for a prolonged ICU stay.

Although only around 22% of severely injured patients require a prolonged ICU stay, this group is responsible for more than 70% of total ICU days and over 90% of all days on mechanical ventilation.

For this purpose, an instrument was developed using data from the TraumaRegister DGU® to calculate such a prognosis in surviving patients (Prolonged ICU Prediction = PICUP). The score includes the following variables: age ≥ 60 years, number of diagnoses, most severe injury, traumatic brain injury (AIS 3+), spinal injury (AIS 3+), pre-trauma ASA score, blood transfusion, intubation/mechanical ventilation in the ICU, shock, and secondary transfer (Lefering & Waydhas 2024).

The PICUP score was developed based on more than 100,000 cases from the TraumaRegister DGU® covering the years 2014 to 2018. Validation was performed using data from 2019 to 2022. Currently, the proportion of patients with a prolonged ICU stay (PICUS) is slightly below the predicted value.

The observed proportion of patients with a prolonged ICU stay (PICUS) is then compared to the expected proportion (PICUP). Similar to mortality analysis, a 95% confidence interval is calculated for the observed rate. This comparison can only be performed for surviving patients who were admitted to and treated in the intensive care unit.

Patients are excluded from this calculation for the following reasons:

- Missing information on ICU length of stay (n = 134 in 2024)
- Late transfer in (>3 days; relevant prior treatment; n = 113 in 2024)
- Early secondary transfer (<48 hours; n = 1,750 in 2024)
- Transfer while still requiring intensive care (ICU treatment not yet completed; n = 95 in 2024)

No. of basic group patients documented in the TR-DGU in 2024
- surviving patients treated in the ICU (excluding early transfers)
– after exclusion criteria applied

n = 30,754
n = 20,910
n = 20,575

The remaining 20,575 patients had an average age of 52.2 years, and 70 % were male. The mean ISS was 17.3 points. Of these patients, 4,510 stayed longer than seven days in the ICU, corresponding to **21.9 %** (95% CI: 21.4 – 22.5). The predicted probability of a prolonged ICU stay (> seven days) for the 20,575 patients was **23.3 %**. These values are presented for the TR-DGU in Figure 4.

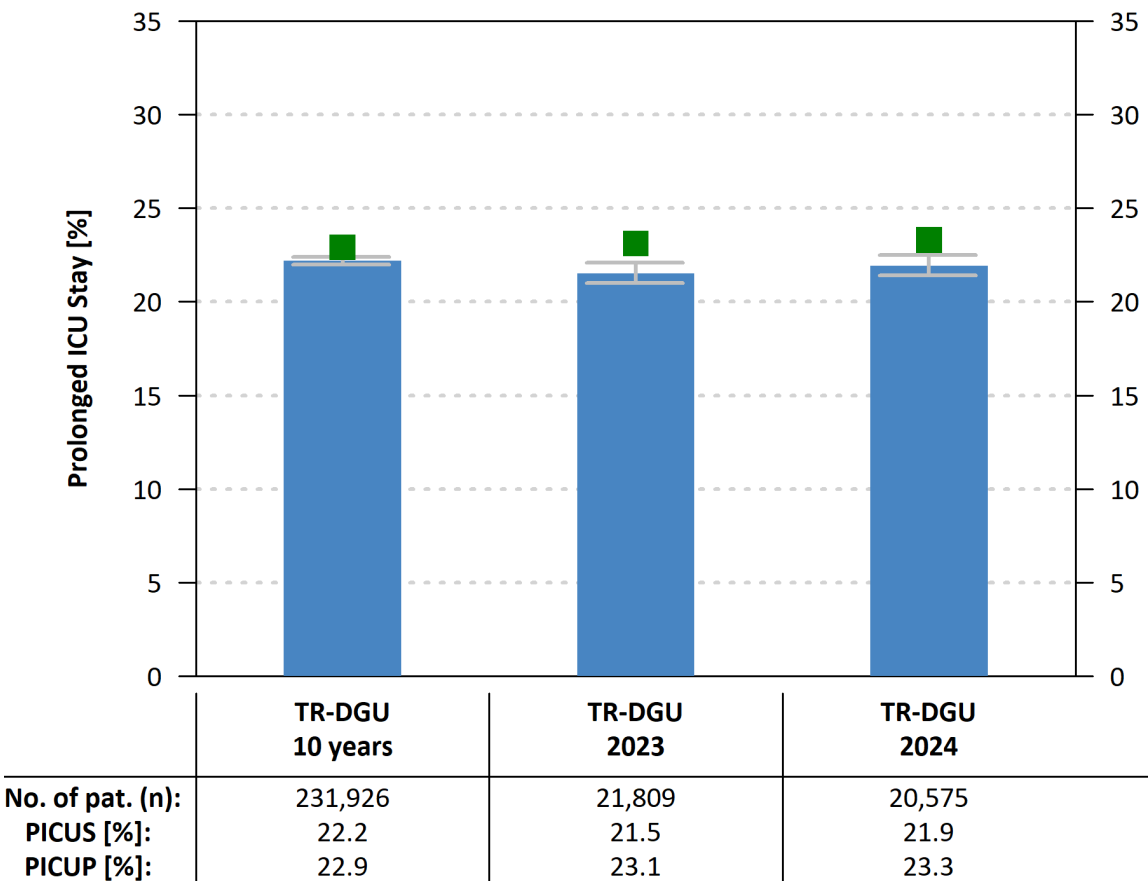


Figure 4: Observed proportion of prolonged ICU stays and the associated prognosis (PICUP)

Prolonged ICU stays vs. prognosis

Figure 5 compares the **proportion of patients who stayed longer than seven days in the ICU** with the **predicted values from all clinics participating in the TR-DGU for 2024**. The **difference** between the observed and predicted proportions of patients with a prolonged ICU stay is shown for each clinic according to their case numbers. Negative values indicate that fewer patients than expected remained in the ICU for more than seven days. The funnel-shaped line represents the 95% confidence interval. Clinics with **fewer than 5 patients** are excluded here due to statistical uncertainty.

TR-DGU 2024: Cases **20,575** relevant patients
 Difference between observed rate and prognosis: **-1.4 %**

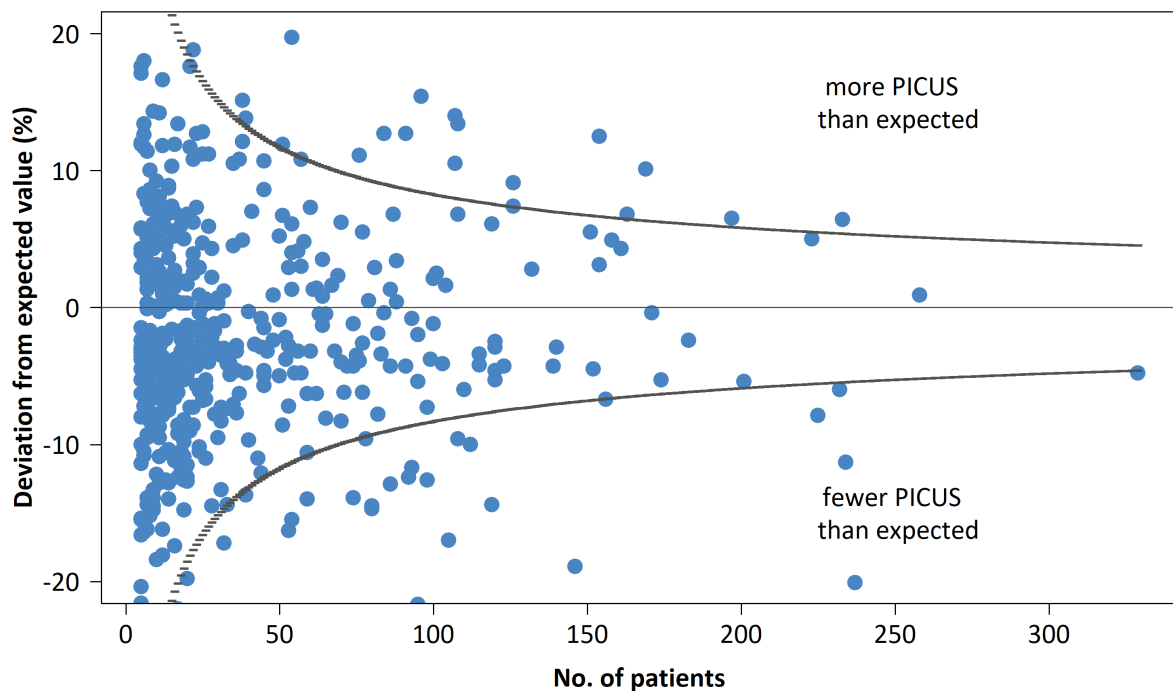


Figure 5: Difference between the observed proportion of patients with an ICU stay longer than seven days and the prognosis (PICUP) of all clinics participating in the TR-DGU with at least 5 cases for the year 2024.

In addition to the difference between the observed proportion of patients with a prolonged ICU stay and their prognosis, an 'Observed Expected Rate' (OER) can also be calculated based on these two values. The OER is determined by dividing the observed rate by the expected rate. If both rates are equal, the OER is 1. If more patients experience a prolonged ICU stay than expected, the value is greater than 1; if fewer, the OER is less than 1. The OER for the past 10 years is presented in chapter 6.3.

3 Basic data from the last 3 years

Table 3: Overview of the data from the TR-DGU in the basic group from the last 3 years

		TR-DGU			
		10 years	2022	2023	2024
Total number of patients	(n)	320,238	31,391	31,269	30,754
Primary admitted and treated patients	(n)	272,302	26,926	26,904	26,434
Patients transferred out early	(n)	20,350	1,985	1,870	1,750
Patients transferred in	(n)	27,586	2,480	2,495	2,570
Demography (all patients in the basic group)					
Mean age	[years]	53.2	54.4	54.5	55.1
70 years or older	[%]	28.3	29.3	30.1	31.4
Proportion male	[%]	69.6	69.5	69.7	69.1
Trauma					
Blunt trauma	[%]	96.0	95.9	95.6	95.6
Mean ISS	[points]	18.3	18.4	18.5	18.5
ISS ≥ 16	[%]	54.4	54.6	55.5	55.5
TBI (AIS head ≥ 3)	[%]	36.8	36.9	37.8	38.3
Prehospital care (only primary admissions)					
Intubation by emergency physician	[%]	20.1	19.8	19.1	18.4
Unconscious (GCS ≤ 8)	[%]	15.9	15.3	15.1	15.1
Shock (RR ≤ 90 mmHg)	[%]	8.2	8.1	8.2	7.9
Emergency room care (only primary admissions)					
Whole-body CT	[%]	76.0	74.8	72.8	72.2
X-ray of thorax	[%]	24.6	16.7	17.3	17.1
Patients with blood transfusion	[%]	7.6	7.7	8.4	9.2
Treatment in hospital					
Patients with surgery ¹⁾	[%]	66.0	65.4	65.4	63.7
Patients treated in the ICU	[%]	85.2	83.7	83.1	80.1
Length of stay in the ICU ³⁾	[days]	6.2	6.1	6.1	6.1
Outcome					
Length of stay in hospital ⁴⁾	[days]	15.0	14.5	14.5	14.2
Hospital mortality ⁴⁾	[n]	36,354	3,834	3,832	3,889
	[%]	12.1	13.0	13.0	13.4
Multiple organ failure ^{2) 4)}	[%]	17.2	15.6	14.5	14.1
Discharge to other hospital	[%]	17.1	16.7	17.4	13.7

¹⁾ years where less than 20 % patients underwent surgery are excluded

²⁾ not available in the reduced QM dataset

³⁾ only ICU patients

⁴⁾ excludes patients transferred out early

4 Indicators of process quality

Quality indicators are measurements which are presumed to be associated with the quality of care and outcome. All results presented here are based on **cases only from the basic group in 2024** with valid data or respective subgroups thereof. This includes early transfer out cases.

For each indicator, the distribution of the values of all participating hospitals is presented graphically over time. The **light blue circles** present the individual hospital values. The **grey horizontal line** is the mean across all hospitals for that year.

4.1 Prehospital indicators

4.1.1 Prehospital time

The sooner a patient reaches a trauma centre, the earlier life-saving interventions can be performed. Only patients with $ISS \geq 16$ are included here. The time period from accident until hospital admission is presented as an average value in minutes. Implausible time values < 5 minutes and > 4 hours are excluded.

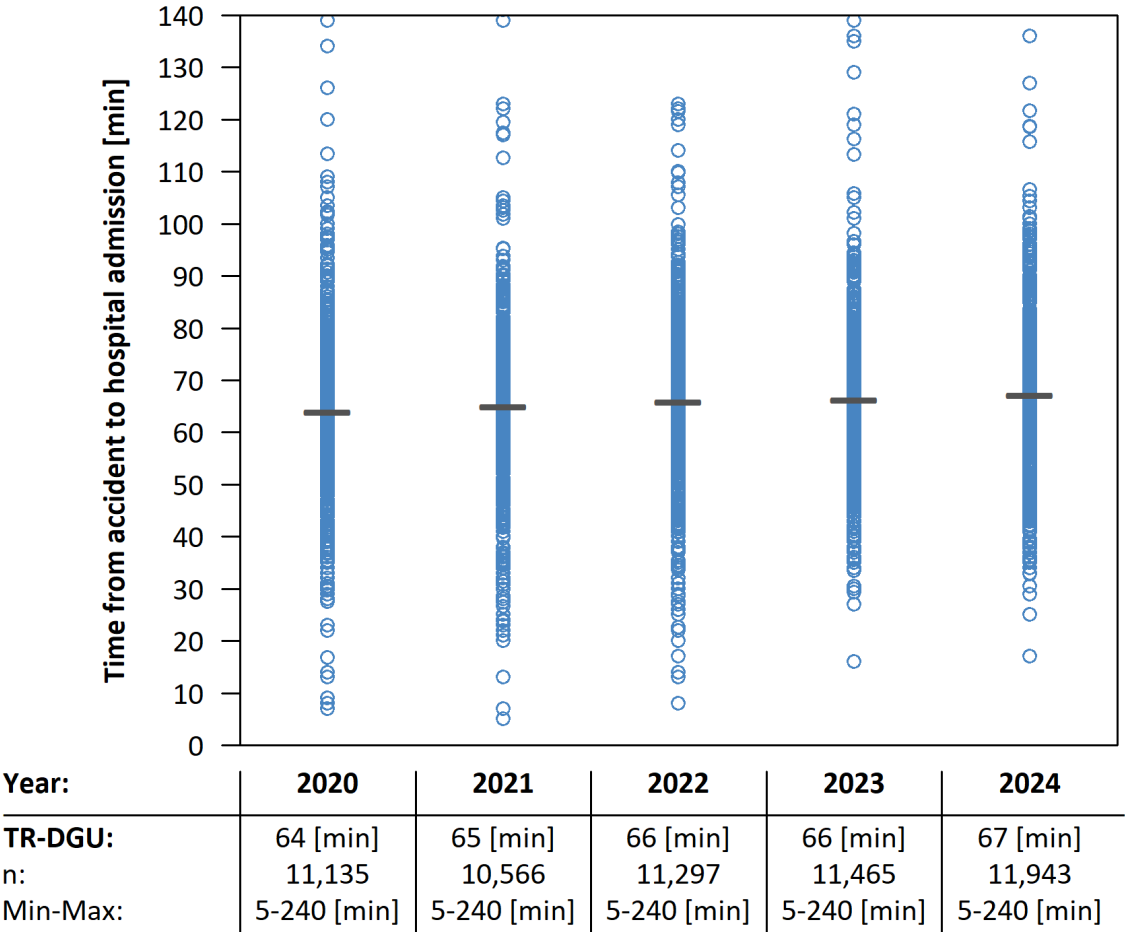


Figure 6: Distribution of the mean duration from accident until hospital admission of patients with mit $ISS \geq 16$ over all hospitals, 2020-2024, — TR-DGU, **o** single hospital value

4.1.2 Capnometry in intubated patients

Capnometry helps to assess the effectiveness of intubation in intubated patients. Only patients with a prehospital endotracheal intubation with valid data for capnometry are considered here. Intubated patients without information regarding capnometry cannot be analysed (n = 947).

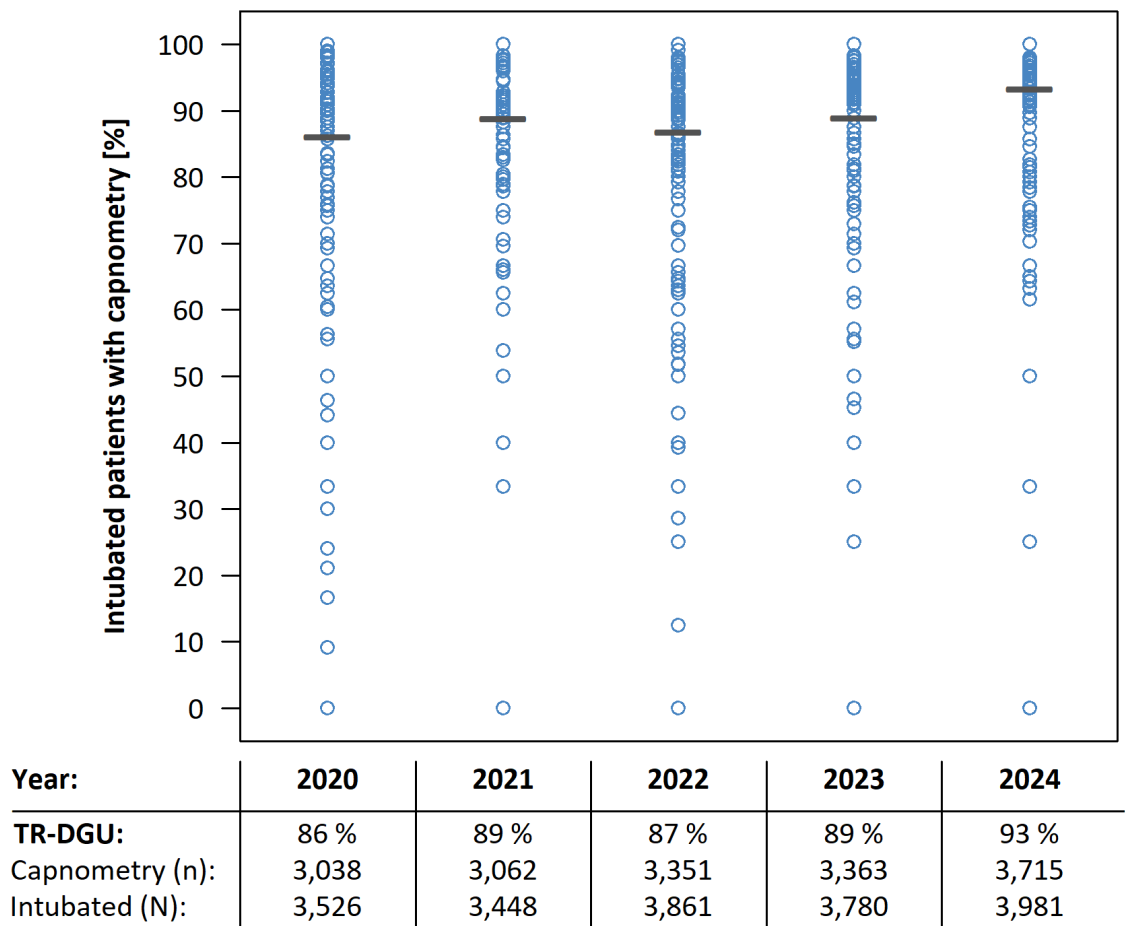


Figure 7: Distribution of the capnometry rate in prehospital intubated patients over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.1.3 Intubation of unconscious patients

The prehospital intubation of unconscious patients guarantees an oxygen supply until the hospital is reached. Only patients with a prehospital documented GCS ≤ 8 are considered here, regardless of the injury severity. When information on intubation is missing it is considered as „no intubation“, while an alternative airway is counted here as „intubation“.

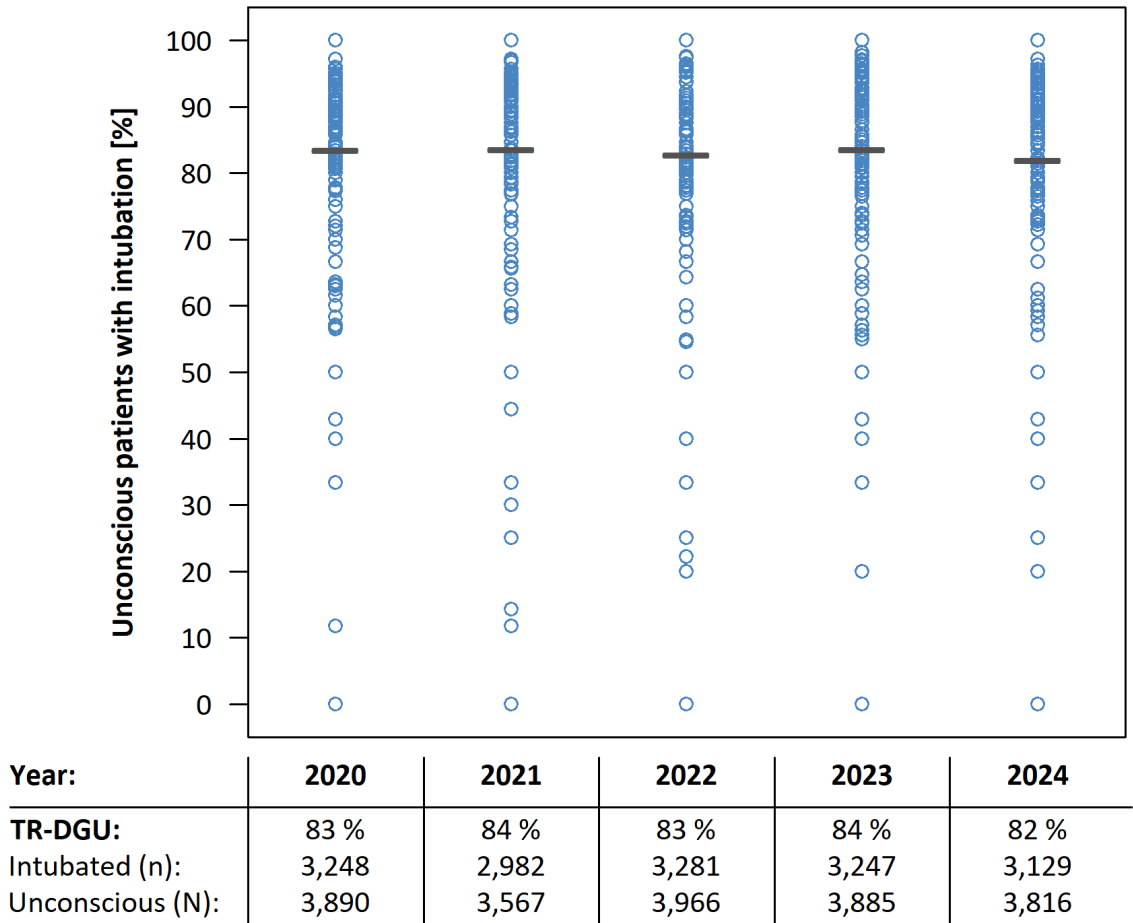


Figure 8: Distribution of the intubation rate in unconscious patients over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.1.4 Pelvic binder in pelvic fracture

The stabilisation of an instable pelvic fracture can help to improve the hemodynamic status of the patient. Only cases with a pelvic fracture (AIS severity 3 to 5) are considered here. The pelvic binder is documented in the standard dataset only.

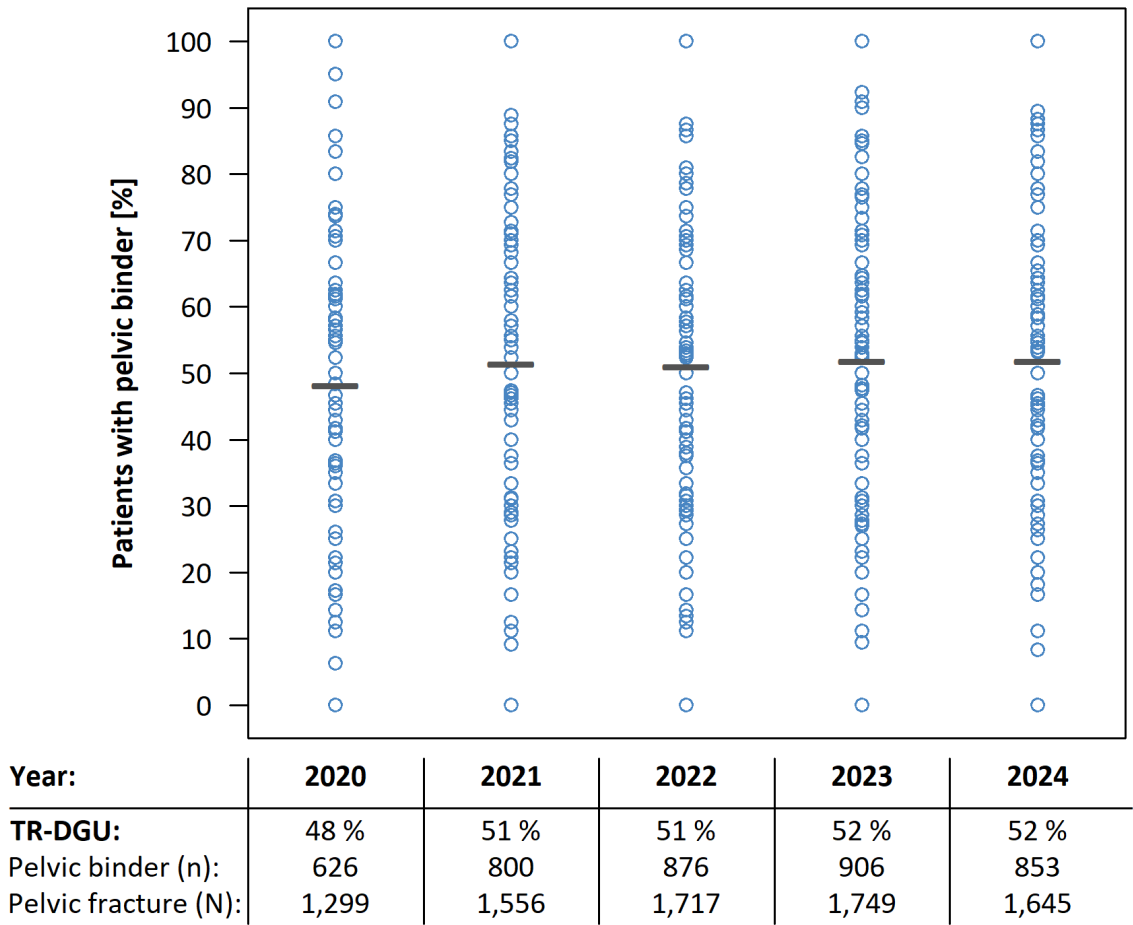


Figure 9: Distribution of the pelvic binder rate in patients with an instable pelvic fracture over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.2 Process times in the emergency room

4.2.1 Time until whole-body CT

If a whole-body CT is indicated, it should be performed immediately after admission to the ER in order to initiate subsequent interventions in a timely manner. Time periods > 120 minutes are excluded from the following analysis. All patients who received a whole-body CT are considered here.

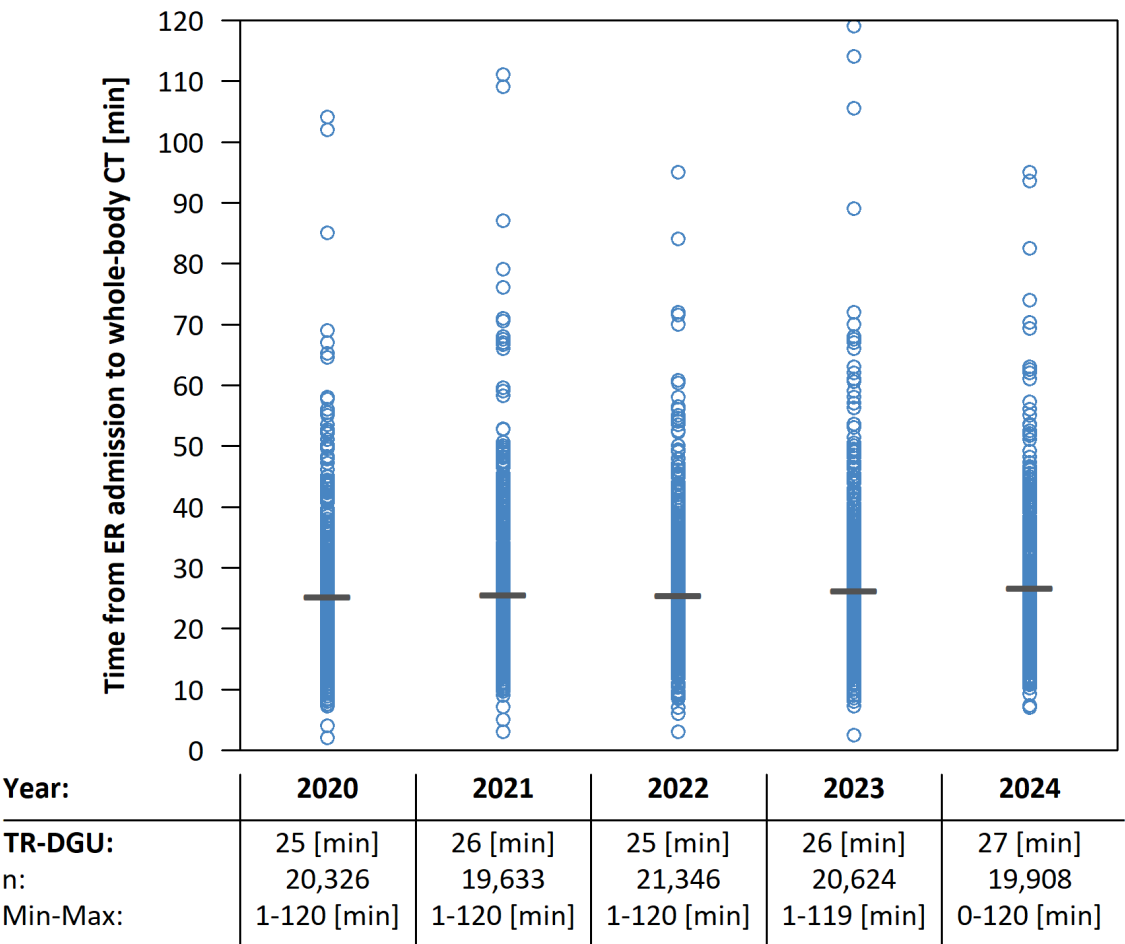


Figure 10: Distribution of the mean duration from admission to the ER until whole-body CT over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.2.2 Time until first emergency surgery

Eleven different emergency interventions are documented in TR-DGU (surgical liquid drain or brain decompression, laminectomy, thoracotomy, laparotomy, revascularisation, embolisation, REBOA, escharotomy, dermatofasciectomy and stabilisation of pelvis or extremities). All patients with at least one of these interventions are considered here. Time periods between admission to the ER and emergency surgery > 120 minutes are excluded.

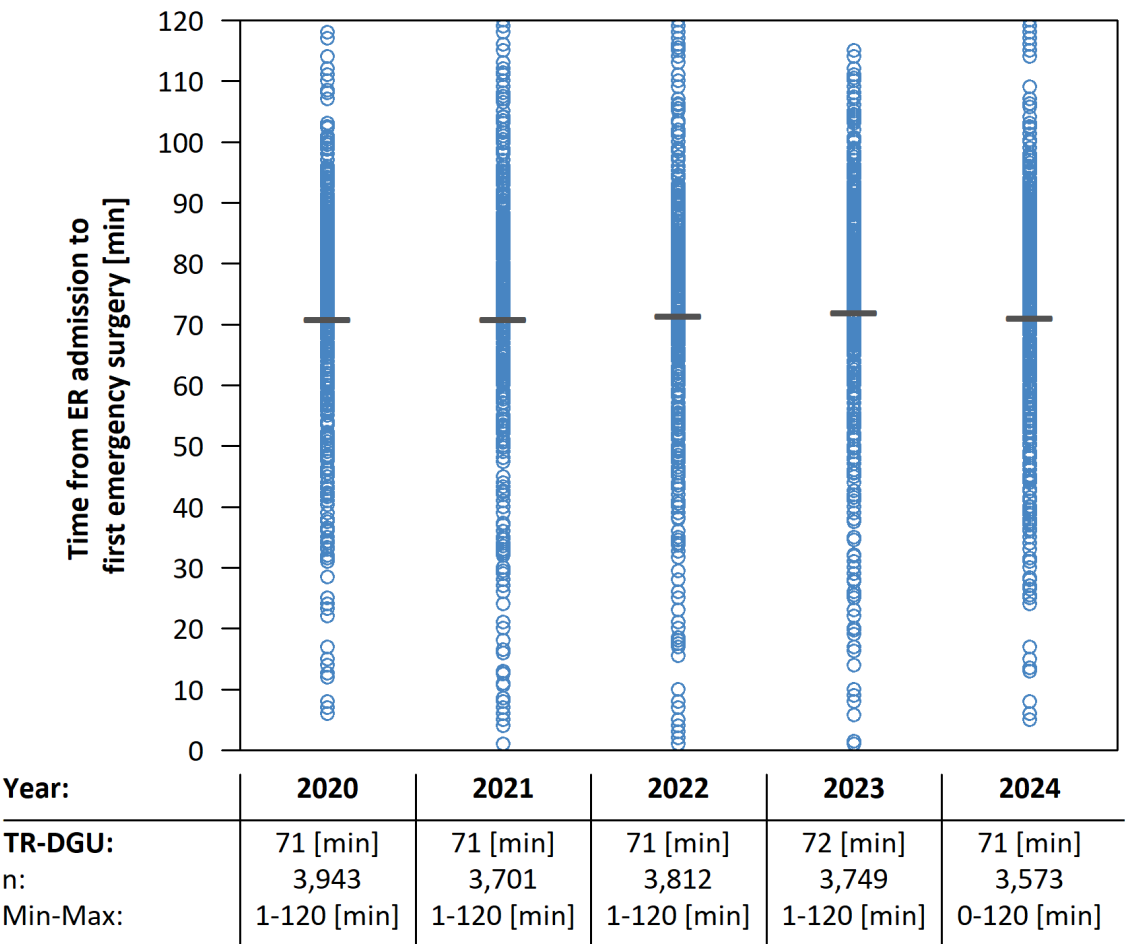


Figure 11: Distribution of the mean duration from admission to the ER until the first emergency surgery over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.2.3 Time from admission to the ER until surgery in penetrating trauma

Time period between admission to the ER and the first surgical intervention (list of procedures see 4.2.2) in patients with penetrating injuries (stabbing, gunshot, etc.). Time periods longer than 120 minutes are excluded from this analysis.

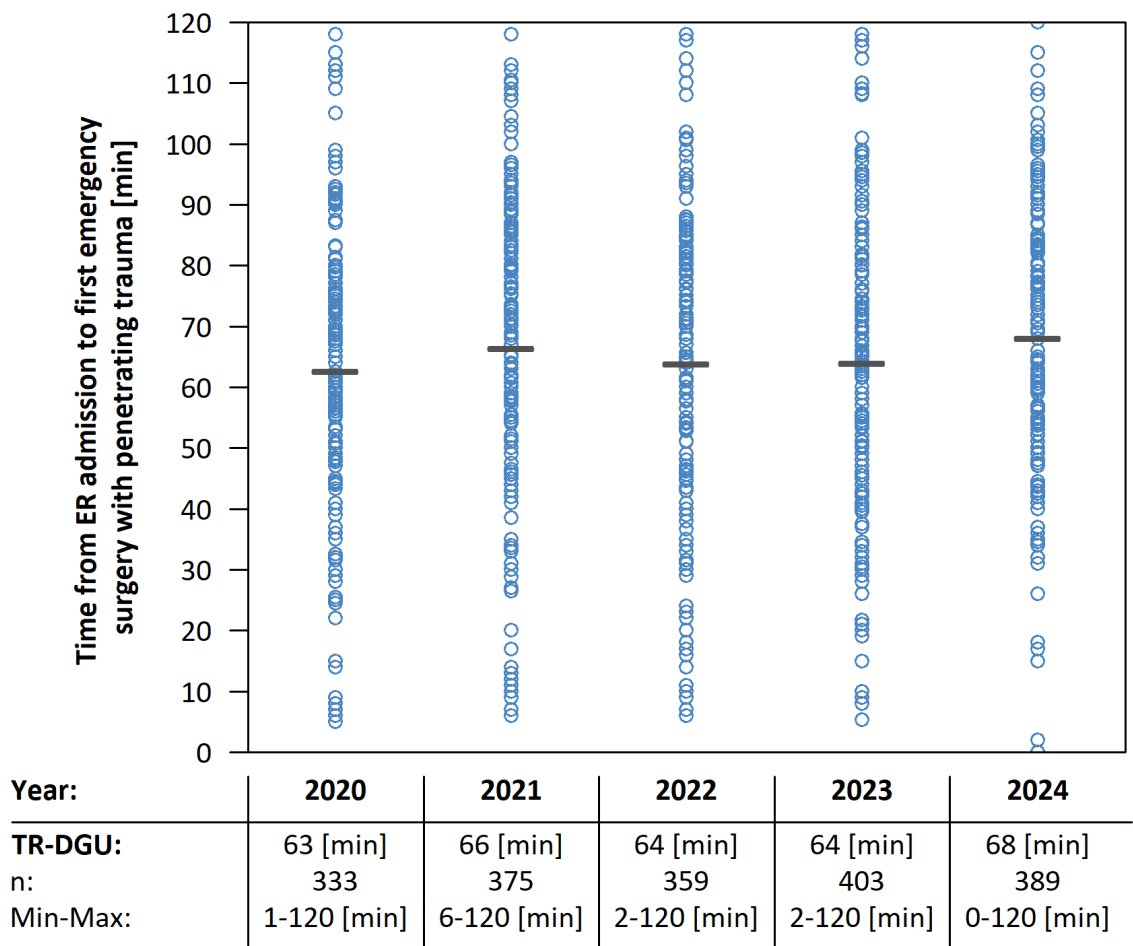


Figure 12: Distribution of the mean duration from admission to the ER until surgery in patients with penetrating trauma over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.2.4 Time until surgery in patients in shock

Time period from admission to the ER until the first surgical intervention (list of procedures see 4.2.2) in patients in shock (systolic blood pressure ≤ 90 mmHg). Time periods longer than 120 minutes are excluded from this analysis.

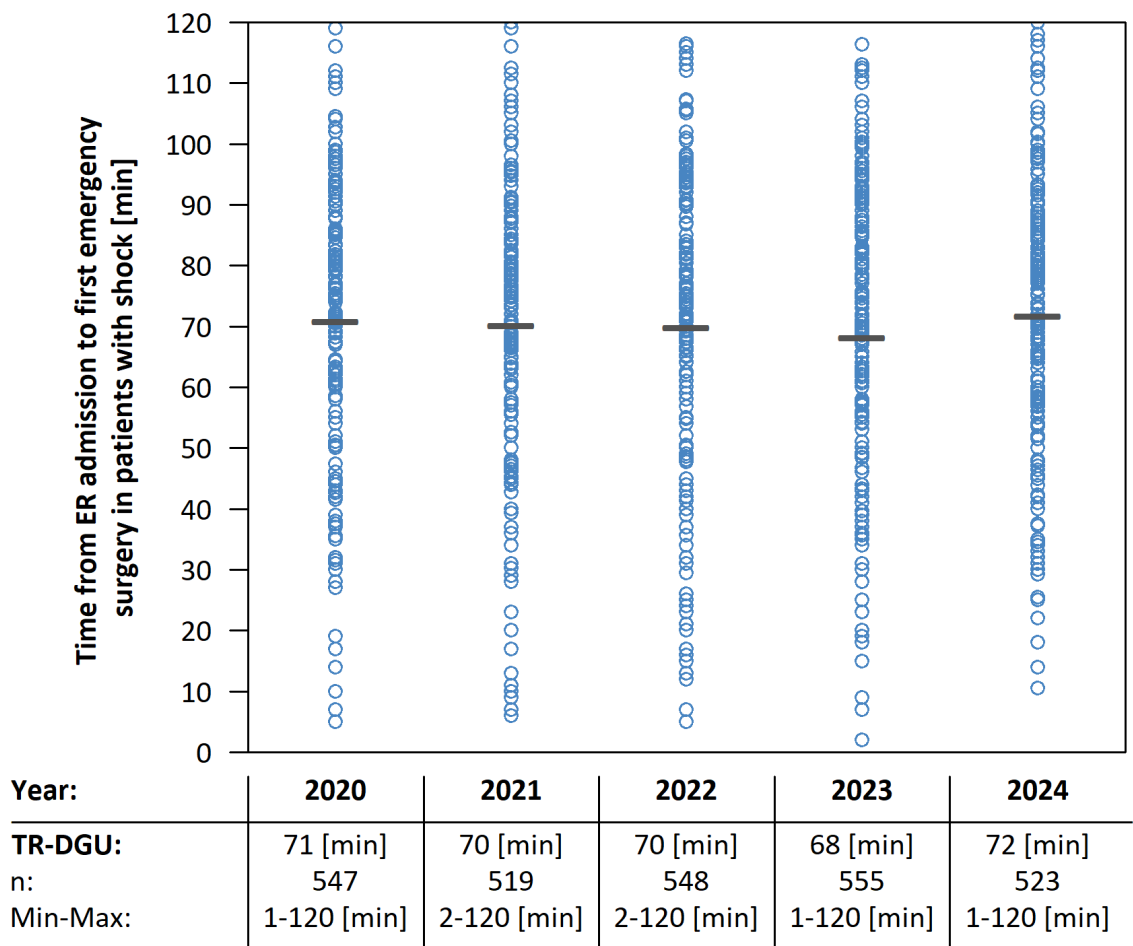


Figure 13: Distribution of the mean duration from admission to the ER until surgery in patients with shock over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

4.2.5 Time until start of blood transfusion

If blood substitution is required, this should be done as quickly as possible. All patients with a valid time to blood transfusion (pRBC) are considered here. Time periods between admission to the ER and time of blood transfusion over 120 minutes are excluded from this analysis.

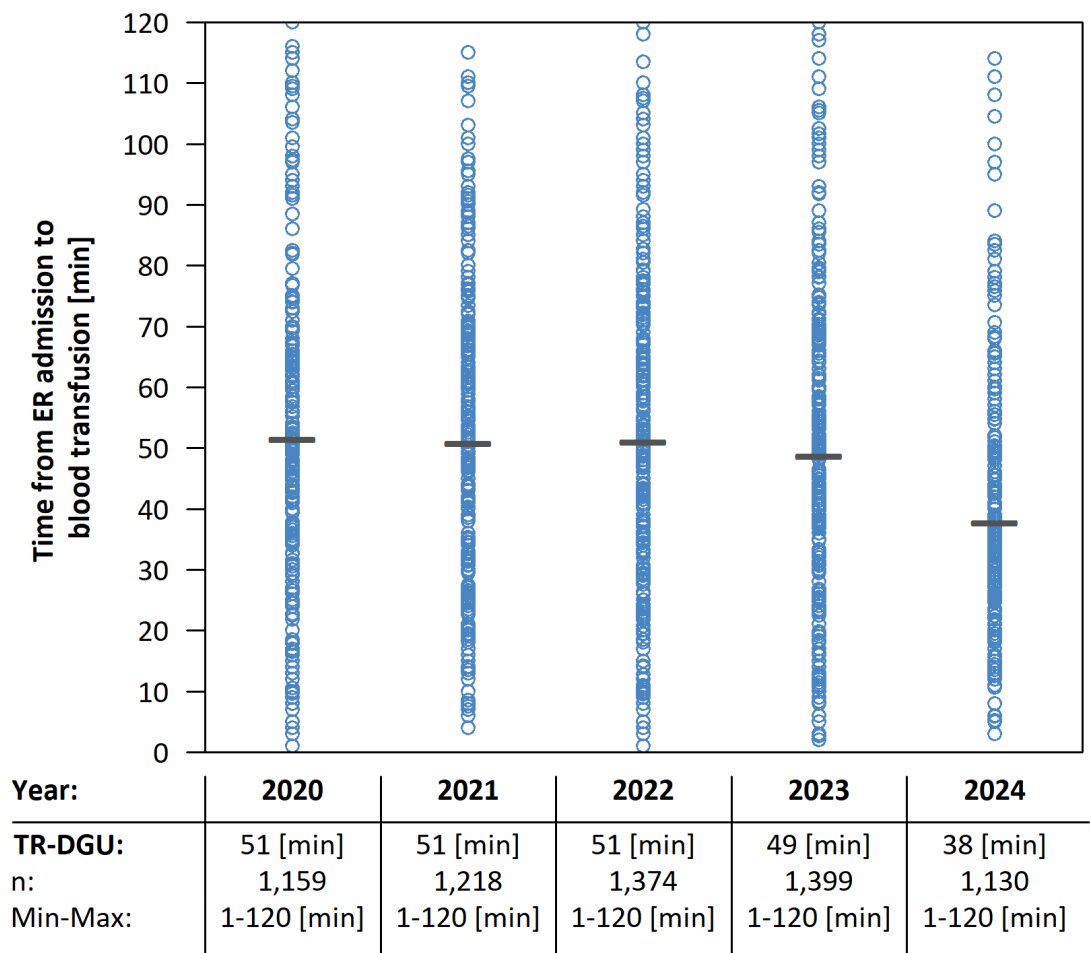


Figure 14: Distribution of the mean duration from admission to the ER until start of the transfusion over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.2.6 Surgical brain decompression

In patients with intracranial bleeding after severe traumatic brain injury (TBI, AIS severity = 5) a surgical brain decompression is indicated. Only surgery patients with a valid time to surgery (max. 120 minutes) and AIS severity degree of 5 are considered in this analysis.

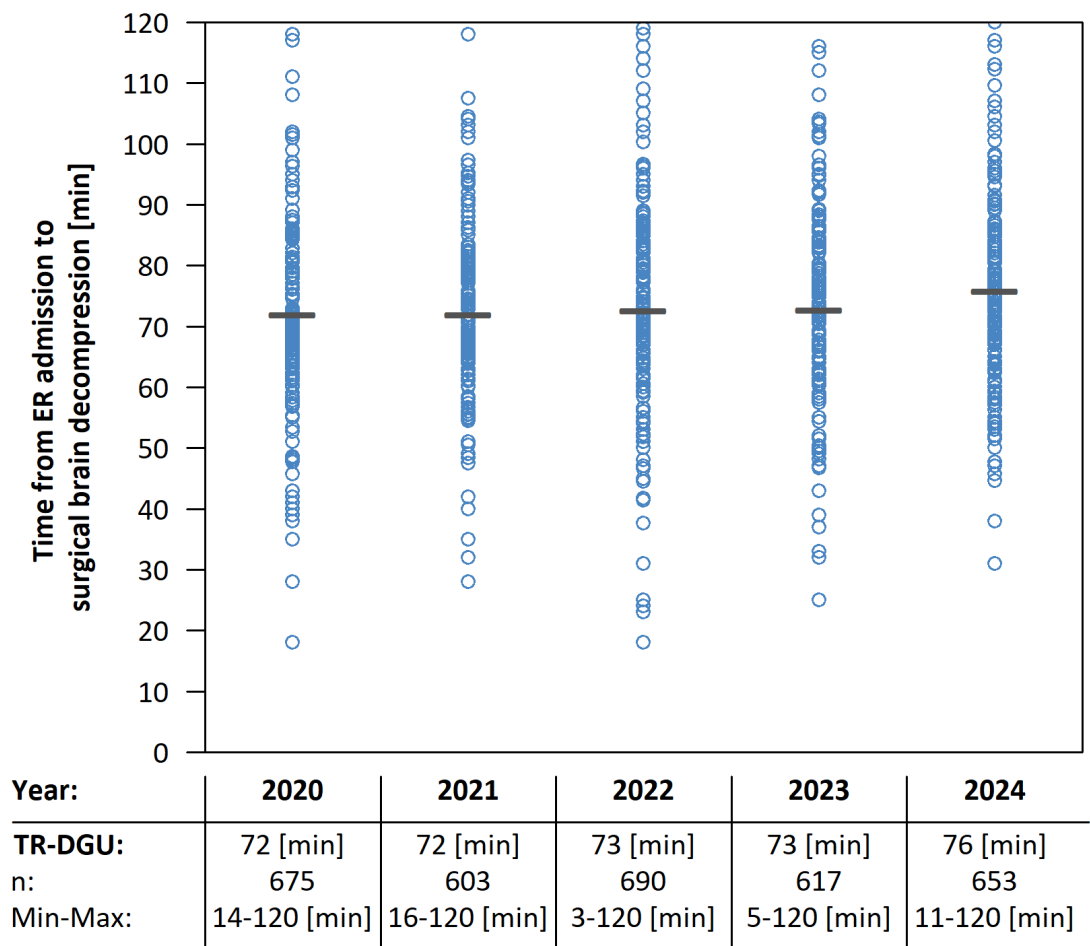


Figure 15: Distribution of the mean duration from admission to the ER until surgical brain decompression over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.3 Diagnostics and interventions

4.3.1 Cranial CT (cCT) with GCS < 14

A reduced consciousness could be indicative of a TBI and should be investigated with a cranial CT (cCT) or whole-body CT. All patients with a GCS < 14 are included, either prehospital or on admission (if not intubated). Patients who died within the first 30 minutes after admission are excluded, because a cCT / whole-body CT is no longer possible. A missing value regarding cCT / whole-body CT is considered as „not performed”.

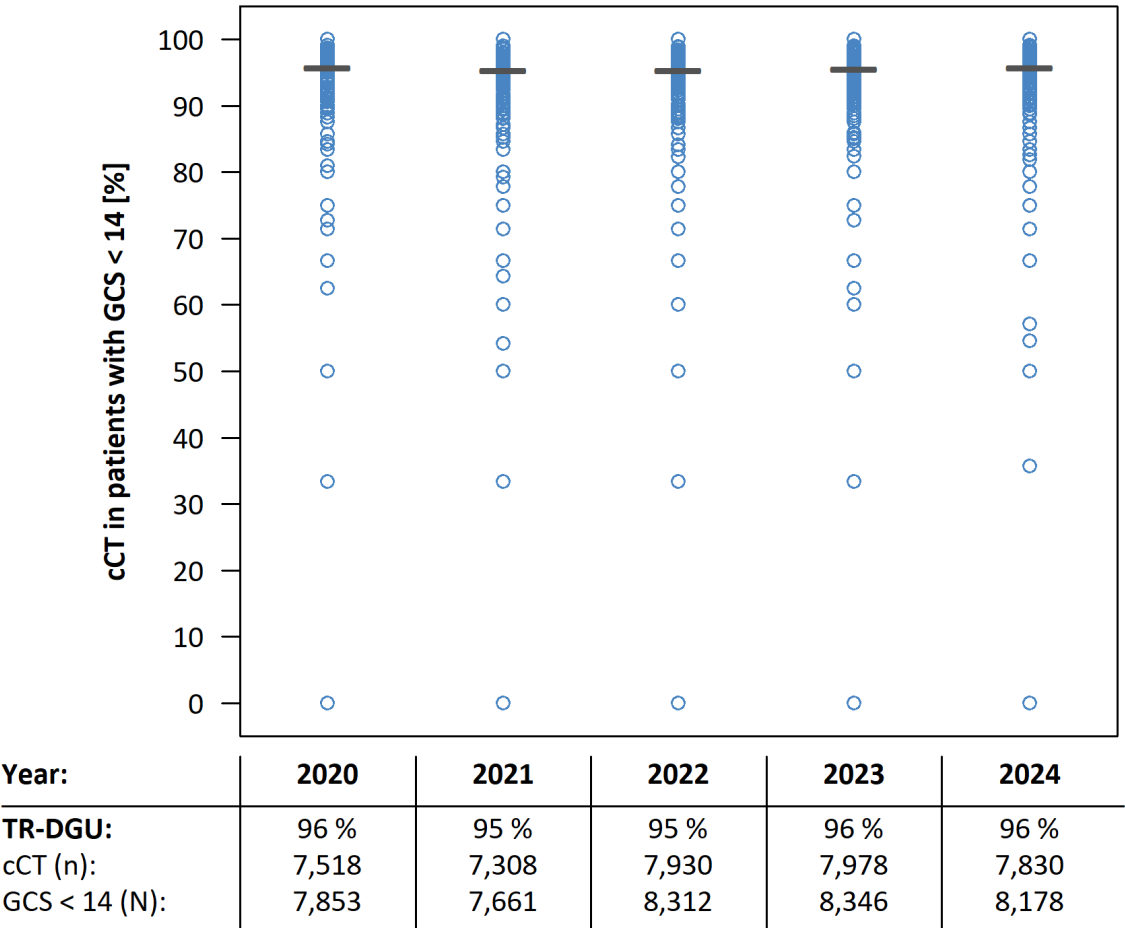


Figure 16: Distribution of the cCT rate in patients with GCS < 14 over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.3.2 Sonography in patients without CT

If no whole-body CT / cCT has been performed, abdominal sonography (FAST = Focused Assessment with Sonography for Trauma) should be part of the diagnostic work-up. All patients without a documented whole-body CT / cCT are included in this analysis. A missing value regarding the FAST is considered as „not performed”.

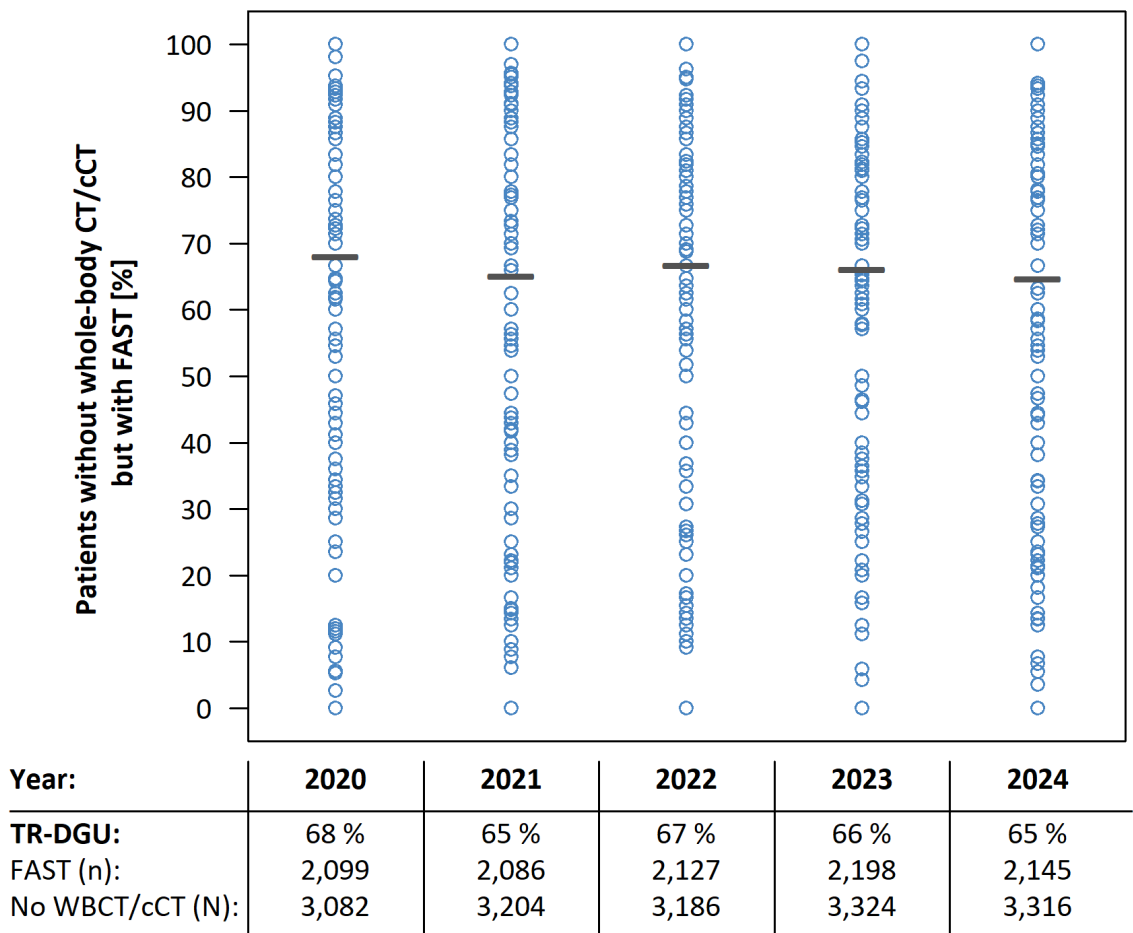


Figure 17: Distribution of the sonography rate in patients without whole-body CT / cCT over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.3.3 Prehospital tranexamic acid in patients with blood transfusion

Based on a randomized trial, patients receiving tranexamic acid (TXA) need a reduced transfusion volume or even no transfusion at all. Therefore, patients who require a blood transfusion should have been previously given TXA. All patients with documented blood transfusion (received pRBCs in the ER up to ICU admission) are included here. A missing value regarding prehospital TXA administration is considered as „no TXA given”.

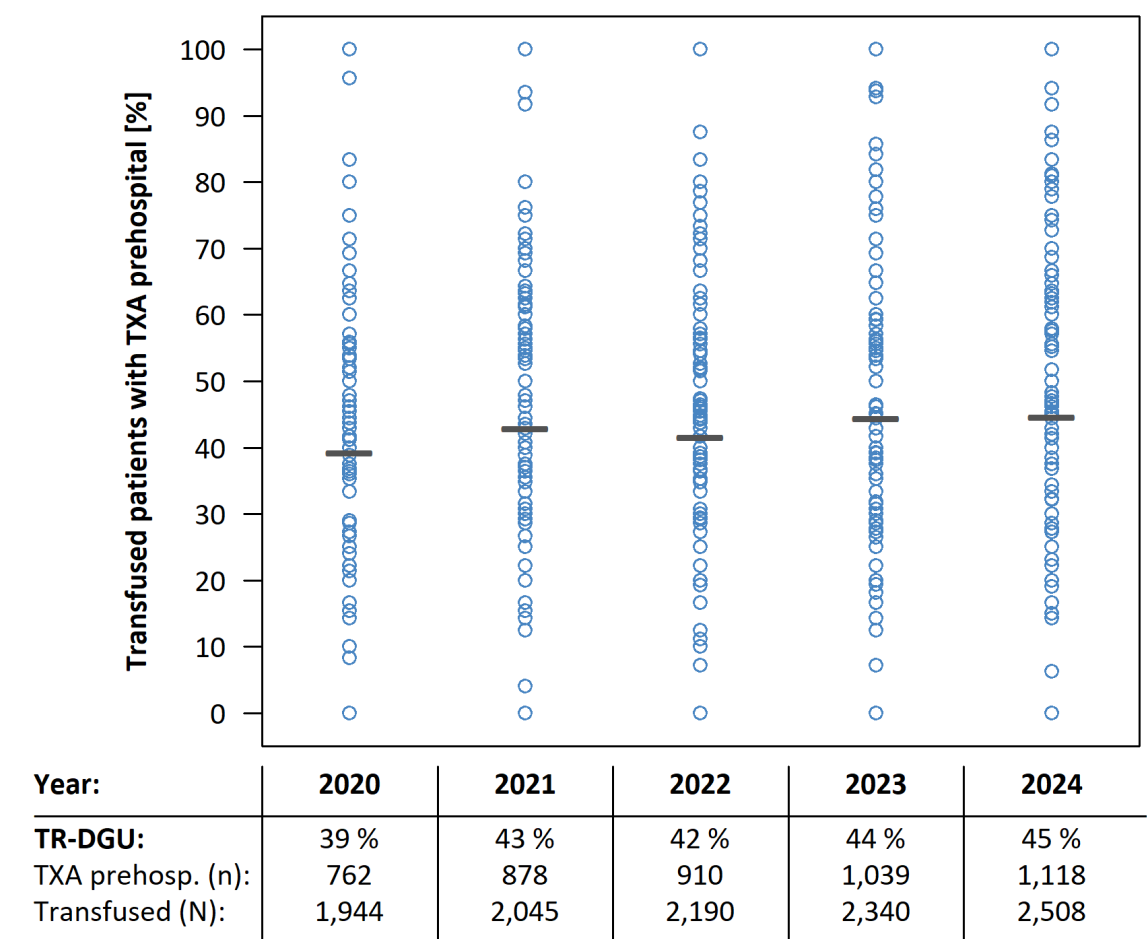


Figure 18: Distribution of the prehospital tranexamic acid rate in the ER or surgery phase transfused patients over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.3.4 Tranexamic acid in the ER in patients with blood transfusion

Currently, tranexamic acid given in the ER is only documented in the standard dataset. All patients with documented blood transfusion (received pRBCs in the ER up to ICU admission) are included here. A missing value regarding TXA administration in the ER is considered as „no TXA given”.

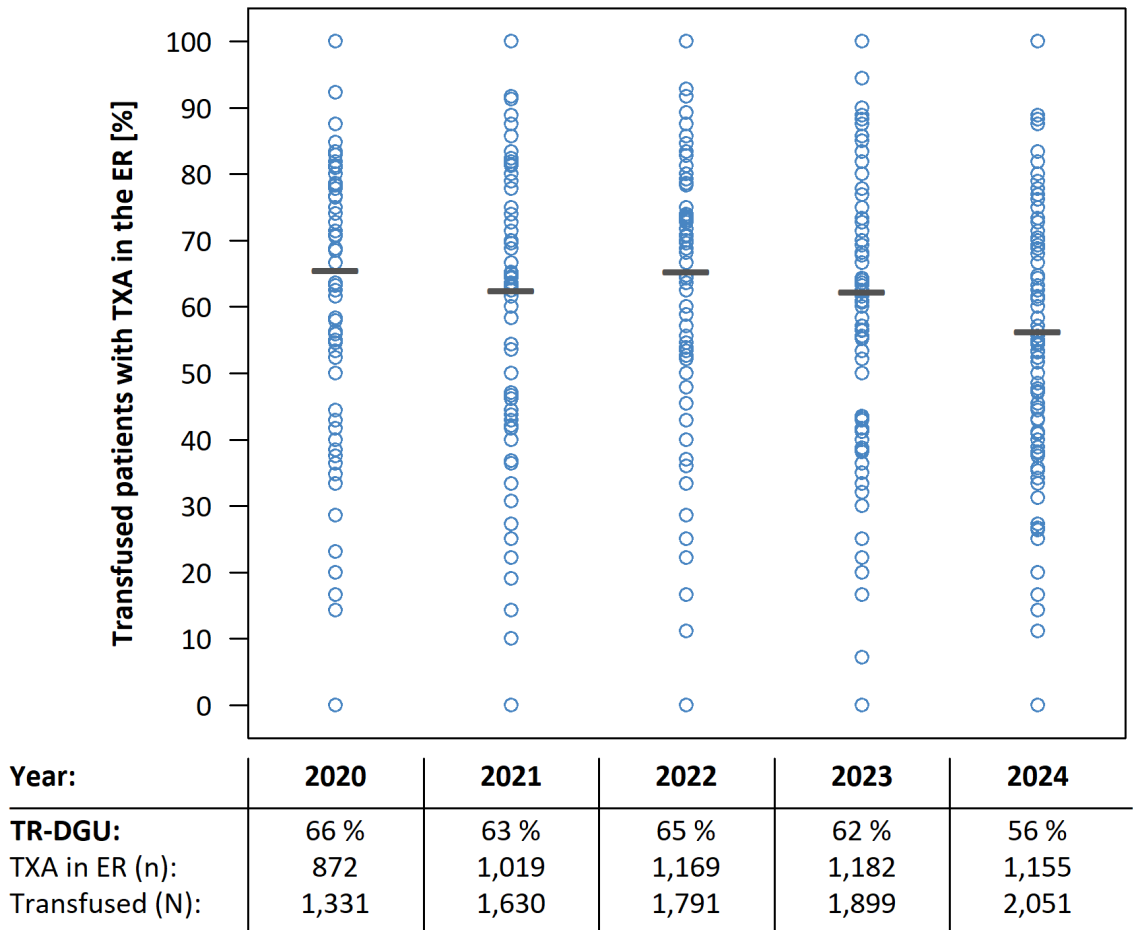


Figure 19: Distribution of the TXA admission rate in the ER in patients transfused between ER and intensive therapy over all hospitals, 2020-2024, — TR-DGU, ● single hospital value

4.4 Data quality

4.4.1 Completion rate

A key aspect of the quality of registries is data completeness. Since April 2024, a completion rate has been calculated for each case during data entry into the TR-DGU. Due to the heterogeneity of the documented cases and the design of the questionnaire, a 100% completion rate is not always possible. This quality indicator is based on all primarily admitted patients, which have been documented in the TR-DGU since 15 April 2024 and it provides a reference for realistically achievable completion rates.

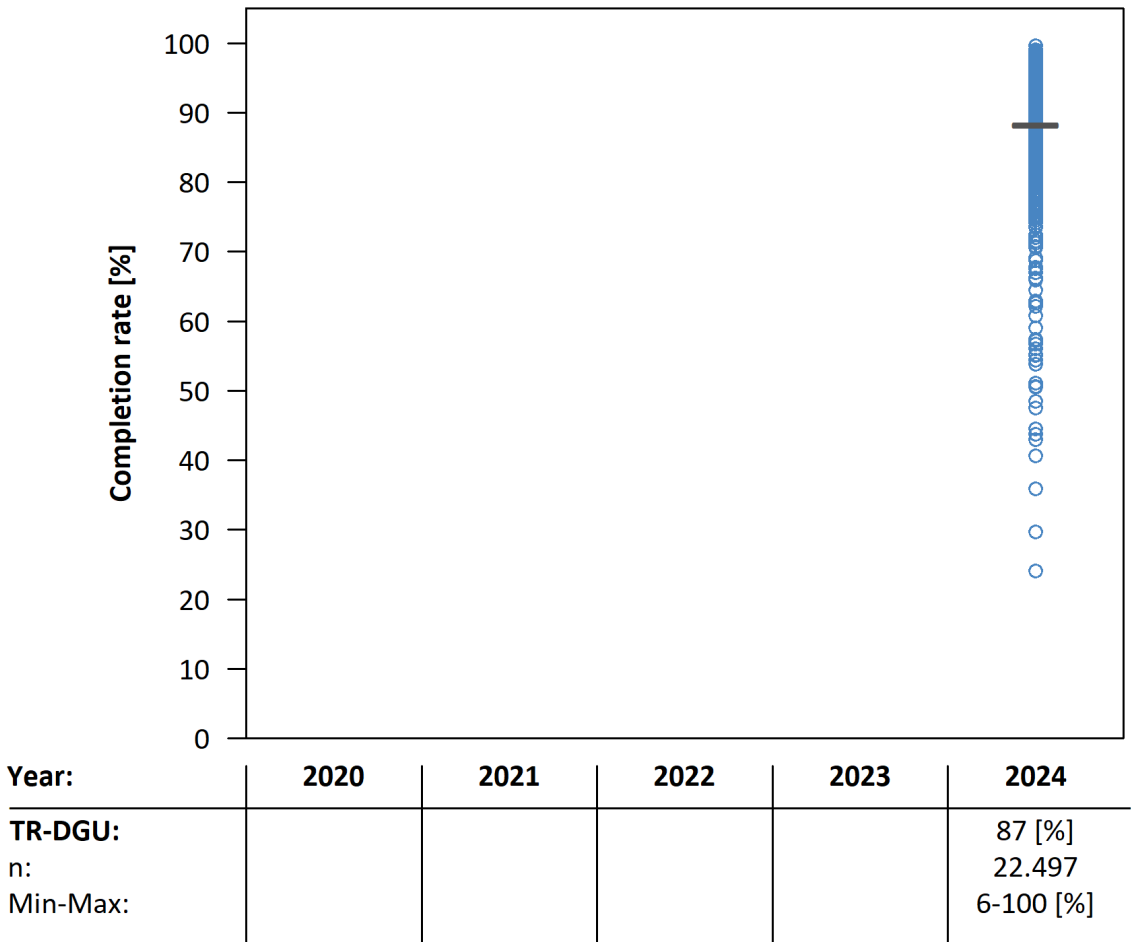


Figure 20: Distribution of the completion rate for primarily treated patients, which have been documented in the TR-DGU since April 15 2024, across all hospitals, 2020–2024, — TR-DGU, ● single hospital value

4.4.2 Blood gas analysis performed / Base excess documented

A blood gas analysis (BGA) provides important and timely information about the condition of a trauma patient. But often these measurements are not documented in the TR-DGU. Specifically the base excess (BE) is an important outcome predictor that is used in the RISC III prognostic score. Detailed results regarding the completeness of data are presented in chapter 10. As an example, the completeness of BE data is presented here in the same way as the process indicators above.

All primary admitted patients are considered in this analysis and the proportion of patients with valid BE values is calculated. BE values less than -50 mmol/l or greater than 20 mmol/l are excluded.

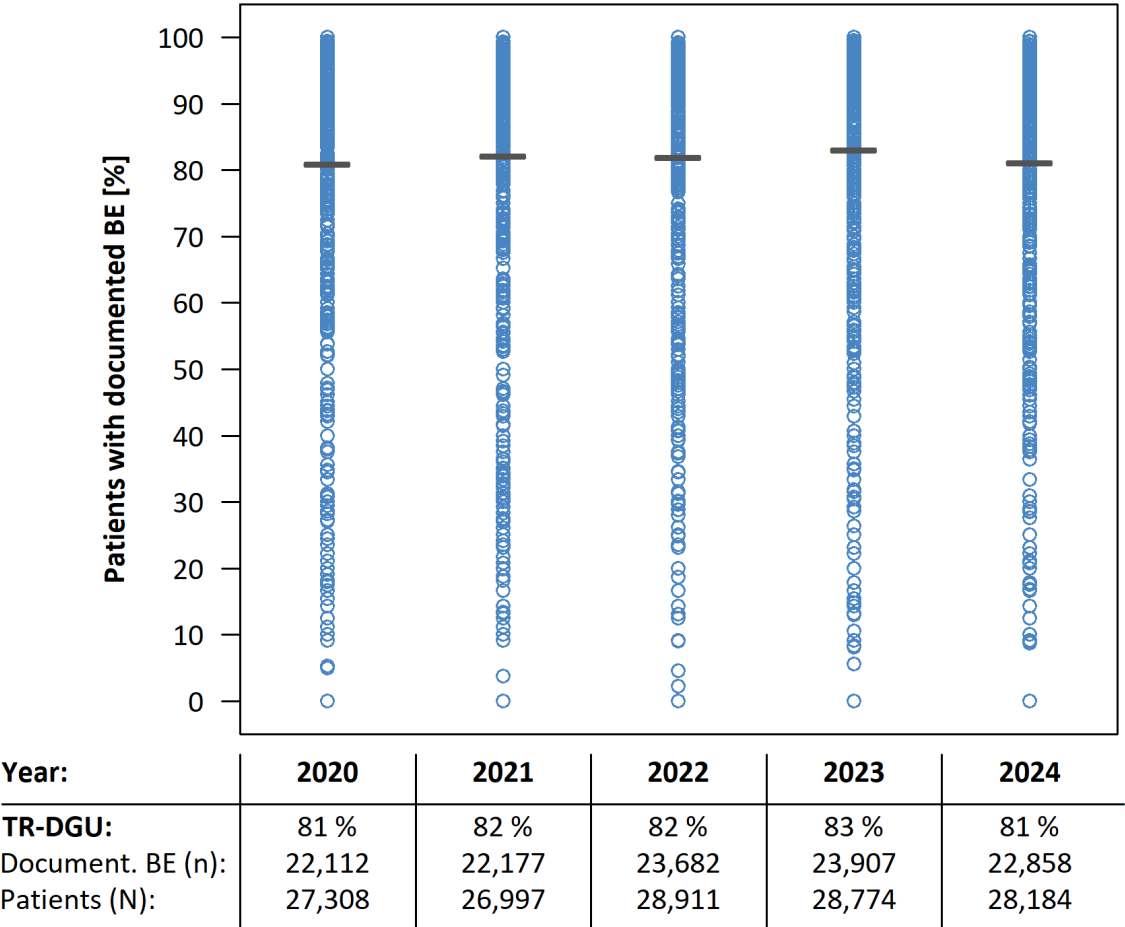


Figure 21: Distribution of the patient rate with documented base excess (BE) over all hospitals, 2020-2024, — TR-DGU, ○ single hospital value

5 Comparisons of the hospitals in the TraumaNetzwerk DGU®

In chapter 5, the hospitals in the TraumaNetzwerk DGU® are displayed corresponding to their trauma level. The classification into local, regional, supra-regional TraumaZentrum DGU® results from the certification requirements of the Whitebook Medical Care of the Severely Injured from the German Trauma Society. Hospitals that are not certified are not considered in the data.

5.1 Documented TraumaNetzwerk DGU® patients in the last 10 years

Figure 22 presents the number of documented trauma patients treated in certified TraumaNetzwerk DGU® centres in the last ten years. In the TraumaNetzwerk DGU® **292,515 Patienten** were documented in the last 10 years, including **27,689 patients** in the latest year alone.

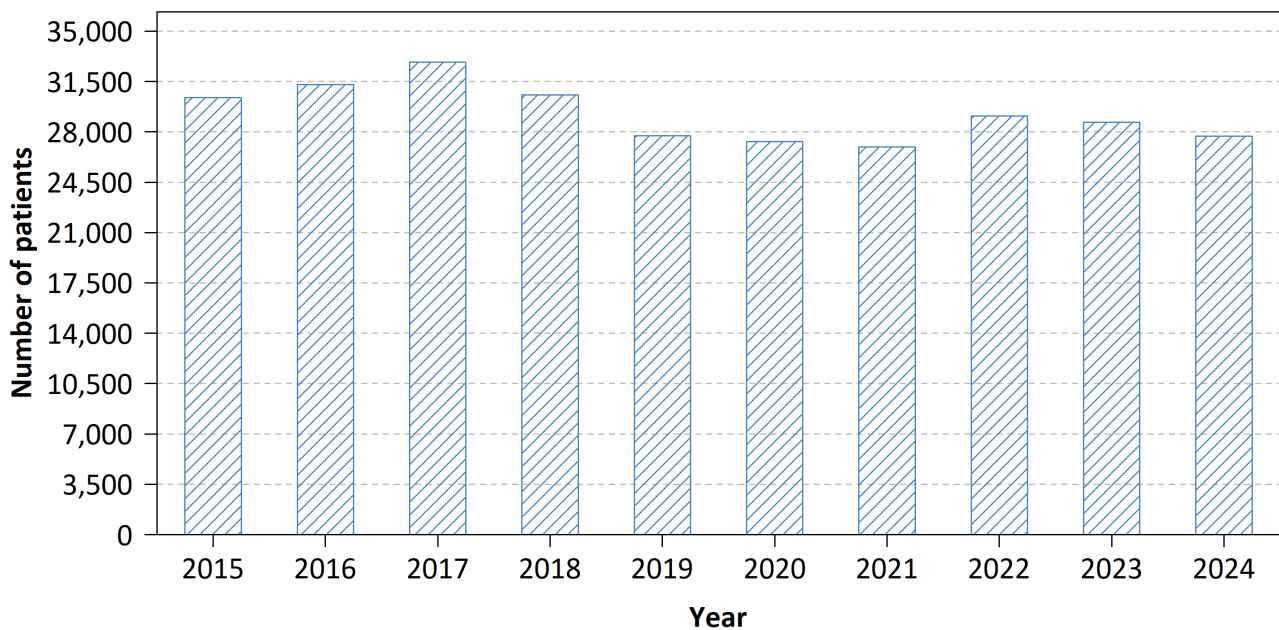


Figure 22: Documented number of patients in the TraumaNetzwerk DGU® basic group from 2015-2024

5.2 Number of patients in each trauma level

In the latest year, the TraumaNetzwerk DGU® documented **27.689 patients** in the basic group. The values in figure 23 represent the median (vertical line), the interquartile range (grey box) and the minimum/maximum (horizontal line). Hospitals without a TraumaNetzwerk DGU® certification are excluded here.

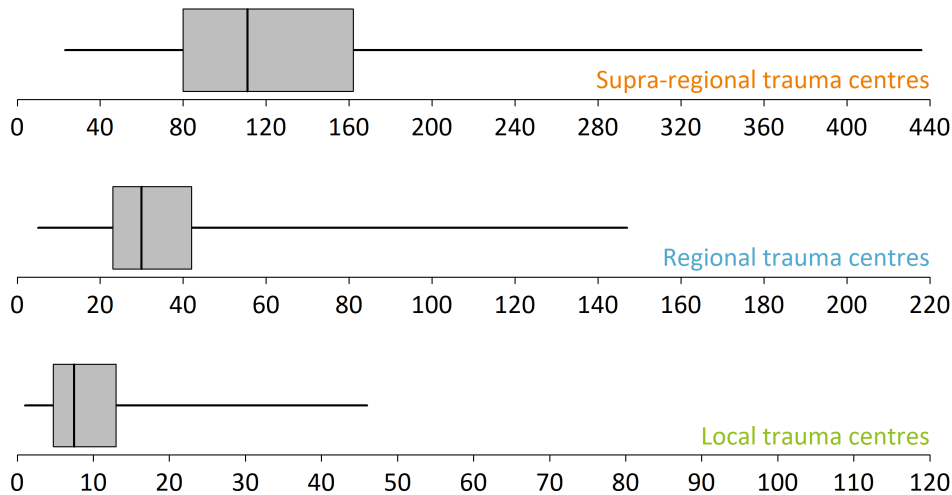


Figure 23: Median number of cases of the in the TraumaNetzwerk DGU® participating trauma centres separated by the trauma level in 2024

5.3 Comparisons between the trauma levels

Table 4 allows a comparison of the hospitals in the TraumaNetzwerk DGU® with the same trauma level. The total values of all certified trauma centres from the TR-DGU are presented as well.

Again, only cases from the **basic group** are considered here. In order to reduce the statistical uncertainty, all patients from the **last three years** are pooled and analysed together.

Table 4: Basic data from the total data from the TR-DGU trauma centres over the past three years

Characteristics	Trauma centre DGU			
	local	regional	supra-regional	TR-DGU
Number of hospitals	268	238	133	639
Portion of patients in the TR-DGU	9 %	30 %	61 %	100 %
Patients per year and hospital (mean)	n 9 / year	35 / year	127 / year	44 / year
Patients (3 years, cumulated)	n 7,589	25,266	50,681	83,536
Primary admitted and treated	n 6,069 (%) (80 %)	21,607 (86 %)	44,303 (87 %)	71,979 (86 %)
Primary admitted and transferred out early (< 48 h)	n 1,426 (%) (19 %)	2,977 (12 %)	764 (2 %)	5,167 (6 %)
Transferred in from another hospital	n 94 (%) (1 %)	682 (3 %)	5,614 (11 %)	6,390 (8 %)

Table 4 continuation:

		Trauma centre			
Characteristics		local	regional	supra-regional	TR-DGU
Patients					
Average age [years]	M	57.9	58.0	53.3	55.1
Patients aged 70 years and older	%	35 %	35 %	28 %	31 %
Males	%	66 %	67 %	70 %	69 %
ASA 3-4	%	25 %	27 %	23 %	24 %
Injuries					
Injury Severity Score (ISS) [points]	M	13.7	16.3	20.0	18.3
Proportion with ISS ≥ 16	%	35 %	47 %	61 %	54 %
Proportion polytrauma *	%	7 %	11 %	18 %	15 %
Proportion with life-threatening severe injury **	%	18 %	27 %	36 %	32 %
Patients with TBI, AIS ≥ 3	%	19 %	29 %	43 %	37 %
Patients with thoracic injury, AIS ≥ 3	%	36 %	39 %	39 %	39 %
Patients with abdominal injury, AIS ≥ 3	%	7 %	9 %	11 %	10 %
Prehospital care (primary admissions only)					
Rescue time (accident to hospital) [min]	M	62.9	64.5	72.2	68.6
Prehospital volume administration [ml]	M	432	496	661	583
Prehospital intubation	%	3 %	9 %	27 %	19 %
Proportion unconscious (GCS ≤ 8)	%	4 %	7 %	18 %	13 %
Emergency room (primary admissions only)					
Blood transfusion	%	3 %	4 %	11 %	8 %
Whole-body CT	%	62 %	67 %	80 %	74 %
Cardio-pulmonary resuscitation	%	2 %	2 %	4 %	3 %
Shock / hypotension	%	4 %	5 %	8 %	7 %
Coagulopathy	%	8 %	9 %	11 %	10 %
Length of stay (without early transfers out)					
Length of intubation on the intensiv care unit [days]	M	4.4	5.5	7.0	6.7
Length of stay on the intensiv care unit [days]	M	2.1	3.5	6.3	5.2
Length of stay in the hospital [days]	M	10.0	11.9	16.1	14.5
Outcome and prognosis (without transfers in and early transfers out)					
Patients	n	6,069	21,607	44,303	71,979
Non-survivors	n	388	2,237	6,896	9,521
Hospital mortality	%	6.4 %	10.4 %	15.6 %	13.2 %
RISC III prognosis	%	7.0 %	10.2 %	15.4 %	13.1 %

GCS = Glasgow Coma Scale; AIS = Abbreviated Injury Scale; M = Mean

* Polytrauma: see „Berlin-Definition“ (Pape et al. 2014)

** Life-threatening severe injury: ISS $\geq$ 16 in conjunction with phys. effects (Paffrath et al. 2014)

5.4 State of transfer within the trauma levels

The transfer status of all patients in the TraumaNetzwerk DGU® is displayed in the following figure, classified according to the trauma level for the year 2024. As expected, the proportion of patients that are transferred out of a local trauma centre as well as the proportion of patients that are transferred into a supra-regional trauma centre are the highest.

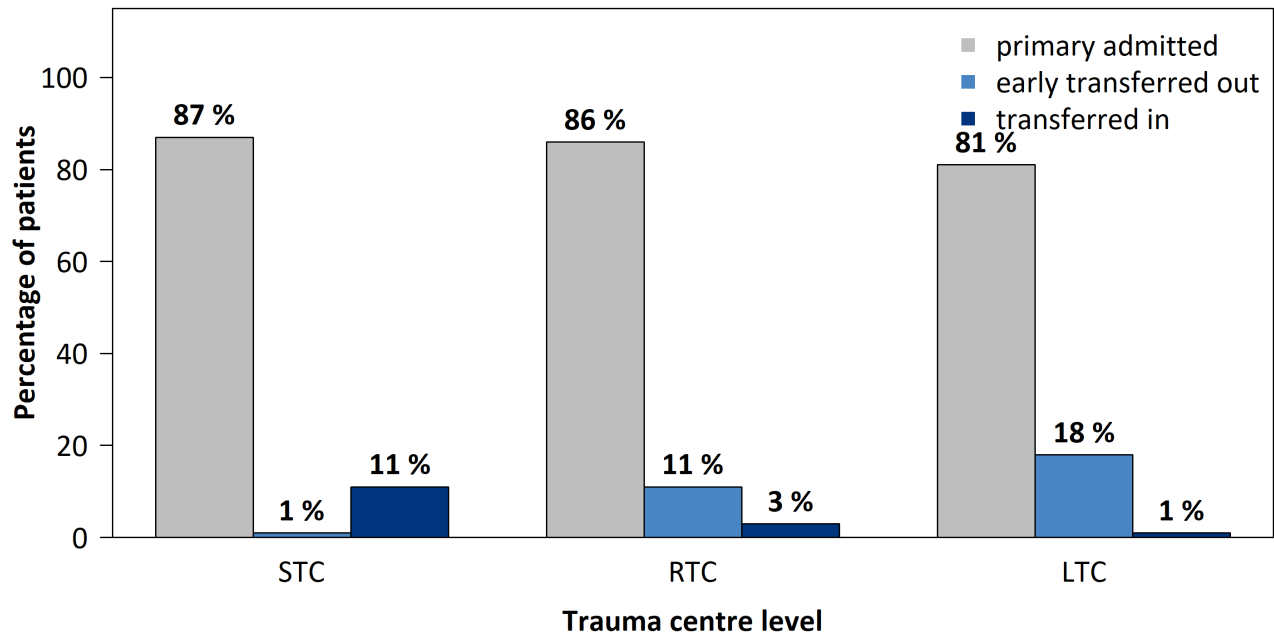


Figure 24: Transfer status classified according to the trauma level in 2024

6 Graphical comparisons with other hospitals

Below, selected information about the patients from the years **2015-2024** from the hospitals in the TraumaRegister DGU® are displayed. Different from the values in chapter 3, only hospitals are analysed, where **at least 3 patients** were available. The hospitals from the TR-DGU are indicated as **light blue circles**. The horizontal grey line is the mean value over all hospitals per year.

6.1 Distribution of age in the past 10 years

The figure below shows the distribution of mean age of the patients from the TR-DGU **with at least 3 patients** over the past ten years.

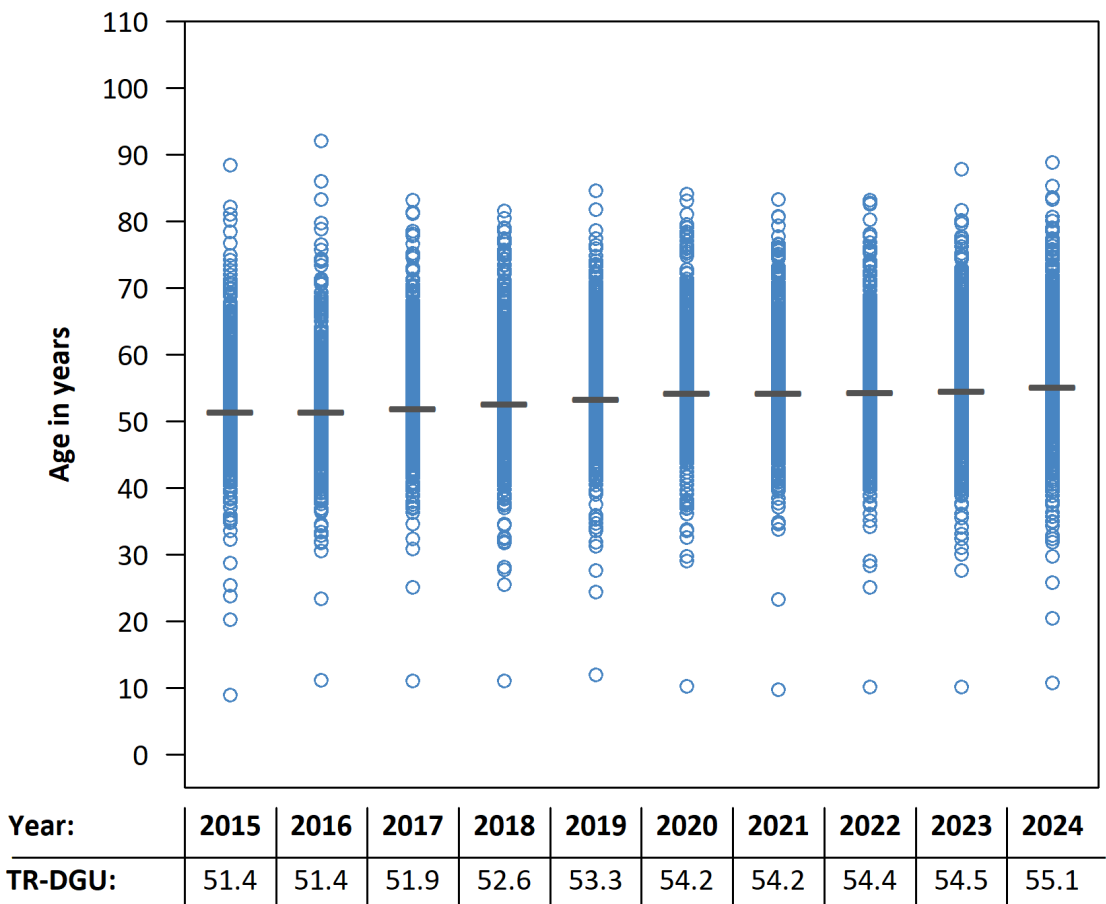


Figure 25: Mean patient's age in the — TR-DGU compared to the **○** single hospital values in the TR-DGU for the years 2015-2024

6.2 Distribution of the standardised mortality ratio (SMR) over the past ten years

Only primary admitted patients are displayed here (from hospitals with at least 3 cases). Early transfers out (< 48 h) are excluded. The standardised mortality ratio (SMR) is shown for each hospital as well as for the TR-DGU over the past ten years. The SMR is defined as the quotient of the observed mortality and the risk of death prognosis (RISC III) for each hospital. A SMR value > 1 means, that the observed mortality is higher than expected. A SMR value < 1 indicates that the observed mortality is lower than expected.

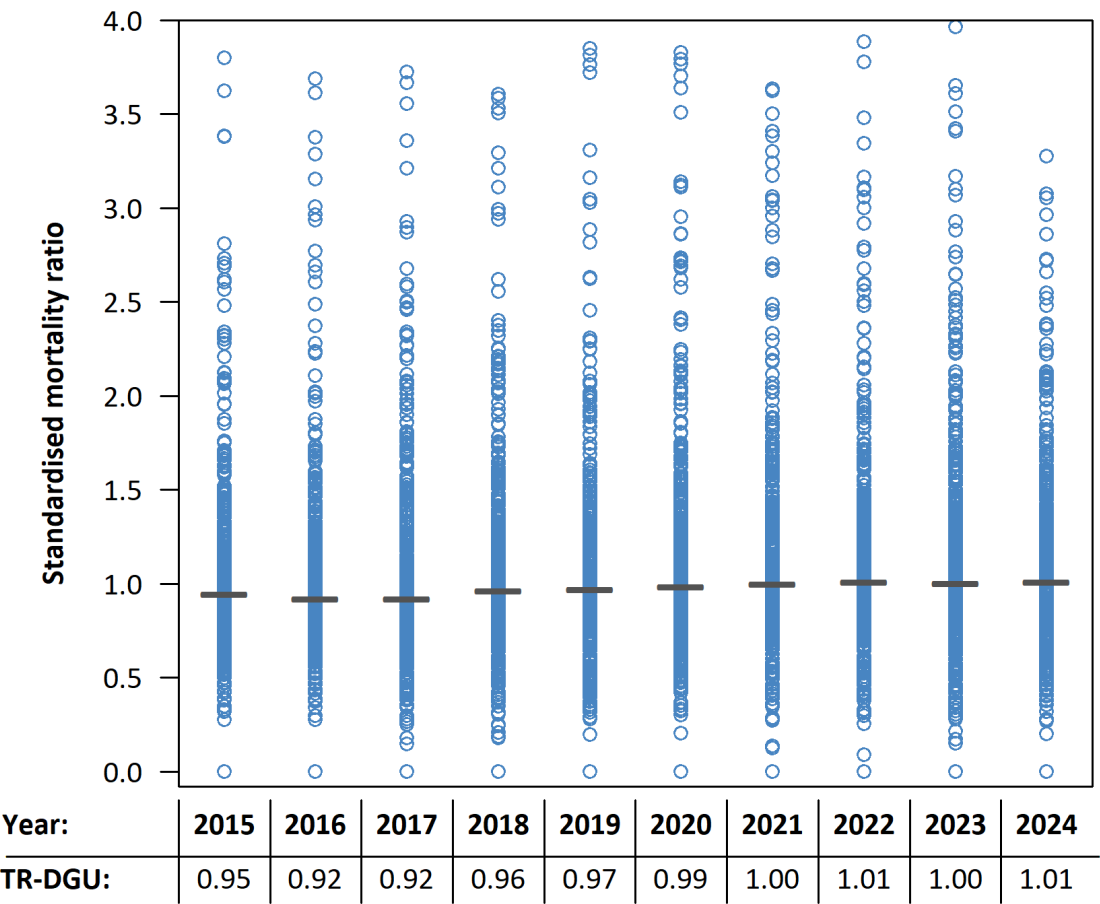


Figure 26: Standardised mortality ratio of the — TR-DGU compared to the ● single hospital values in the TR-DGU for the years 2015-2024

6.3 Distribution of the Observed Expected Ratio (OER) of prolonged ICU stays over the past ten years

This figure only includes surviving patients who had a stay in the intensive care unit from hospitals with at least 3 cases in the respective year. Patients who meet the exclusion criteria described in Chapter 2.2 are not included. The Observed Expected Ratio (OER) for each hospital as well as for the TR-DGU is shown here over the past ten years. The OER is defined as the ratio between the observed proportion of prolonged ICU stays and the predicted proportion (PICUP) for each hospital. An OER value > 1 indicates that the observed proportion of prolonged ICU stays is higher than expected. Conversely, an OER value < 1 indicates a lower observed proportion of prolonged ICU stays than expected.

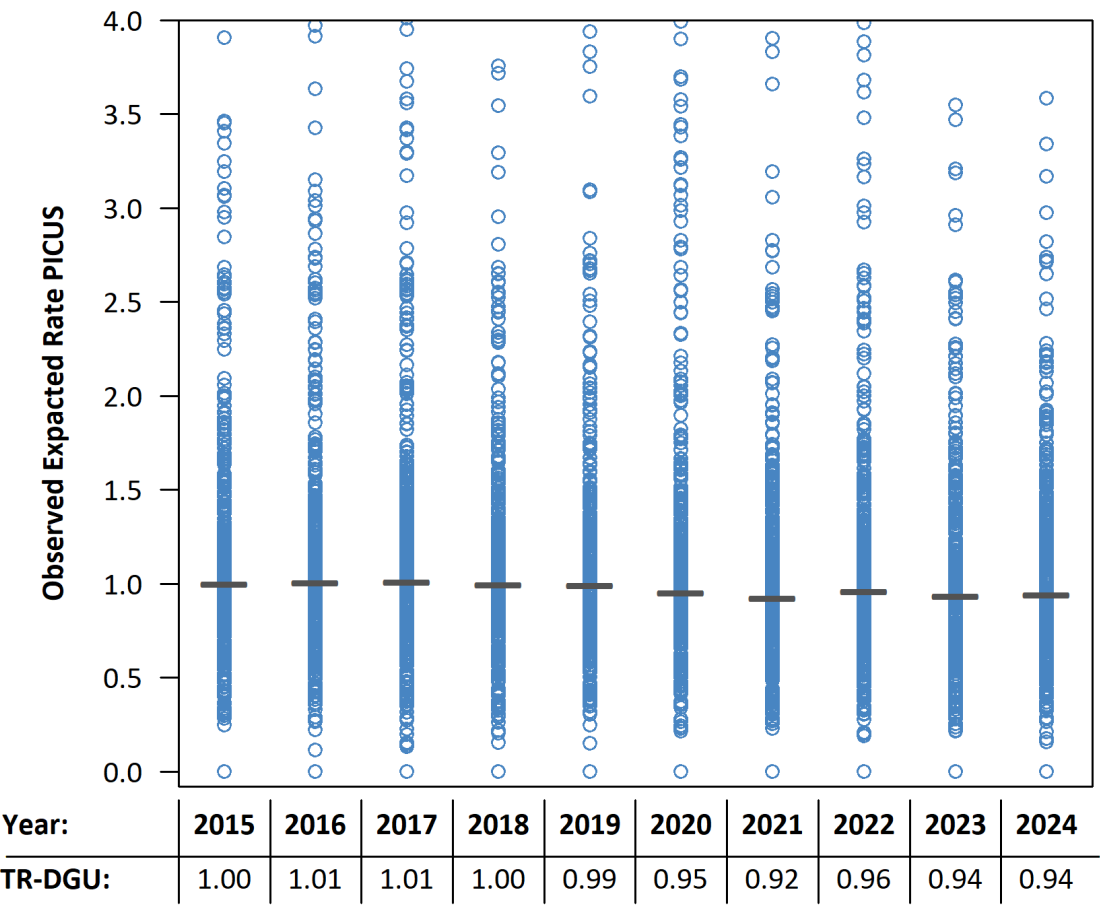


Figure 27: Observed Expected Ratio of prolonged ICU stays in the — TR-DGU compared to the ○ individual hospital values in the TR-DGU for the years 2015 – 2024

6.4 Length of stay and injury severity

The length of stay of patients is highly variable and depends on diverse factors. Figure 28 describes the relationship between the average length of stay (LOS) in hospital and injury severity (ISS). The mean value is calculated for survivors. Patients transferred to another hospital (n= 3,688) are excluded here. Hospitals with **fewer than 3 patients** are **not** displayed in the figure due to their statistical uncertainty.

TR-DGU 2024:

The value is based on:

23,150 patients

Mean length of stay:

15.3 days

Mean ISS:

16.5 points

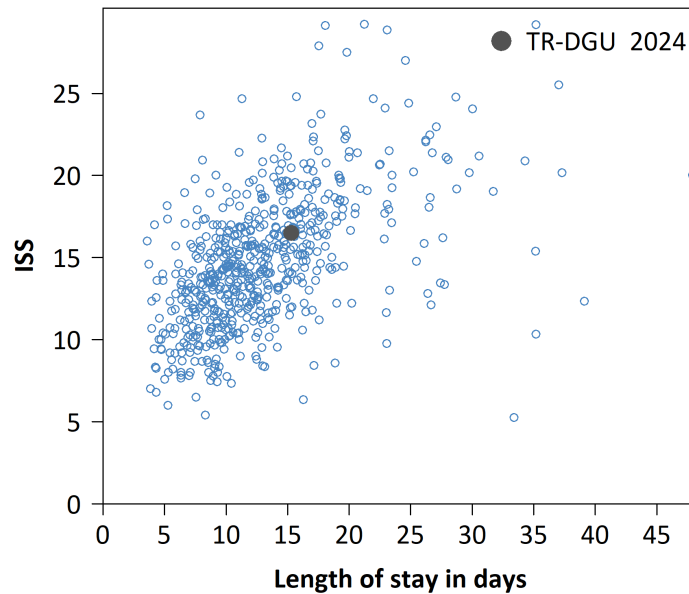


Figure 28: Relationship between length of stay and injury severity over all hospitals in 2024

6.5 Length of stay of the deceased patients

The following figure shows the distribution of length of stay of the deceased patients (N = 3,878) within the first 30 days (n = 3,744) in the TR-DGU in the last year.

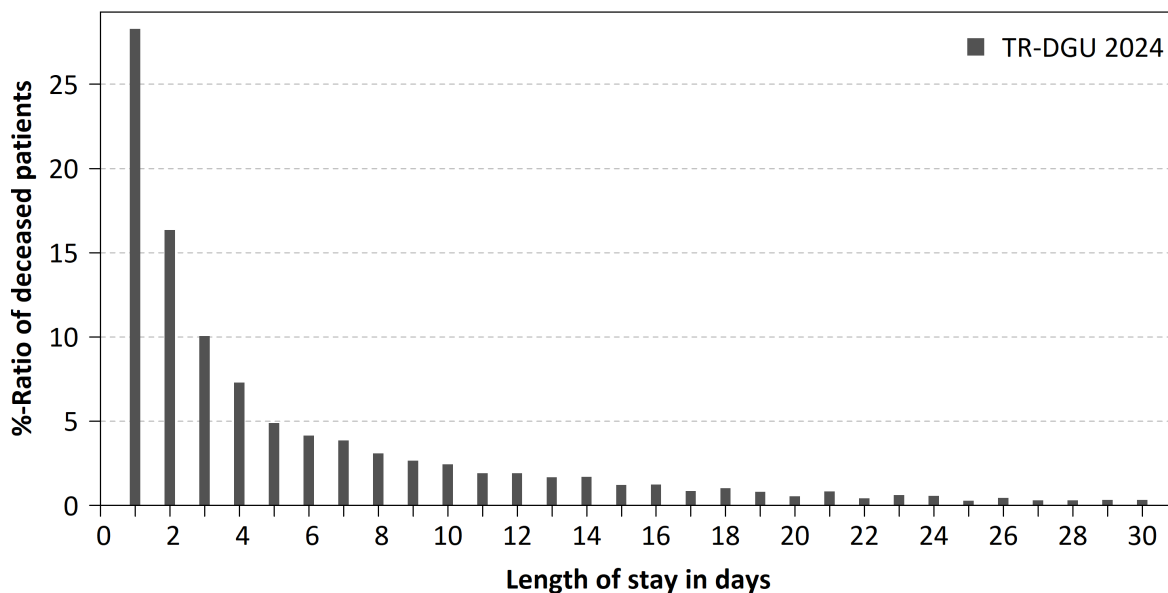


Figure 29: Time point of death of the patients from the TR-DGU [length of stay in days] in 2024

7 Basic data of trauma care

The following pages present basic data from the trauma care of the actual year 2024. Shown is data from the TraumaRegister DGU® basic group in the current year **2024** and the registry data summarized from the last 10 years, 2015-2024 (**TR-DGU 10 years**).

Table 5: Data from the TR-DGU regarding the patients and accident type

(S) Patient and accident	TR-DGU 2024		TR-DGU 10 years	
Patients in the basic group (n)	30,754		320,238	
Primary admissions / transfers	%	n	%	n
Primary admitted	91.6 %	28,184	91.4 %	292,652
... and transferred out within 48 h	5.7 %	1,750	6.4 %	20,350
Transferred in within 24 h after accident	7.6 %	2,336	7.8 %	24,907
Transferred in after 24 h	0.8 %	234	0.8 %	2,679
Patient characteristics	M ± SD* / %	n	M ± SD* / %	n
Age [years]	55.1 ± 23.1	30,749	53.2 ± 22.8	320,233
Children under 16 years	3.7 %	1,151	3.9 %	12,367
Elderly over 70 years	31.4 %	9,646	28.3 %	90,567
Males	69.1 %	21,253	69.6 %	222,849
ASA 3-4 prior to trauma (since 2009)	25.3 %	7,555	20.5 %	60,981
Mechanism of injury	%	n	%	n
Blunt	95.6 %	28,709	96.0 %	292,273
Penetrating	4.4 %	1,313	4.0 %	12,233
Type and cause of accident	%	n	%	n
Traffic: Car	14.9 %	4,521	18.3 %	57,554
... thereof as car passenger (since 2020)	14.3 %	4,321	14.6 %	21,998
... thereof as lorry passenger (since 2020)	0.5 %	160	0.6 %	878
... thereof as bus passenger (since 2020)	0.1 %	40	0.1 %	195
Traffic: Motor bike	11.0 %	3,328	11.7 %	36,958
Traffic: Bicycle	11.6 %	3,516	10.8 %	34,182
... thereof as supported bike (since 2020)	1.7 %	525	0.7 %	2,269
Traffic: Pedestrian	4.3 %	1,311	5.1 %	16,220
Traffic: E-scooter (since 2020)	1.1 %	333	0.3 %	1,040
High fall (> 3m)	13.9 %	4,198	14.9 %	47,139
Low fall (≤ 3m)	31.0 %	9,357	27.5 %	86,981
... thereof as ground level fall (since 2020)	13.4 %	4,043	10.0 %	14,986
Suicide (suspected)	4.6 %	1,406	4.5 %	13,936
Assault (suspected)	3.2 %	986	2.7 %	8,365

* M = Mean; SD = Standard deviation

Table 6: Data from the TR-DGU regarding findings at the accident scene. Information for primary admitted patients

Time point A: Findings at the accident scene	TR-DGU 2024		TR-DGU 10 years	
Primary admitted patients (n) (%-ratio of the basic group)	28,184 (92 %)		292,652 (91 %)	
Vital signs	M ± SD*	n	M ± SD*	n
Systolic blood pressure [mmHg]	134.3 ± 32.5	23,479	134.1 ± 32.8	249,128
Respiratory rate [1/min]	16.4 ± 5.6	20,287	15.9 ± 5.7	192,498
Glasgow Coma Scale (GCS) [points]	12.8 ± 3.8	25,320	12.7 ± 3.9	267,260
Findings	%	n	%	n
Shock (systolic blood pressure ≤ 90 mmHg)	7.9 %	1,860	8.2 %	20,417
Unconsciousness (GCS ≤ 8)	15.1 %	3,816	15.9 %	42,426
Therapy	%	n	%	n
Cardio-pulmonary resuscitation	3.4 %	920	3.1 %	8,641
Pre-hospital thoracotomy (since 2020)	0.3 %	84	0.2 %	266
Endotracheal intubation	18.4 %	4,928	20.1 %	56,161
Alternative airway	1.0 %	276	1.2 %	3,395
Surgical airway (since 2020)	0.0 %	9	0.1 %	72
Cervical spine immobilization (since 2020)	49.9 %	13,412	55.0 %	70,071
Analgesedation **	52.9 %	14,214	55.8 %	111,096
Chest drain (with and without needle decompression) **	3.0 %	816	2.2 %	6,134
... thereof only with needle decompression (since 2020)	0.7 %	177	0.6 %	799
Catecholamines **	8.8 %	2,364	8.7 %	17,052
Pelvic binder **	16.1 %	4,330	9.9 %	27,678
Tourniquet (since 2020)	1.7 %	450	1.5 %	1,925
Intraosseous access (since 2020)	1.7 %	453	1.6 %	2,065
Tranexamic acid	17.3 %	4,657	11.0 %	30,627
Volume administration	M ± SD*/%	n	M ± SD*/%	n
Patients without volume administration	24.3 %	6,166	19.0 %	50,877
with volume administration	75.7 %	19,208	81.0 %	216,236
with colloids	1.6 %	398	2.6 %	6,747
Average amount in patients with volume administration [ml]	547 ± 511	25,374	613 ± 524	267,113
Average amount in patients with and without volume administration [ml]	Median 500		Median 500	

* M = Mean; SD = Standard deviation

** Not available in the reduced QM dataset

Table 7: Data from the TR-DGU on emergency room and surgery. Information for primary admitted patients

Time point B: Emergency room / surgery	TR-DGU 2024		TR-DGU 10 years	
Primary admitted patients (n) (%-ratio of the basic group)	28,184 (92 %)		292,652 (91 %)	
Transportation to the hospital	%	n	%	n
With helicopter	16.1 %	4,550	18.5 %	54,048
Glasgow Coma Scale (GCS)	M ± SD*	n	M ± SD*	n
Prehospital intubated patients	3.4 ± 1.9	2,874	3.3 ± 1.6	33,881
Patients not prehospital intubated	13.9 ± 2.3	13,557	13.9 ± 2.4	113,957
Initial diagnostics	%	n	%	n
Sonography of the abdomen	76.1 %	21,458	80.0 %	234,255
X-ray of the thorax	17.1 %	4,830	24.6 %	71,863
cCT (isolated or whole-body)	88.2 %	24,868	89.5 %	261,843
Whole-body CT	72.2 %	20,361	76.0 %	222,283
Selective CT: Cervical spine (since 2020)	11.1 %	3,125	9.7 %	13,620
Selective CT: Chest/thoracic spine (since 2020)	5.8 %	1,627	4.8 %	6,795
Selective CT: Abdomen/lumbar spine/pelvis (since 2020)	5.0 %	1,399	4.3 %	6,013
Time period in the emergency room	M ± SD*/%	n	M ± SD*/%	n
Transfer to the operating theatre	23.6 %	6,472	23.6 %	60,690
If so: Duration from admission to the ER* until surgery [min]	92.9 ± 76.6	6,136	80.9 ± 65.1	54,896
Transfer to intensive care unit	61.0 %	16,737	62.8 %	161,706
If so: Duration from admission to the ER* until ICU* [min]	121.0 ± 97.1	15,799	97.5 ± 83.2	141,951
Bleeding and transfusion	M ± SD*/%	n	M ± SD*/%	n
Pre-existing coagulopathy	22.2 %	5,780	20.9 %	47,236
Systolic blood pressure ≤ 90 mmHg	6.8 %	1,824	7.2 %	19,702
Hemostasis therapy**	20.6 %	3,731	21.3 %	31,502
Administration of tranexamic acid**	14.3 %	3,823	15.1 %	26,934
ROTEM / thrombelastography**	8.8 %	1,624	10.1 %	13,770
Patients with blood transfusion	9.2 %	2,598	7.6 %	22,231
Number of pRBC, if transfused	4.4 ± 5.0	2,598	4.8 ± 5.8	22,231
Number of FFP, if transfused	2.7 ± 4.5	2,598	3.0 ± 5.3	22,231
Treatment in the ER*	%	n	%	n
Cardio-pulmonary resuscitation **	2.3 %	632	2.2 %	4,624
Chest drain**	9.2 %	2,521	9.0 %	19,305
Endotracheal intubation**	8.5 %	2,335	10.8 %	21,377
Initial laboratory values	M * ± SD	n	M * ± SD	n
Base excess [mmol/l]	-1.8 ± 8.9	22,890	-1.6 ± 5.3	234,565
Haemoglobin [g/dl]	13.0 ± 2.2	27,358	13.1 ± 2.2	282,785
INR	1.1 ± 0.4	26,118	1.1 ± 0.5	272,337
Quick's value [%]	88.2 ± 20.5	25,363	88.3 ± 21.2	264,757
Temperature [C°]**	36.3 ± 1.0	19,237	36.2 ± 1.1	130,451

* ICU = Intensive care unit; ER = Emergency room; M = Mean; SD = Standard deviation

** Not available in the reduced QM dataset

Table 8: Data from the TR-DGU on intensive care unit

Time point C: Intensive care unit	TR-DGU 2024		TR-DGU 10 years	
Patients with intensive care therapy (n) (%-ratio of the basic group)	24,641 (80 %)		272,722 (85 %)	
Treatment	%	n	%	n
Hemostasis therapy **	11.0 %	1,939	13.3 %	20,322
Dialysis / hemofiltration **	1.6 %	283	2.0 %	3,092
Blood transfusion ** (within the first 48 h after admission to ICU)	22.2 %	3,088	24.1 %	29,598
Mechanical ventilation / intubated	35.2 %	8,667	35.7 %	97,481
Complications on ICU	%	n	%	n
Organ failure **	29.0 %	5,021	30.9 %	47,828
Multiple organ failure (MOF) **	14.1 %	2,555	17.2 %	26,568
Sepsis **	4.6 %	801	5.4 %	8,207
Length of stay and ventilation	M ± SD*	n	M ± SD*	n
Length of intubation [days]	7.1 ± 15.9 Median 3	8,448	7.2 ± 10.7 Median 3	96,237
Length of stay on ICU* [days]	6.1 ± 9.9 Median 3	24,503	6.2 ± 9.8 Median 2	272,576

* ICU = Intensiv care unit; ER = Emergency room; M = Mean; SD = Standard deviation

** Not available in the reduced QM dataset

Table 9: Data from the TR-DGU on discharge and outcome

Time point D: Discharge / outcome	TR-DGU 2024		TR-DGU 10 years	
Patients from the basic group	30,754		320,238	
Diagnoses	M ± SD*/%	n	M ± SD*/%	n
Number of injuries / diagnoses per patient	4.5 ± 3.1		4.5 ± 3.0	
Patients with only one injury	10.6 %	3,264	10.3 %	32,854
Surgeries	M ± SD*/%	n	M ± SD*/%	n
Patients requiring surgery	63.7 %	13,876	66.0 %	124,675
Number of surgeries per patient, if undergone surgery**	2.9 ± 3.5		3.3 ± 6.9	
Thrombo-embolic events (MI; pulmonary embolism; DVT; stroke; etc.)	%	n	%	n
Patients with at least one event **	3.1 %	660	2.9 %	4,888
Outcome (without early transfers out)	%	n	%	n
Survivors	86.6 %	25,115	87.9 %	263,534
Hospital mortality	13.4 %	3,889	12.1 %	36,354
Died within 30 days	12.9 %	3,744	11.6 %	34,915
Died within 24 hours	4.8 %	1,395	4.5 %	13,443
Died in the ER (without ICU)	1.8 %	517	1.6 %	4,681
Died with end-of-life-decision (since 2015)	70.9 %	2,606	59.2 %	17,161
... palliative reason (since 2020)	46.2 %	1,164	47.7 %	5,591
... presumed will of the patient (since 2020)	36.8 %	925	35.7 %	4,188
... written willingness of the patient (since 2020)	17.0 %	428	16.6 %	1,953

* M = Mean; SD = Standard deviation

** Not available in the reduced QM dataset

Table 9 continuation:

Time point D: Discharge / outcome	TR-DGU 2024		TR-DGU 10 years	
Patients from the basic group	30,754		320,238	
Transfer / discharge (all survivors)	%	n	%	n
Survivors who were discharged and ...	100.0 %	26,865	100.0 %	283,884
transferred into another hospital	13.7 %	3,688	17.1 %	48,555
... among them early discharges (< 48 h)	6.5 %	1,750	7.2 %	20,350
transferred into a rehabilitation center	17.1 %	4,595	15.5 %	44,023
other destination	4.5 %	1,212	3.7 %	10,532
sent home	64.7 %	17,370	63.7 %	180,774
Condition at the time of discharge (without early transfers out)	%	n	%	n
Patients with a valid value		28,497		294,903
of these surviving patients		24,608		258,549
- good recovery	55.7 %	13,700	62.0 %	160,313
- moderate disability	33.3 %	8,201	27.4 %	70,930
- severe disability	9.8 %	2,412	9.3 %	23,981
- persistant vegetative state	1.2 %	295	1.3 %	3,325
Length of stay in hospital [days]	M ± SD*	n	M ± SD*	n
All patients	13.4 ± 16.8	30,712	14.2 ± 16.7	320,163
Median	9		10	
Only survivors	14.3 ± 17.0	26,834	15.0 ± 16.9	283,826
Median survivors	10		10	
Only non-survivors	7.4 ± 13.8	3,878	7.5 ± 12.7	36,337
Median non-survivors	3		3	
LOS when transferred to a rehabilitation centre	24.6 ± 21.1	4,592	27.7 ± 22.1	44,016
when transferred to another hospital	8.4 ± 13.3	3,684	10.1 ± 14.5	48,550
when sent home	12.6 ± 15.1	17,352	13.0 ± 14.0	180,735

* M = Mean; SD = Standard deviation; LOS = Length of stay

** Not available in the reduced QM dataset

*** **Treatment costs:** The estimated treatment costs are based on data from 1,002 German TR-DGU patients treated in 2007/08. For these patients a detailed cost analysis is available (Lefering et al., Unfallchirurg, 2019). Assuming a cost increase of 2 % per year the costs today would be 35 % higher.

8 Subgroup analyses

Specific subgroups are presented on these pages. Besides descriptive data on the patients and the process of care, also the outcome (hospital mortality) and prognosis are presented here for each subgroup. In order to reduce the statistical uncertainty occurring in subgroup analyses, patients from the last three years (2022-2024) are pooled together.

8.1 Subgroups within the TR-DGU

All results in table 10 refer to **primary admitted cases**. Patients transferred in as well as those transferred out early (within 48 h) are not considered here. There are a total of **80,267 patients** from the TR-DGU in the last three years.

Table 10: Basic data from the TR-DGU on selected subgroups. The percentage frequency refers to the number of patients from the respective subgroup in the basic group

		Primary patients 2022-2024	Subgroups					
			No TBI	Combined trauma	Isolated TBI	Shock	Severe injuries	Elderly
Definition of the subgroups		All	AIS head ≤ 1	AIS head and body each ≥ 2	AIS head ≥ 3 and AIS elsewhere ≤ 1	sBP ≤ 90 mmHg on admission	ISS ≥ 16 and at least 1 phys. problem*	Age 70 years or more
Number of basic group patients	n	80,267	39,611	29,645	11,011	5,237	25,743	24,274
	%	100 %	49.3 %	36.9 %	13.7 %	6.5 %	32.1 %	30.2 %
Patients								
Age [years]	M	54.8	51.3	56.3	63.4	54.2	63.7	80.9
Males	%	69.2 %	70.6 %	68.9 %	64.7 %	70.3 %	66.4 %	56.0 %
ASA 3-4	%	23.6 %	18.3 %	25.4 %	38.6 %	28.8 %	37.4 %	53.3 %
Injuries								
ISS [points]	M	18.2	14.7	23.1	17.9	29.4	27.8	18.6
Head injury (AIS ≥ 3)	%	36.0 %		60.3 %	100.0 %	46.5 %	64.4 %	47.4 %
Thoracic injury (AIS ≥ 3)	%	39.7 %	47.9 %	43.6 %		57.2 %	50.7 %	36.7 %
Abdominal injury (AIS ≥ 3)	%	9.7 %	14.0 %	7.5 %		23.4 %	13.5 %	5.0 %
Prehospital care								
Duration from accident to hospital [min]	M	69	68	70	70	75	74	71
Intubation	%	19.8 %	9.5 %	29.6 %	29.6 %	56.8 %	43.3 %	17.8 %
Volume [ml]	M	579.8	582.4	619.6	460.4	920.4	698.5	488.0
Emergency room								
Blood transfusion	%	8.6 %	8.8 %	10.3 %	3.7 %	40.3 %	19.1 %	6.9 %
Whole-body CT	%	73.6 %	74.5 %	80.2 %	52.8 %	76.7 %	76.3 %	66.1 %
Cardio-pulmonary resuscitation	%	2.3 %	2.0 %	2.9 %	1.9 %	15.2 %	6.2 %	2.1 %
Physiological problems *								
Age ≥ 70 years	%	30.2 %	22.9 %	32.9 %	49.4 %	29.8 %	54.5 %	100.0 %
Shock (sBP ≤ 90 mmHg)	%	11.4 %	10.4 %	13.9 %	8.1 %	100.0 %	27.4 %	11.0 %
Acidosis (BE < -6)	%	12.5 %	10.1 %	15.9 %	11.9 %	45.0 %	29.2 %	12.3 %
Coagulopathy	%	11.3 %	8.8 %	13.9 %	13.5 %	34.7 %	25.5 %	18.3 %
Unconsciousness (GCS ≤ 8)	%	15.6 %	4.1 %	25.0 %	31.4 %	44.2 %	40.7 %	16.7 %

* According to the definition of patients with severe life-threatening injuries from Paffrath et al. (2014); physiological problems are defined according to Pape et al. (2014).

Table 10 continuation:

		Primary patients 2022-2024	Subgroups					
			No TBI	Combined trauma	Isolated TBI	Shock	Severe injuries	Elderly
Length of stay								
Patients with intensive care therapy	n	67,972	31,628	26,815	9,529	4,415	22,554	19,974
- Intubation on intensive care unit [days]	M	6.9	5.4	8.1	6.4	7.8	7.8	6.3
- Intensive care unit [days]	M	6.1	4.8	7.6	6.2	11.1	9.7	5.9
Days in hospital, all patients	M	14.4	14.4	15.3	11.8	18.8	17.5	13.9
Mortality and prognosis								
Non-survivors	n	10,613	2,163	5,137	3,313	2,111	8,809	6,500
Mortality	%	13.2 %	5.5 %	17.3 %	30.1 %	40.3 %	34.2 %	26.8 %
Risk of death prognosis (RISC III)	%	13.1 %	5.4 %	18.0 %	28.1 %	40.9 %	34.1 %	26.7 %

8.2 Graphical comparison of the length of stay between subgroups

To graphically illustrate the deviations between the different subgroups regarding their length of stay, the following figures are given. As in chapter 6, the hospitals from the TR-DGU are indicated as light blue circles. The horizontal grey line is the mean value over all hospitals per group.

Figure 30 shows the length of stay in the intensive care unit in days for 2022-2024 between the subgroups defined in table 10 for all primary admitted and treated patients of the TR-DGU in the basic group.

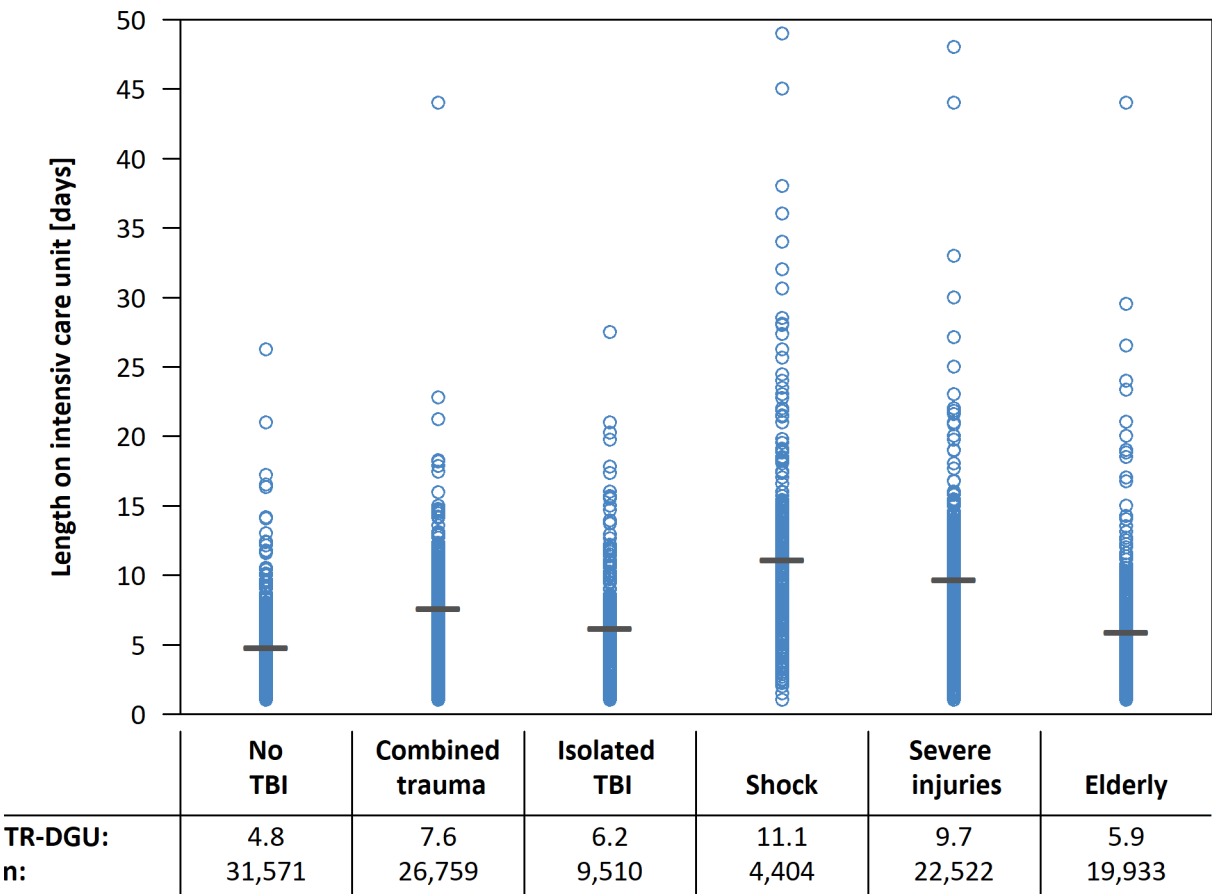


Figure 30: Length of stay in the intensive care unit [days] and number of patients divided into subgroups, for definition see tab. 10, patients 2022-2024, — TR-DGU, ○ single hospital value

Figure 31 compares the **length of stay in hospital** in days for 2022-2024 between the subgroups defined in table 10 for all primary admitted and treated patients of the TR-DGU in the basic group.

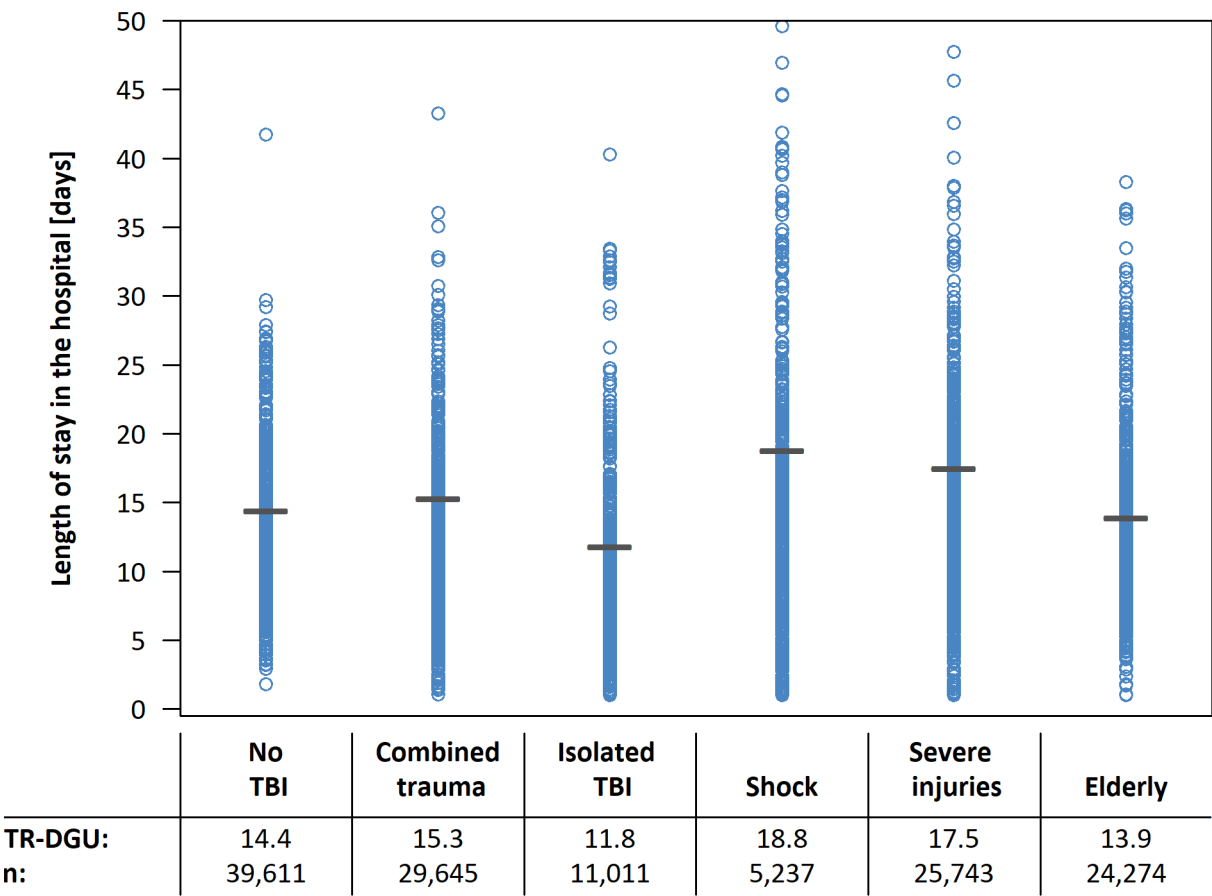


Figure 31: Length of stay in hospital [days] and number of patients divided into subgroups, for definition see tab. 10, patients 2022-2024, — TR-DGU, o single hospital value

9 Data quality and completeness

9.1 Completeness of selected variables

Registries and audit reports can only be as good as the data they are based on. If a lot of patients have missing data in important variables, then the results might be biased or even wrong. Table 12 describes the **completeness rates** („ % ") of several important variables, together with **the number of patients with missing data** („ { } "). The list of variables only contains the prognostic variables needed for the RISC III.

The completeness rates of the **TR-DGU in 2024** are compared with the data from the previous years (**since 2015**). Cases with implausible data are classified as missing.

Table 11: Evaluation criteria for data quality in the TR-DGU

Coding	Evaluation	Data completeness in general	Data completeness based on the surgery rate
	Good	> 95 %	≥ 70 %
	Moderate	90 %-95 %	50 %-69 %
	Insufficient	< 90 %	< 50 %

Table 12: Completeness rates [%], number of missing values {} for selected parameters as well as time to case documentation in the TR-DGU [months]

Variable	Explanation	TR-DGU 2024	TR-DGU 2015-2023
Pre-hospital data (A)		% {}	% {}
Only primary admitted patients, who have not admitted themselves / were not admitted privately		n = 27,375	n = 258,944
GCS	RISC III requires the motor component; quality indicators use the GCS for the definition of cases	92 %  2,327	93 %  18,683
Blood pressure	Initial blood pressure is important for validating the volume therapy and for the definition of shock	85 %  3,990	87 %  33,975
Pupils *	Pupil size and reactivity are relevant for prognosis (RISC III)	95 %  1,432	86 %  35,977
CPR	Cardio-pulmonary resuscitation is seldom but highly predictive for outcome; required for RISC III	93 %  1,928	89 %  28,515
Emergency room (B)			
Only primary admitted patients		n = 28,184	n = 264,468
Time of admission	Required to calculate the diagnostic time periods (quality indicators)	100 %  133	100 %  1,264
Blood pressure	Blood pressure on admission is used by RISC III as a prognostic variable and to define shock	95 %  1,493	94 %  17,063
Base excess	The initial base excess is part of the RISC III and an important prognostic factor	81 %  5,326	80 %  53,005
Coagulation	The INR (or Quick's value) is needed for the RISC III as coagulation marker	93 %  2,066	93 %  18,249
Haemoglobin	Prognostic factor; is part of the RISC III prognosis	97 %  826	97 %  9,041
Patients and outcome			
All patients from the basic group		n = 30,754	n = 289,484
ASA	Prior diseases are relevant for outcome prediction (RISC III)	97 %  926	92 %  22,422
Surgical treatment *	A low rate of surgical patients could be based on incomplete documentation	60 %  12,366	57 %  123,597
Outcome	The levels according to the parameter „outcome“ describe the patient's condition at discharge or transfer	98 %  673	97 %  7,446
Process data - Period of time until documentation			
All patients from the basic group		n = 30,754	n = 289,484
Time from accident to case creation in the TR-DGU**	A prompt documentation of patients increases the data quality of a case in the TR-DGU. Therefore, the time period from accident to the start of documentation is given here	3.7 months	4.2 months
Time from discharge to case completion in the TR-DGU**	Time from discharge of a patient to completion of documentation in the registry	5.1 months	5.4 months

* Since the dataset revision in 2015 the parameter is also part of the QM dataset

** Not to be interpreted for imported data, because only the import date is recorded and not the date of creation and completion of the case documentation

9.2 Comparison of data quality among hospitals

Detailed completeness rates for different variables are presented in chapter 9.1. In order to compare data quality among hospitals, a combined **quality score** is generated here.

The calculation of this quality score is based on the following ten variables:

Prehospital phase: GCS, blood pressure, cardio-pulmonary resuscitation

Emergency room phase: Time of admission, blood pressure, base excess, coagulation (Quick’s value or INR), haemoglobin

Patient information: Previous health status (pre-injury ASA), outcome (according to the parameter „outcome”).

All these variables are part of both the standard and the reduced QM dataset.

The number of missing data from all **primary admitted patients in the basic group** is summarised. This leads to the calculation of an average completeness rate.

Table 13: Data completeness for the TR-DGU in 2024 and comparison over the time

Data quality: Completeness	TR-DGU 2024	TR-DGU 2015-2023
Primary admitted patients from the basic group	n = 28,184	n = 264,468
Expected number of documented values	n = 281,840	n = 2,644,680
Number of missing values	{ } 21,221	{ } 218,882
Average completeness rate (%) based on the 10 specified parameters	92.5 %	91.7 %

9.2.1 Graphical comparison with other hospitals

Figure 32 summarises the average completeness value from all 684 hospitals with documented basic group cases **in the last year**. It follows the idea of a box plot in which the **light blue box** ranging from 90.0 % to 97.1 % covers half of all hospital values. The black vertical line within the box is the median average completeness value 93.7 %.

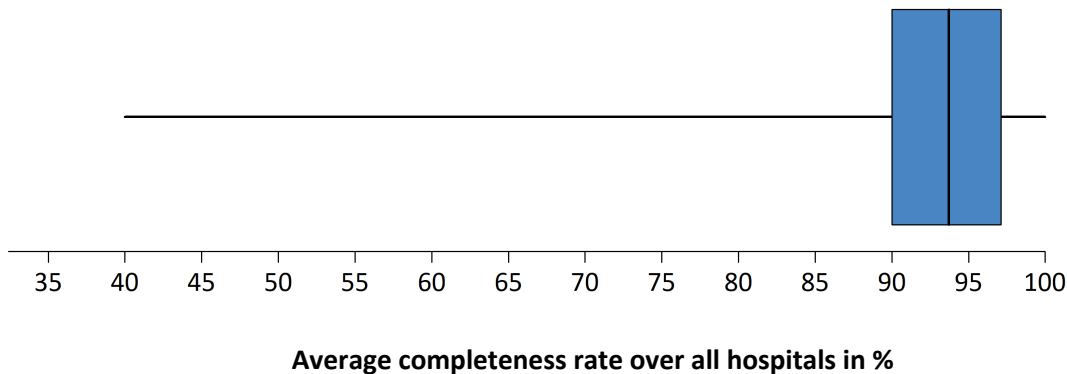


Figure 32: Distribution of the data completeness rate in 2024 over all hospitals

9.2.2 Development over time

Figure 33 shows the development of data completeness over the last ten years since 2015. For each documentation form (standard/QM dataset) a separate line is given. In 2024 the completeness of both datasets are over 90 %.

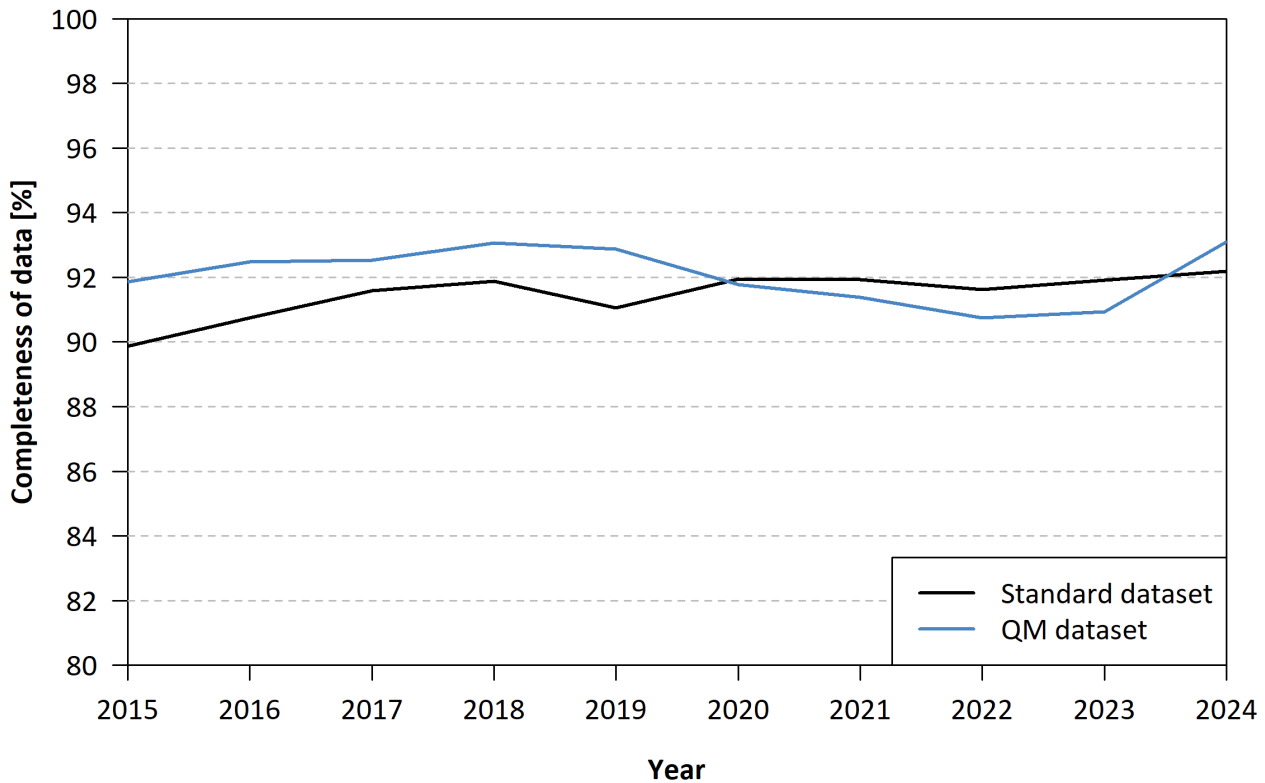


Figure 33: Development over time of the documentation quality: completeness rate in the TR-DGU 2015-2024

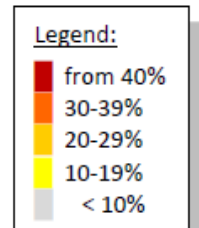
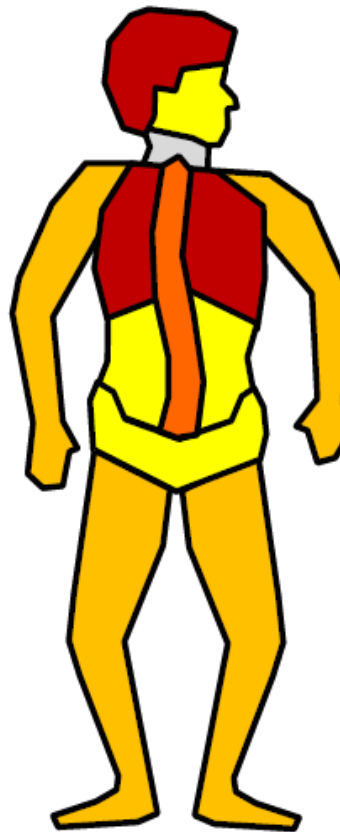
10 Injury pattern

In table 14, the average injury pattern of the TraumaRegister DGU® patients is presented. In order to increase precision, all patients from the **last three years (2022-2024)** are pooled. Data are presented for each of the nine body regions according to the **Abbreviated Injury Scale (AIS)**. The percents refer to injuries with an injury **severity of at least two points** (including radius fractures, spine fractures, lung contusions, etc.).

Figure 34 shows in colour the injury pattern over the the body regions that were documented in the TR-DGU in 2022-2024.

Table 14: Distribution of the injuries from the TR-DGU for the years 2022-2024

	TR-DGU 2022-2024
Patients in the basic group	100 % (N = 93,420)
Head	46.6 % (n = 43,517)
Face	11.0 % (n = 10,251)
Neck	1.9 % (n = 1,795)
Thorax	46.1 % (n = 43,047)
Abdomen	14.5 % (n = 13,554)
Spine	29.8 % (n = 27,812)
Arms	28.8 % (n = 26,931)
Pelvis	15.3 % (n = 14,280)
Legs	22.7 % (n = 21,185)

**Serious injuries (AIS 3+)****Figure 34: Injury pattern in the TR-DGU from 2022-2024**

Injuries with a severity of 3 points or more (AIS) are considered „serious“. The prevalence of serious injuries in the four most important body regions (head, thorax, abdomen, extremities) is given in table 15. The body regions considered here refer to the respective regions of the **Injury Severity Score (ISS)**. Spinal injuries are assigned to the respective regions head, thorax or abdomen.

Different from table 14 only patients with at least one relevant serious injury (MAIS 3+, see chapter 1) are considered here.

Table 15: Ratio of serious injured patients (AIS ≥ 3) per body region for the years 2022-2024

	TR-DGU 2022-2024
Serious injury (AIS ≥ 3)	84.7 % (N = 79,091)
... of the head	44.5 % (n = 35,176)
... of the thorax	45.9 % (n = 36,316)
... of the abdomen	11.9 % (n = 9,392)
... of the extremities and/or the pelvis	27.5 % (n = 21,751)
Patients with more than one seriously injured body region	28.8 % (n = 22,777)

11 General results

11.1 Number of cases

Some results of the actual data analysis from the TraumaRegister DGU® are of general interest. They are presented here without reference to individual hospitals' results.

Hospitals

In the latest year, 36,809 patients were registered from 684 hospitals that documented cases in the TraumaRegister DGU®. The **basic group** that this report is based on comprises **30,754 patients** from 684 hospitals (details on the definition see chapter 1).

There were 17,058 patients with $ISS \geq 16$ from 649 hospitals in the basic group. The distribution of the number of $ISS \geq 16$ patients per hospital is shown in figure 35.

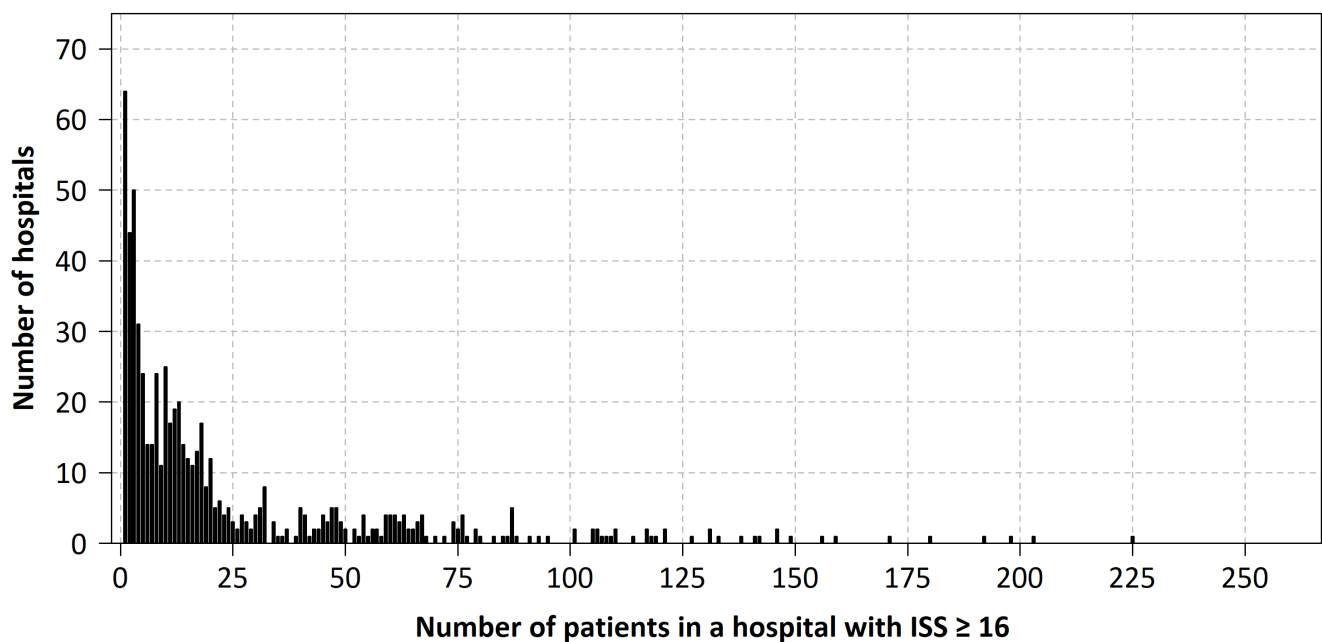


Figure 35: Frequency distribution of $ISS \geq 16$ patients numbers per hospital in the TR-DGU 2024

Patients

Figure 36 demonstrates the continuous increase of registered patients over time since 2002. In the latest year, 6,055 documented patients did not fulfill the criteria to be included in the basic group and were not seriously injured per TR-DGU definition. There were 66.0 % patients in the basic group that were documented by the standard dataset (S) in the last year.

In the latest year, there were **684 hospitals** that documented patients in the basic group, 70 hospitals were from foreign countries (10.2 %), namely Belgium, Finland, Luxembourg, The Netherlands, Austria, Switzerland, Slovenia and the United Arab Emirates and 614 hospitals from Germany.

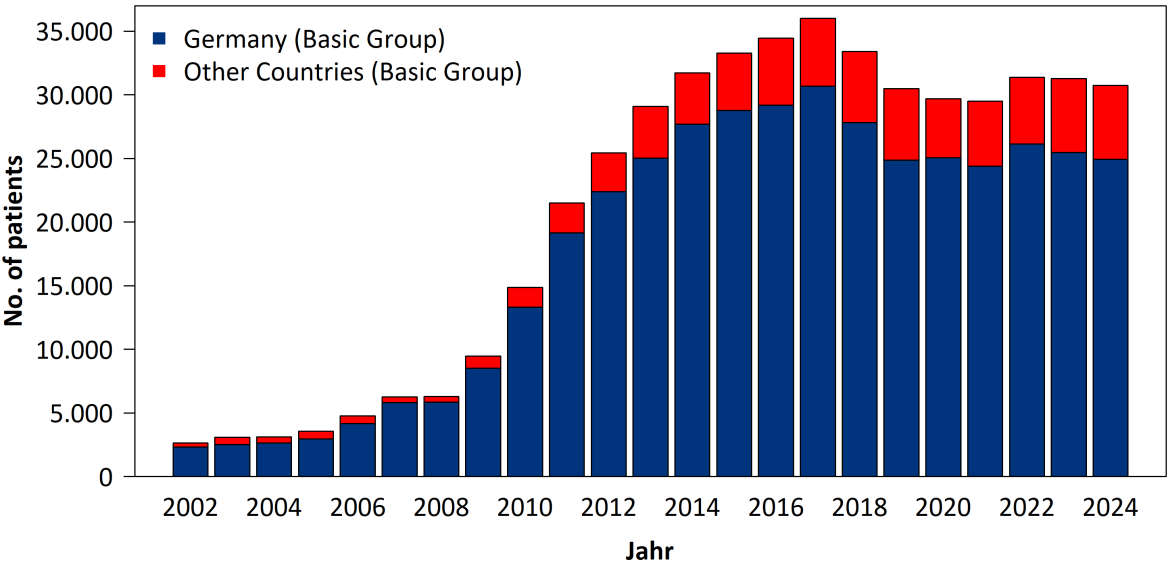


Figure 36: Number of cases in the TR-DGU 2002-2024

11.2 Therapy-Limiting Patient Will

In 2015, the variable "reason for end-of-life-decision" was added to the TR-DGU dataset. Since 2020, the reason for therapy limitation has also been recorded. The categories include "palliative," "presumed will of patient," and "written willingness of the patient". This data should generally only be recorded in cases where the patient has indeed passed away.

This variable was introduced to exclude cases involving an advance directive or therapy limitation, where the patient died within the first week from the comparison of prognosis and mortality. The aim was to prevent these special cases from distorting the comparison between expected and observed mortality (SMR) to the disadvantage of the hospital.

The adjacent figure shows that a significant proportion of deceased patients, particularly among the elderly, were excluded in this way. Among patients aged 80 and above, more than half of all deaths were excluded (data from the past five years).

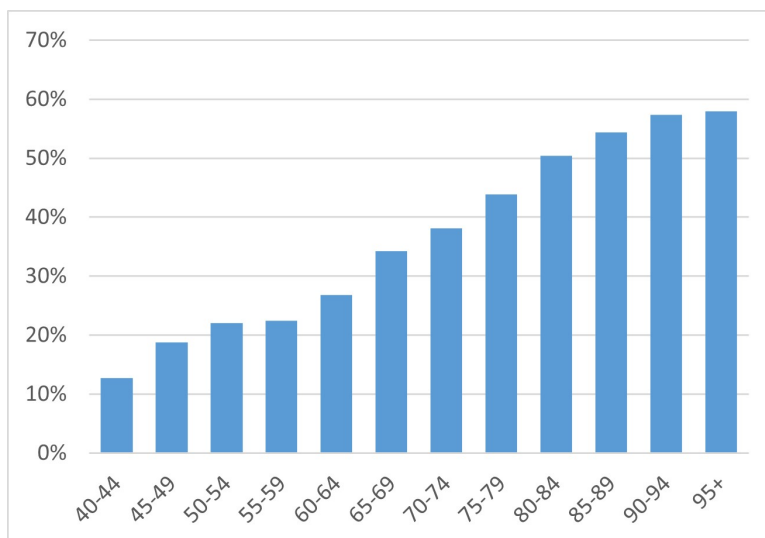


Figure 37: Age distribution of excluded, deceased patients, with therapy-limiting patient directives

The more detailed documentation introduced in 2020 also indicates that, in many cases, no written directive was available. In two-thirds of the recorded cases, the limitation of therapy was based on the presumed will of the patient or due to a shift in treatment goals for palliative reasons.

In summary, the following picture emerges:

- One quarter of deceased trauma patients were excluded from the annual quality assessments using this variable—primarily older patients.
- The documentation does not make it clear whether the patient's wish to limit therapy actually influenced the treatment goal.
- Only a small portion (14%) of therapy limitations were formally documented in writing; most were based on palliative considerations or presumed patient will.
- Patients with a "therapy-limiting declaration" had, on average, a hospital stay that was two days longer than those without such a declaration.
- 70% of all deceased trauma patients were aged 65 or older. From around the age of 50, the proportion of cases marked by a therapy-limiting patient will steadily increases.

Although the exclusion of cases with a therapy-limiting patient will was originally intended to prevent distortions in mortality predictions (RISC), the available data suggest that excluding these cases may also negatively impact quality analyses. For this reason, patients with a therapy-limiting patient will are no longer excluded from the calculations of prognosis and mortality.

With the new RISC III, the growing group of older trauma patients, most recently, 38% of cases in the TR-DGU were aged 65 or older, is now appropriately reflected in the outcome prediction (see section 11.3).

11.3 The New Prognostic Score: RISC III

In the early years of the TR-DGU, observed mortality was compared with a prognosis based on the Trauma Score and Injury Severity Score (TRISS). In 2003, the first proprietary prognostic score, the Revised Injury Severity Classification (RISC), was introduced. An improved version, RISC II, was then developed based on 31,866 datasets from 2010–2011. Why is another adjustment needed now?

Reason 1: The average age of both trauma patients and the general population is increasing, and more accident victims are being admitted with therapy-limiting directives. This can restrict clinical interventions; therefore, in recent annual reports, deceased patients (within one week) with such end-of-life decisions were excluded.

However, as mentioned in section 11.2, all patients should now be considered again. However, the RISC II predictions no longer match observed mortality, particularly in older patients (see Figure 38). RISC III now assigns older patients a slightly higher risk.

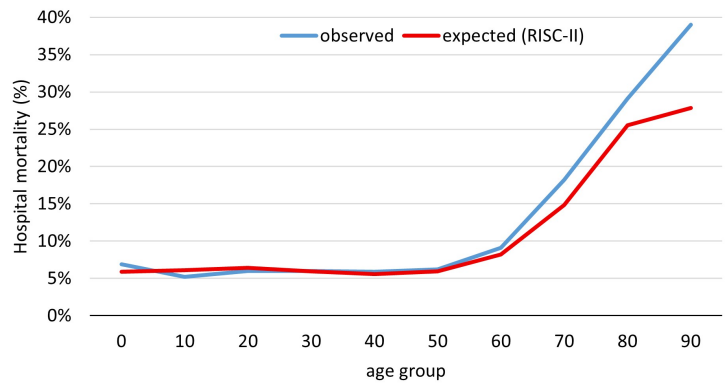


Figure 38: RISC II vs. Observed Mortality (including all patients)

Tabelle 16: Substitution rules for RISC III

Predictor	Missing values	Replacement rule
Age, injuries	0%	Mandatory field
Sex	<0,1%	Male
ASA	5,8%	via age
Light reaction (pupils)	11,2%	via AIS head
Pupil size	3,5%	via AIS head
Mechanism	5,8%	blunt
GCS Motor reaction	6,0%	via AIS head
Blood pressure	3,5%	Catecholamines, blood transfusion, ISS
CPR	6,6%	no CPR
Coagulation (INR)	7,4%	Blood transfusion, volume, ISS, medication
Haemoglobin	3,2%	Blood transfusion
Base Excess	17,5%	Blood transfusion, haemoglobin, ISS

Reason 2: The principle of RISC II was that missing values should not affect the prognosis. Therefore, missing values were given a score of zero, while available data could carry a positive, neutral or negative weighting. However, missing values can often be reliably estimated. This approach has been implemented in RISC III. Table 16 lists the missing data rates and their replacement criteria. If no replacement condition is met, normal values are assumed. This reinstates a principle from the original RISC. RISC III introduces no new predictors; only the weightings have been optimised.

RISC III therefore enables a prognosis estimate to be calculated for all patients undergoing primary treatment, providing improved prognoses, particularly for older accident victims, as well as plausible replacement rules for missing values. This annual report already includes the new RISC III prognoses. A publication with further details is in preparation.

12 Publications from the TraumaRegister DGU®

An extended list of publications from the TraumaRegister DGU® since 1997 is available on www.traumaregister-dgu.de.

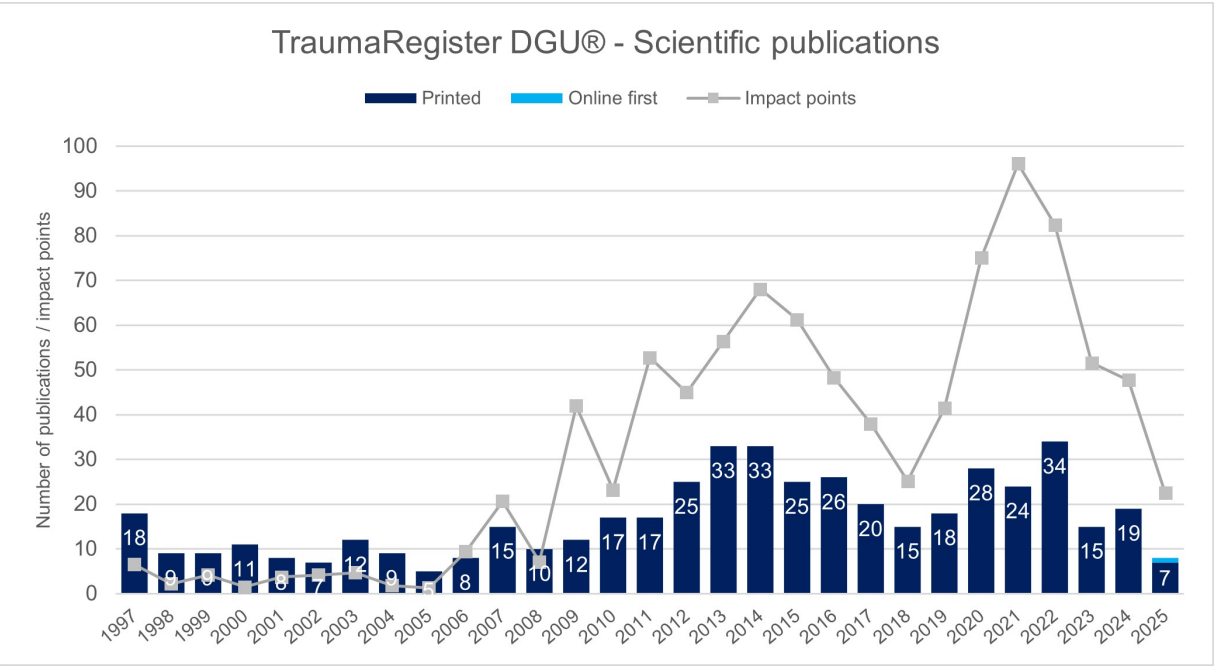


Figure 39: Number of publications from the TraumaRegister DGU® and their impact points since 1997 (status: 05/2025)

12.1 Facts from the Reviewboard in 2024

The Reviewboard meets every 4-6 weeks to discuss incoming applications and manuscripts from the TraumaRegister DGU® and to initiate the review process. The Reviewboard consists of four members of the NIS, that meet in a quarterly rotation system with Prof. Lefering, Dr. Höfer, Mr. Huber and Ms. Bartha. The administrative management is performed by Ms. Freund.

Table 17: Facts from the Reviewboard 2024

	2024
Number of new research proposals	40
Number of research proposals discussed in the Reviewboard (incl. Revisions)	53
Number of research proposals reviewed (incl. resubmissions)	33
Number of manuscripts reviewed	15
Number of manuscripts approved for publication	12
Number of participating reviewers	95

12.2 Publications from the TR-DGU 2024 - 05/2025

2025

Feth M, Leppe PM., Eimer C, Bauer AK, Muellenbach R, Ajouri J, Achatz G, Schober J, Lefering R, Hossfeld B, Kulla M. Evaluating factors associated with the use of extracorporeal membrane oxygenation in major trauma – an analysis of the TraumaRegister DGU®. *Eur J Trauma Emerg Surg* 2025; 51: 165. doi: 10.1007/s00068-025-02844-4

Hartz F, Zehnder P, Resch T, Römmermann G, Schwarz M, Kirchhoff C, Biberthaler P, Lefering R, Zyskowski M. Schwere Verletzungen nach E-Scooter-Unfällen: Eine Auswertung der Daten aus dem TraumaRegister DGU. *Dtsch Arztebl Int* 2025; 122: 265-70; DOI: 10.3238/arztebl.m2025.0041

Hax J, Teuben M, Halvachizadeh S, Berk T, Scherer J, Jensen KO, Lefering R, Pape HC, Sprengel K; TraumaRegister DGU. Timing of Spinal Surgery in Polytrauma: The Relevance of Injury Severity, Injury Level and Associated Injuries. *Global Spine J.* 2025 Mar;15(2):906-915. doi: 10.1177/21925682231216082.

Hilbert-Carius P, Lefering R, Wrigge H, Hofmann GO, Davis J, Koch R. Does a Simple Blood Gas Analysis and the Clinical Impression Predict Trauma-Induced Coagulopathy? *Hamostaseologie.* 2025 Jan 20. doi: 10.1055/a-2445-7163. Epub ahead of print.

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12.3 Abstracts 06/2024 - 05/2025

J Clin Med. 2024 Jul 11;13(14):4059. doi: 10.3390/jcm13144059.

Early Point-of-Care Thromboelastometry Reduces Mortality in Patients with Severe Trauma and Risk of Transfusion: An Analysis Based on the TraumaRegister DGU®.

Beyersdorf C, Bieler D, Lefering R, Imach S, Hackenberg L, Schiffner E, Thelen S, Lakomek F, Windolf J, Jaekel C, TraumaRegister Dgu.

Background: Thromboelastometry like ROTEM® is a point-of-care method used to assess the coagulation status of patients in a rapid manner being particularly useful in critical care settings, such as trauma, where quick and accurate assessment of coagulation can guide timely and appropriate treatment. Currently, this method is not yet comprehensively available with sparse data on its effectiveness in resuscitation rooms. The aim of this study was to assess the effect of early thromboelastometry on the probability of mass transfusions and mortality of severely injured patients.

Methods: The TraumaRegister DGU® was retrospectively analyzed for severely injured patients (2011 until 2020) with information available regarding blood transfusions and Trauma-Associated Severe Hemorrhage (TASH) score components. Patients with an estimated risk of mass transfusion >2% were included in a matched-pair analysis. Cases with and without use of ROTEM® diagnostic were matched based on risk categories for mass transfusion. A total of 1722 patients with ROTEM® diagnostics could be matched with a non-ROTEM® patient with an identical risk category. Adult patients (≥16) admitted to a trauma center in Germany, Austria, or Switzerland with Maximum Abbreviated Injury Scale severity ≥3 were included.

Results: A total of 83,798 trauma victims were identified after applying the inclusion and exclusion criteria. For 7740 of these patients, the use of ROTEM® was documented. The mean Injury Severity Score (ISS) in patients with ROTEM® was 24.3 compared to 19.7 in the non-ROTEM® group. The number of mass transfusions showed no significant difference (14.9% ROTEM® group vs. 13.4% non-ROTEM® group, $p = 0.45$). Coagulation management agents were given significantly more often in the ROTEM® subgroup. Mortality in the ROTEM® group was 4.1% less than expected (estimated mortality based on RISC II 34.6% vs. observed mortality 30.5% ($n = 525$)). In the non-ROTEM® group, observed mortality was 1.6% less than expected. Therefore, by using ROTEM® analysis, the expected mortality could be reduced by 2.5% (number needed to treat (NNT) 40; SMR of ROTEM® group: 1:0.88; SMR of non-ROTEM® group: 1:0.96; $p = 0.081$).

Conclusions: Hemorrhage is still one of the leading causes of death of severely injured patients in the first hours after trauma. Early thromboelastometry can lead to a more targeted coagulation management, but is not yet widely available. This study demonstrated that ROTEM® was used for the more severely injured patients and that its use was associated with a less than expected mortality as well as a higher utilization of hemostatic products.

Eur J Trauma Emerg Surg. 2025 Apr 7;51(1):165. doi: 10.1007/s00068-025-02844-4.

Evaluating factors associated with the use of extracorporeal membrane oxygenation in major trauma - an analysis of the TraumaRegister DGU®).

Feth M, Lepper PM, Eimer C, Bauer AK, Muellenbach R, Ajouri J, Ring M, Achatz G, Schober J, Lefering R, Hossfeld B, Kulla M.

PURPOSE: There is increasing evidence that use of ECMO is beneficial in major trauma patients with refractory organ failure. Hence, increased numbers of ECMO support following major trauma are reported. We set out to determine the use of ECMO among major trauma patients submitted to the TraumaRegister DGU® as well as patient features associated with ECMO support.

METHODS: The TraumaRegister DGU® is a multinational database compiling trauma related health care data from point-of-injury, initial and critical care to outcome. Major trauma cases (AIS ≥ 3 irrespective of injury location) with subsequent critical care as well as respiratory and/or circulatory failure (SOFA score ≥ 3 per respective category) enrolled in the TraumaRegister DGU® between 2015 and 2022 were reviewed. A logistic regression model was carried out to evaluate patient features associated with ECMO support.

RESULTS: 410/ 22,548 individuals (1.8%) received ECMO support. Survival among ECMO patients was 46.1%. At discharge, good functional outcome as indicated by a Glasgow outcome scale > 3 was observed for 97 ECMO patients (23.6%). Age > 65 (OR 95%-CI 1.90, 1.52-2.60), male sex (OR 1.49, 95%-CI 1.41-1.95), coagulopathy at admission to the emergency department (OR 2.37, 95%-CI 1.88-3.00), chest trauma (OR 2.12, 95%-CI 1.61-2.81), sepsis (OR 2.94, 95%-CI 1.93-2.97), as well as massive transfusion (OR 2.23, 95%-CI 1.56-3.19) were associated with the use of ECMO following trauma.

CONCLUSION: In the TraumaRegister DGU®, ECMO for trauma related organ failure remains rare. Among ECMO patients, good functional outcome was observed infrequently. However, the design of the registry did not allow for capturing granular data on ECMO management and timing of organ failure. Hence, outcome data should be interpreted with caution. Nevertheless, evaluation of factors associated with ECMO support after trauma might contribute to early identification of ECMO candidates and improve patient distribution for trauma centers without ECMO capability.

Eur J Trauma Emerg Surg. 2024 Oct;50(5):2199-2207. doi: 10.1007/s00068-024-02571-2

Influencing factors for delayed diagnosed injuries in multiple trauma patients - introducing the 'Risk for Delayed Diagnoses Score' (RIDD-Score).

Gümbel D, Matthes G, Ekkernkamp A, Laue F, Lefering R; TraumaRegister DGU.

PURPOSE: Delayed diagnosed injuries (DDI) in severely injured patients are an essential problem faced by emergency staff. Aim of the current study was to analyse incidence and type of DDI in a large trauma cohort. Furthermore, factors predicting DDI were investigated to create a score to identify patients at risk for DDI.

METHODS: Multiply injured patients admitted between 2011 and 2020 and documented in the TraumaRegister DGU® were analysed. Primary admitted patients with severe injuries and/or intensive care who survived at least 24 h were included. The prevalence, type and severity of DDI were described. Through multivariate logistic regression analysis, risk factors for DDI were identified. Results were used to create a 'Risk for Delayed Diagnoses' (RIDD) score.

RESULTS: Of 99,754 multiply injured patients, 9,175 (9.2%) had 13,226 injuries first diagnosed on ICU. Most common DDI were head injuries (35.8%), extremity injuries (33.3%) and thoracic injuries (19.7%). Patients with DDI had a higher ISS, were more frequently unconscious, in shock, required more blood transfusions, and stayed longer on ICU and in hospital. Multivariate analysis identified seven factors indicating a higher risk for DDI (OR from 1.2 to 1.9). The sum of these factors gives the RIDD score, which expresses the individual risk for a DDI ranging from 3.6% (0 points) to 24.8% (6 + points).

CONCLUSION: DDI are present in a sounding number of trauma patients. The reported results highlight the importance of a highly suspicious and thorough physical examination in the trauma room. The introduced RIDD score might help to identify patients at high risk for DDI. A tertiary survey should be implemented to minimise delayed diagnosed or even missed injuries.

Dtsch Arztebl Int. 2025 May 16;(Forthcoming):arztebl.m2025.0041. doi: 10.3238/arztebl.m2025.0041.

Severe Injuries in E-Scooter Accidents: An Evaluation of Data From the TraumaRegister DGU.

Hartz F, Zehnder P, Resch T, Römmermann G, Schwarz M, Kirchhoff C, Biberthaler P, Lefering R, Zyskowski M.

BACKGROUND: The e-scooter has become an alternative mode of transport in urban areas, and this has led to a rising number of injuries. There is a lack of comprehensive, nationwide data on severe injuries due to e-scooter accidents.

METHODS: From 2020 onward, e-scooter accidents have been recorded as a separate subgroup in the multicenter TraumaRegister DGU (TR-DGU) (DGU = German Trauma Society). In this study, we analyzed the data from 2020-2023 and compared them with data for bicyclists and other road users.

RESULTS: We compared data on 538 persons who were severely injured in e-scooter accidents with data on injured bicyclists and other road users. Compared to cyclists, e-scooter accident victims were more often male (78.4% versus 72.3%), younger (44.3 versus 54.5 years) and more often under the influence of alcohol (34.9% versus 15.6%). More than half of the accidents (54%) took place at night, and 83% of the e-scooter accident victims suffered a severe injury to the head or face (Abbreviated Injury Scale [AIS] ≥ 2). The most common injuries were subarachnoid hemorrhage (20.1%), skull base fracture (16.7%), and serial rib fractures (16.5%). 83.5% of these e-scooter accident victims were treated in intensive care; the average length of hospital stay was 7 days (interquartile range, 4-12 days). 26 (4.8%) of the e-scooter accident victims died.

CONCLUSION: E-scooter accidents cause severe injuries to the head and face. Middle-aged men are most commonly affected. The victims are often under the influence of alcohol, need intensive care, and have an appreciable mortality. Measures should be taken urgently to educate e-scooter riders and improve safety.

Crit Care. 2024 Jul 5;28(1):222. doi: 10.1186/s13054-024-05002-1..

Calcium supplementation during trauma resuscitation: a propensity score-matched analysis from the TraumaRegister DGU®.

Helsloot D, Fitzgerald M, Lefering R, Groombridge C, Becaas N, Verelst S, Missant C; TraumaRegister DGU.

BACKGROUND: In major trauma patients, hypocalcemia is associated with increased mortality. Despite the absence of strong evidence on causality, early calcium supplementation has been recommended. This study investigates whether calcium supplementation during trauma resuscitation provides a survival benefit.

METHODS: We conducted a retrospective analysis using data from the TraumaRegister DGU® (2015-2019), applying propensity score matching to balance demographics, injury severity, and management between major trauma patients with and without calcium supplementation. 6 h mortality, 24 h mortality, and in-hospital mortality were considered as primary outcome parameters.

RESULTS: Within a cohort of 28,323 directly admitted adult major trauma patients at a European trauma center, 1593 (5.6%) received calcium supplementation. Using multivariable logistic regression to generate propensity scores, two comparable groups of 1447 patients could be matched. No significant difference in early mortality (6 h and 24 h) was observed, while in-hospital mortality appeared higher in those with calcium supplementation (28.3% vs. 24.5%, $P = 0.020$), although this was not significant when adjusted for predicted mortality ($P = 0.244$).

CONCLUSION: In this matched cohort, no evidence was found for or against a survival benefit from calcium supplementation during trauma resuscitation. Further research should focus on understanding the dynamics and kinetics of ionized calcium levels in major trauma patients and identify if specific conditions or subgroups could benefit from calcium supplementation.

Hamostaseologie. 2025 Jan 20. doi: 10.1055/a-2445-7163.

Does a Simple Blood Gas Analysis and the Clinical Impression Predict Trauma-Induced Coagulopathy?

Hilbert-Carius P, Lefering R, Wrigge H, Hofmann GO, Davis J, Koch R.

OBJECTIVES: Trauma-induced coagulopathy (TIC) is common in severely injured patients and is associated with significant morbidity and mortality.

METHOD: The association of two parameters of blood gas analysis (hemoglobin [Hb], base excess [BE]) with standard coagulation tests (SCTs) and rotational thrombelastometry (ROTEM) using the database of the TraumaRegister DGU between 2015 and 2022 was studied. In a stepwise approach, the occurrence of a TIC, the correlations between Hb/BE levels and SCT, as well as ROTEM were calculated respectively. Then we aimed to detect relations between different Hb/BE levels and the occurrence of TIC, using standard clotting studies and/or ROTEM respectively.

RESULTS: TIC occurred in 17.2% of the 68,996 primarily admitted adult patients with Injury Severity Score ≥ 9 . A high correlation was found between Hb/BE and SCT. With a decrease in Hb and BE, the frequency of TIC increased and at an admission Hb < 8 g/dL and BE < -6 mmol/L, $> 60\%$ of patients presented with TIC. Clinical conditions associated with TIC were Glasgow Coma Scale ≤ 8 , blood pressure ≤ 90 mmHg on the scene or at hospital admission, prehospital volume $> 1,000$ mL, serious injuries to the head and/or the thorax and/or the abdomen and/or the extremities.

CONCLUSION: Almost one-sixth of patients present with a TIC at hospital admission. Blood gas analysis samples showed relevant correlations between Hb/BE levels and SCT. The combined closer inspection of Hb/BE and the clinical presentation of the patient is able to predict TIC in the majority of patients.

Eur J Trauma Emerg Surg. 2025 Jan 24;51(1):55. doi: 10.1007/s00068-024-02756-9.

Surgical stabilisation of rib fractures in non-ventilated patients: a retrospective propensity-matched analysis using the data from the trauma registry of the German Trauma Society (TraumaRegister DGU)

Huelskamp MD, Duesing H, Lefering R, Raschke MJ, Rosslenbroich S; TraumaRegister DGU.

PURPOSE: Severe thorax trauma including multiple rib fractures and flail chest deformity are leading causes of death in trauma patients. Increasing evidence supports the use of surgical stabilisation of rib fractures (SSRF) in these patients. However, there is currently a paucity of evidence for its use in non-ventilator-dependent patients.

METHODS: A retrospective propensity-matched analysis of the data of the TraumaRegister DGU® for non-ventilator-dependent patients with severe rib injury (abbreviated injury score ≥ 3) was performed. Subgroup analyses with respect to injury severity score, American society of anaesthesiologists physical status classification and age were performed. Furthermore, the effect of time to surgery was analysed. REGISTRATION: TR-DGU project ID 2023-007; ClinicalTrials.gov protocol ID: NCT06464289.

RESULTS: SSRF led to reduced mortality compared to conservative treatment (1.6% vs. 4.8%; $p = 0.002$) and in comparison to the mortality prognosis of the revised injury severity classification II (RISC II) of 5.2%. Interestingly, SSRF was associated with increased length of hospital and intensive care unit stay, higher rates of organ failure and secondary intubation. The patients with organ failure received SSRF later than those without organ failure.

CONCLUSION: Here we report on the largest currently published dataset of non-intubated patients receiving SSRF, which showed reduced mortality in the SSRF cohort. The data indicates that SSRF is a viable treatment option for non-intubated patients. The observed late surgical time points, which may be due to cross over after failed conservative treatment, might be the cause for the observed increased rate of organ failure.

Health Qual Life Outcomes. 2024 Jun 5;22(1):46. doi: 10.1186/s12955-024-02261-y.

Implementation of health-related quality of life in the German TraumaRegister DGU® - first results of a pilot study.

Jaekel C, Nienaber U, Neubert A, Kamp O, Wienhöfer L, Nohl A, Maegele M, Duesing H, Erichsen CJ, Frenzel S, Lefering R, Flohe S, Bieler D; Outcome Study Group of the Committee on Emergency Medicine, Intensive Care, Trauma Management (Sektion NIS) of the German Trauma Society (DGU).

BACKGROUND: Approximately 30,000 people are affected by severe injuries in Germany each year. Continuous progress in prehospital and hospital care has significantly reduced the mortality of polytrauma patients. With increasing survival rates, the functional outcome, health-related quality (hrQoL) of life and ability to work are now gaining importance. Aim of the study is, the presentation of the response behavior of seriously injured patients on the one hand and the examination of the factors influencing the quality of life and ability to work 12 months after major trauma on the other hand. Building on these initial results, a standard outcome tool shall be integrated in the established TraumaRegister DGU® in the future.

METHODS: In 2018, patients [Injury Severity Score (ISS) ≥ 16 ; age:18-75 years] underwent multicenter one-year posttraumatic follow-up in six study hospitals. In addition to assessing hrQoL by using the Short-Form Health Survey (SF-12), five additional questions (treatment satisfaction; ability to work; trauma-related medical treatment; relevant physical disability, hrQoL as compared with the prior to injury status) were applied.

RESULTS: Of the 1,162 patients contacted, 594 responded and were included in the analysis. The post-injury hrQoL does not show statistically significant differences between the sexes. Regarding age, however, the younger the patient at injury, the better the SF-12 physical sum score. Furthermore, the physically perceived quality of life decreases statistically significantly in relation to the severity of the trauma as measured by the ISS, whereas the mentally perceived quality of life shows no differences in terms of injury severity. A large proportion of severely injured patients were very satisfied (42.2%) or satisfied (39.9%) with the treatment outcome. It should be emphasized that patients with a high injury severity (ISS > 50) were on average more often very satisfied with the treatment outcome (46.7%). A total of 429 patients provided information on their ability to work 12 months post-injury. Here, 194 (45.2%) patients had a full employment, and 58 (13.5%) patients were had a restricted employment.

CONCLUSION: The present results show the importance of a structured assessment of the postinjury hrQoL and the ability to work after polytrauma. Further studies on the detection of influenceable risk factors on hrQoL and ability to work in the intersectoral course of treatment should follow to enable the best possible outcome of polytrauma survivors.

Front Med (Lausanne). 2025 Feb 3;12:1508172. doi: 10.3389/fmed.2025.1508172.

Severe soft tissue injuries in multiple trauma patients-a challenge we can meet? A matched-pair analysis from the TraumaRegister DGU®).

Kirsten N, Franke GM, Lefering R, Klüter T, Weuster M, Müller M, Lippross S, Seekamp A; TraumaRegister DGU®; Fitschen-Oestern S.

INTRODUCTION: Despite tremendous clinical efforts over the past few decades, the treatment of severely injured patients remains still challenging. Concomitant soft tissue injuries represent a particular challenge, as they can lead to complications at any time of trauma care, hold a high risk of infection and often require multiple surgical interventions and interdisciplinary collaboration.

METHODS: This retrospective, multicentric study used the TraumaRegister DGU® to examine the effect of open fractures and severe soft tissue injuries on outcome of multiple trauma patients. Primary admitted multiple trauma patients at the age of 16 to 70 years, treated from 2010 to 2021, were included. A Matched pair analysis was performed for better comparability of trauma patients with and without open fractures and/or severe soft tissue injuries.

RESULTS: After applying the matching criteria, 5,795 pairs were created and analyzed. The group with sustained soft tissue injuries/open fractures was found to have a higher ISS ([mean $\pm$ SD] 22.1 ± 10.4 vs. 20.6 ± 10.2 , $p < 0.001$). Endotracheal tube insertion (27.7% vs. 30.4%, $p = 0.003$), catecholamine administration (6.0% vs. 8.4%, $p < 0.001$) and cardio-pulmonary resuscitation (1.6% vs. 2.1%, $p = 0.027$) were more frequent in the group with sustained soft tissue injury. Both groups were equally frequent admitted to the intensive care unit (ICU) and length of stay (LOS) at the ICU (median (quartiles) 3 (1-9) versus 3 (1-9)) did not differ significantly. However, total LOS at the hospital was longer for the group with sustained soft tissue injury (median (quartiles) 18 (11-29) versus 17 (10-27)). Sepsis occurred more often in patients with soft tissue injury (4.3% vs. 5.2%, $p = 0.034$). There was no significant difference in prevalence of multi organ failure, 24 h-mortality (2.1% vs. 2.5%, $p = 0.151$) and overall-mortality (3.6% vs. 3.9%, $p = 0.329$) between both groups.

CONCLUSION: Due to database analysis and revision of guidelines, the treatment of severely injured patients has steadily improved in recent years. Patients with severe soft tissue injuries/open fractures required more medical interventions and length of stay at the hospital was longer. In this study, we were able to show that although concomitant severe soft tissue injuries required more ICU interventions and led to a longer length of stay, 24-h and all-cause mortality were not significantly increased.

Eur J Trauma Emerg Surg. 2024 Oct;50(5):2451-2462. doi: 10.1007/s00068-024-02640-6.

Angioembolization in patients with blunt splenic trauma in Germany -guidelines vs. Reality a retrospective registry-based cohort study of the TraumaRegister DGU®.

Kölbel B, Imach S, Engelhardt M, Wafaisade A, Lefering R, Beltzer C; TraumaRegister DGU.

PURPOSE: Nonoperative management (NOM) for blunt splenic injuries (BSIs) is supported by both international and national guidelines in Germany, with high success rates even for severe organ injuries. Angioembolization (ANGIO) has been recommended for stabilizable patients with BSI requiring intervention since the 2016 German National Trauma Guideline. The objectives were to study treatment modalities in the adult BSI population according to different severity parameters including NOM, ANGIO and splenectomy in Germany.

METHODS: Between 2015 and 2020, a retrospective registry-based cohort study was performed on patients with BSIs with an Abbreviated Injury Score ≥ 2 in Germany using registry data from the TraumaRegister DGU® (TR DGU). This registry includes patients which were treated in a resuscitation room and spend more than 24-h in an intensive care unit or died in the resuscitation room.

RESULTS: A total of 2,782 patients with BSIs were included in the analysis. ANGIO was used in 28 patients (1.0%). NOM was performed in 57.5% of all patients, predominantly those with less severe organ injuries measured by the American Association for the Surgery of Trauma Organ Injury Scale (AAST) ≤ 2 . The splenectomy rate for patients with an AAST ≥ 3 was 58.5%, and the overall mortality associated with BSI was 15%.

CONCLUSIONS: In this cohort splenic injuries AAST ≥ 3 were predominantly managed surgically and ANGIO was rarely used to augment NOM. Therefore, clinical reality deviates from guideline recommendations regarding the use of ANGIO and NOM. Local interdisciplinary treatment protocols might close that gap in the future.

Front Med (Lausanne). 2024 Jun 5;11:1358205. doi: 10.3389/fmed.2024.1358205.

Prediction of prolonged length of stay on the intensive care unit in severely injured patients-a registry-based multivariable analysis.

Lefering R, Waydhas C; TraumaRegister DGU.

PURPOSE: Mortality is the primary outcome measure in severely injured trauma victims. However, quality indicators for survivors are rare. We aimed to develop and validate an outcome measure based on length of stay on the intensive care unit (ICU).

METHODS: The TraumaRegister DGU of the German Trauma Society (DGU) was used to identify 108,178 surviving patients with serious injuries who required treatment on ICU (2014-2018). In a first step, need for prolonged ICU stay, defined as 8 or more days, was predicted. In a second step, length of stay was estimated in patients with a prolonged stay. Data from the same trauma registry (2019-2022, n = 72,062) were used to validate the models derived with logistic and linear regression analysis.

RESULTS: The mean age was 50 years, 70% were males, and the average Injury Severity Score was 16.2 points. Average/median length of stay on ICU was 6.3/2 days, where 78% were discharged from ICU within the first 7 days. Prediction of need for a prolonged ICU stay revealed 15 predictors among which injury severity (worst Abbreviated Injury Scale severity level), need for intubation, and pre-trauma condition were the most important ones. The area under the receiver operating characteristic curve was 0.903 (95% confidence interval 0.900-0.905). Length of stay prediction in those with a prolonged ICU stay identified the need for ventilation and the number of injuries as the most important factors. Pearson's correlation of observed and predicted length of stay was 0.613. Validation results were satisfactory for both estimates.

CONCLUSION: Length of stay on ICU is a suitable outcome measure in surviving patients after severe trauma if adjusted for severity. The risk of needing prolonged ICU care could be calculated in all patients, and observed vs. predicted rates could be used in quality assessment similar to mortality prediction. Length of stay prediction in those who require a prolonged stay is feasible and allows for further benchmarking.

J Clin Med. 2024 Nov 17;13(22):6914. doi: 10.3390/jcm13226914.

An Additional Certification as a Centre for Geriatric Trauma Had No Benefit on Mortality Among Seriously Injured Elderly Patients-An Analysis of the TraumaRegister DGU® with Data of the Registry for Geriatric Trauma (ATR-DGU).

Pass B, Aigner R, Lefering R, Lendemann S, Hussmann B, Maek T, Bieler D, Bliemel C, Neuerburg C, Schoeneberg C, The TraumaRegister Dgu.

Background/Objectives: The number of seriously injured elderly patients is continuously rising. Several studies have underlined the benefit of orthogeriatric co-management in treating older patients with a proximal femur fracture. The basis of this orthogeriatric co-management is a certification as a Centre for Geriatric Trauma (ATZ). Data of seriously injured patients are collected in the TraumaRegister DGU® (TR-DGU) from participating trauma centres. We hypothesise that if a certified trauma centre is also a certified Centre for Geriatric Trauma, a benefit can be measured.

Methods: Retrospective cohort analysis was conducted from 1 January 2016 to 31 December 2021. The TraumaRegister DGU® collected the data prospectively. This retrospective multicentre registry study included patients 70 years or older with an abbreviated injury scale of ≥ 3 and intensive care unit treatment from 700 certified Trauma Centres and 110 Centres for Geriatric Trauma in Germany, Austria and Switzerland. The primary outcome was mortality in in-hospital stays. Other outcome parameters were days of intubation, the length of stay in ICU, and in-hospital stays. Furthermore, the discharge target and the Glasgow Outcome Scale (GOS) were analysed.

Results: The inclusion criteria were met by 27,531 patients. The majority of seriously injured patients ($n = 23,007$) were transported to certified trauma centres without certification as ATZ. A total of 4524 patients were transported to a trauma centre with additional ATZ certifications. Mortality and the Revised Injury Severity Classification II (RISC-II) model for prediction of mortality after trauma were higher in ATZ hospitals. Logistic regression analysis showed no effect on mortality by a certification as a centre for geriatric trauma in treating seriously injured elderly patients.

Conclusions: We assume that the additional ATZ certification does not positively influence the treatment of seriously injured elderly patients. A potential side effect could not be measured.

J Clin Med. 2024 Nov 20;13(22):7000. doi: 10.3390/jcm13227000.

Epidemiology and Mortality of Surgical Amputations in Severely Injured Patients with Extremity Injuries-A Retrospective Analysis of 32,572 Patients from the TraumaRegister DGU®.

Scherer J, Hax J, Teuben MPJ, Pape HC, Lefering R, Sprengel K.

Background: Extremity fractures are common injuries in polytraumatized patients. Concomitant injuries to the soft tissue, vessels and nerves in these fractures are defined as mangled extremities. The decision for or against limb salvage is dependent on the patient's physiology and the limb status. In severely injured patients with critical physiological status, limb salvage may be contraindicated. International data on the epidemiology and management of mangled limbs in severely injured patients are lacking. Thus, the aim of this study was to assess the incidence of polytraumatized patients with severe injuries to either upper (UL) or lower limb (LL) as well as their management.

Methods: A retrospective cohort analysis was conducted of patients aged 16 years and above with an Injury Severity Score (ISS) ≥ 16 who sustained fractures to the limbs and were admitted to a certified trauma center of the TraumaRegister DGU® (TR-DGU) between 2009 and 2019.

Results: In total, we assessed 32,572 patients (UL: 14,567, mean age 48.3 years, 70% male and LL: 18,005, mean age 47.0 years, 70.5% male) The mean ISS in UL was 28.8 (LL 29.3). Fractures to the humerus ($n = 4969$) and radius ($n = 7008$) were predominantly assessed in UL, and fractures to the femur ($n = 9502$) and tibia ($n = 8076$) were most common in LL. In both groups, the most frequent injury mechanism was motor vehicle accidents, and more than half (UL: 9416 and LL: 11,689) of the patients had additional severe Abbreviated Injury Scale (AIS) ≥ 3 chest trauma. 915 patients in UL and 1481 in LL died within 24 h of the index admission. Surgical amputation occurred in 242 (UL) and 422 (LL) cases with a peak ratio in patients with an ISS above 50 in both groups. In both groups, patients with severe concomitant chest trauma were more often surgically amputated. In both groups, fewer patients with surgical amputations died within 24 h of admission (3.3% vs. 6.3% UL; 6.4% vs. 8.3% LL) compared to patients without amputation, but more patients with surgical amputations died within the overall hospital admissions (15.7% vs. 11.9% UL; 19.2% vs. 14.2%). In both groups, hemodynamical shock as well as the administration of Packed Red Blood Cells (PRBCs) were associated with a higher amputation rate.

Conclusions: Surgical amputations after major trauma seem to be rare. Hemodynamical instability seems to play a key role in the management of mangled limbs. Patients with life-saving surgical amputation still have an increased overall in-hospital mortality.

Injury. 2024 Oct;55(10):111734. doi: 10.1016/j.injury.2024.111734.

Gunshot injuries in Central Europe - Epidemiology and outcome in Germany, Switzerland and Austria - an analysis based on the TraumaRegister DGU®.

Scherer J, Jensen KO, Suda AJ, Lefering R, Kollig E, Pape HC, Bieler D.

BACKGROUND: Firearms are of special interest in trauma research due to high lethality and criminal value. Strong correlation between guns per capita and fire-arm related deaths has been shown. Most of existing literature regarding gunshot fatalities are from the U.S. and data for Central Europe is lacking. Thus, the aim of this study was to assess the legal frameworks regarding gun-ownership in Germany (DE), Austria (A) and Switzerland (CH), and to retrospectively analyze data from the TraumaRegister DGU® regarding the epidemiology, injury severity, intention and outcome of gunshot-related deaths in these countries.

METHODS: All patients from TR-DGU who sustained a gunshot injury in the time period from 1st January 2009 to 31st December 2019 were considered for analysis. Only cases admitted to level 1 or 2 trauma center in Germany, Switzerland, or Austria were included. Predicted mortality was calculated using the RISC-II. Further, the legal framework for firearm possession were explored.

RESULTS: The legal frameworks do not differ significantly between the countries. However, only ex-military men from Switzerland are allowed to keep their automatic (military) weapon at home. We assessed 1312 gunshot fatalities (DE 1,099, A 111, CH 102) of which most were due to suspected suicide (A 72.1 %, CH 64.7 %, and DE 56.6 %, $p = 0.003$). Act of suspected violent crime or accidental gunshots were rare in all three countries. Amongst all gunshot fatalities, Austria showed the highest mean age (57.6 years), followed by DE (53.4 years) and CH (49.4 years; $p < 0.01$). Gunshot fatalities amongst all assessed countries due to suspected suicide showed a peak at the age of 60 years and above, whereas suspected violent crime delicts with gunshots were mainly seen in younger age groups. The highest mortality was found in suspected suicide cases, showing a mortality of 82.1 % (predicted 65.2 %) in Switzerland, 75.3 % (predicted 65.8 %) in Austria and 63.7 % (predicted 56.2 %) in Germany.

CONCLUSION: Gunshot wounds are still rare in central Europe, but gunshot-related suicide rates are high. Gun ownership laws may have an impact on gunshot wounds due to suspected suicide. Injury patterns differ compared to countries where a high incidence of gun ownership is seen.

Eur J Trauma Emerg Surg. 2025 Mar 20;51(1):145. doi: 10.1007/s00068-025-02811-z.

Preventing the disaster: severe abdominal injury in child passengers of motor vehicle accidents often indicate even more serious trauma

Spering C, Lefering R, Bieler D, Hackenberg L, Dobroniak CC, Müller G, Lehmann W, Rütther H.

Purpose: The purpose of this study was to assess severe abdominal injury in child passengers of different ages of motor vehicle accidents and analyze the concomitant pattern of injury regarding injury severity, trauma management and outcome.

Method: Data acquisition from Trauma Register DGU® (TR-DGU) in a 10-years period (2010-2020) of seriously injured children (max. AIS 2+ / intensive care) 0-15 years of age, as motor vehicle passengers (cMVP) (n = 1,035). Primarily treated in or transferred to a German Trauma Center. Matched pairs analysis with adult severely injured motor vehicle passengers (aMVP) (age 20-50 years, n = 26,218), matching 1:4 (child: adult), was performed to identify causes of mortality.

Results: The study group (cMVP) included 1,035 children. The mean age was 9.5 years, 50.5% were male and the mean Injury Severity Score (ISS) was 18.7 points. 93.0% were transported from scene directly to the final trauma center. Transferred patients showed a higher ISS (26 vs. 18 points), higher rate of severe traumatic brain injury (TBI), a higher rate of serious abdominal injury and a higher mortality rate (12.5% vs. 7.4%). Most of the severe abdominal injuries occurred after the third year of age (first peak between 8 and 9 years; second peak 14-15 years). Serious injuries to the pelvis show a similar distribution but less often, the same applies to thoracical injuries. Severe brain and head injuries show an antiproportional distribution to the age groups with the highest rate in the 0-1 year old (78%) and the lowest in the 14-15 year old (40%). The highest mortality rate was shown in the youngest age groups, related to TBI (AISTBI ≥ 3 ; 62% in 0-1 years). The matched pairs analysis shows a higher mortality rate of cMVP compared to aMVP within the first 24 h after hospital admission and a significantly higher rate of shock and unconsciousness, while the intubation rate is significantly lower.

Conclusion: Child passengers of motor vehicle accidents are in need of a specific and age-related attention towards security systems. Severe injuries in children are rare, yet life threatening. The highest mortality rate is related to severe TBI, especially in the youngest children. But also severe abdominal as well as thoracic injuries their concomitant trauma need to be prevented and are indicators for even more severe injuries. It seems to be favorable for cMVP to be directly transported to designated special centers with sufficient capacity and competency to treat and manage severely injured children.

Aging Clin Exp Res. 2024 Aug 7;36(1):161. doi: 10.1007/s40520-024-02817-4.

Extremity fractures, attempted suicide, blood transfusion and thromboembolic events are independent risk factors for a prolonged hospital stay in severely injured elderly.

Störmann P, Hörauf JA, Sturm R, Zankena L, Zumsteg JS, Lefering R, Marzi I, Pape HC, Jensen KO; TraumaRegister DGU.

METHODS: Due to demographic change, the number of polytraumatized geriatric patients (> 64 years) is expected to further increase in the coming years. In addition to the particularities of the accident and the associated injury patterns, prolonged inpatient stays are regularly observed in this group. The aim of the evaluation is to identify further factors that cause prolonged inpatient stays. A study of the data from the TraumaRegister DGU® from 2016-2020 was performed. Inclusion criteria were an age of over 64 years, intensive care treatment in the GAS-region, and an Injury Severity Score (ISS) of at least 16 points. All patients who were above the 80th percentile for the average length of stay or average intensive care stay of the study population were defined as so-called long-stay patients. This resulted in a prolonged inpatient stay of > 25 days and an intensive care stay of > 13 days. Among other, the influence of the cause of the accident, injury patterns according to body regions, the occurrence of complications, and the influence of numerous clinical parameters were examined.

RESULTS: A total of 23,026 patients with a mean age of 76.6 years and a mean ISS of 24 points were included. Mean ICU length of stay was 11 ± 12.9 days (regular length of stay: 3.9 ± 3.1 d vs. prolonged length of stay: 12.8 ± 5.7 d) and mean inpatient stay was 22.5 ± 18.9 days (regular length of stay: 20.7 ± 15 d vs. 35.7 ± 22.3 d). A total of $n = 6,447$ patients met the criteria for a prolonged length of stay. Among these, patients had one more diagnosis on average (4.6 vs. 5.8 diagnoses) and had a higher ISS (21.8 ± 6 pts. vs. 26.9 ± 9.5 pts.) Independent risk factors for prolonged length of stay were intubation duration greater than 6 days (30-fold increased risk), occurrence of sepsis (4x), attempted suicide (3x), presence of extremity injury (2.3x), occurrence of a thromboembolic event (2.7x), and administration of red blood cell concentrates in the resuscitation room (1.9x).

CONCLUSIONS: The present analysis identified numerous independent risk factors for significantly prolonged hospitalization of the geriatric polytraumatized patient, which should be given increased attention during treatment. In particular, the need for a smooth transition to psychiatric follow-up treatment or patient-adapted rehabilitative care for geriatric patients with prolonged immobility after extremity injuries is emphasized by these results.

BMC Emerg Med. 2025 Mar 5;25(1):36. doi: 10.1186/s12873-025-01186-z.

Trends in analgesia in prehospital trauma care: an analysis of 105.908 patients from the multicenter database TraumaRegister DGU®).

Uzun DD, Stock JP, Steffen R, Knapp J, Lefering R, Schmitt FCF, Weigand MA, Münzberg M, Woelfl CG, Häske D

BACKGROUND: The management of pain in patients with traumatic injuries is a common task for emergency medicine providers, particularly in the prehospital setting. However, for sufficient and safe analgesia, correct pain recording and documentation is also necessary. The aim of this study was to assess trends in analgesia over the study period and to identify factors that may enable more sufficient pain management in trauma care.

METHODS: The TraumaRegister DGU® recorded data of patients who were primarily treated at one of the participating hospitals between 2011 and 2020 and received analgesia as part of their prehospital care. This retrospective analysis included a total of 105.908 severely injured patients from Germany, Switzerland, and Austria. Patients with and without analgesia were compared, and factors associated with analgesia were investigated with logistic regression analysis.

RESULTS: The mean age of the patients enrolled was 50 ± 22 years. 71% were male and 29% were female. Out of all the patients, 66% ($n = 70,257$) received prehospital analgesia. The average age of patients in the analgesia group was 48 ± 21 years, the non-analgesia group had an average age of 54 ± 23 years. 67% of the male patients received analgesia compared to 64% of the female patients. The mean Injury Severity Score (ISS) in the analgesia group was 21.2 points, compared to 16.5 points in the non-analgesia group. 4% of the patients were under the age of sixteen, and of these, 65% received analgesia. 29% of patients were older than 65 years and received analgesia in 57%. Presence of an emergency physician at scene, was a remarkable independent variable for the receipt of analgesia (Odds Ratio 5.55; $p < 0.001$). Transportation by helicopter was also a significant predictor for analgesia (OR 1.62; $p < 0.001$).

CONCLUSIONS: Analgesia is a crucial aspect of emergency medicine, as evidenced by relevant guidelines. Nevertheless, it is plausible that a considerable proportion of seriously injured patients do not receive optimal analgesic treatment, or at the very least, this is not documented. In this regard, both aspects require optimization.

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16 List of abbreviations

AIS	Abbreviated Injury Scale
ASA	American Society of Anaesthesiologists (classification)
AUC	AUC – Academy for Trauma Surgery (Akademie der Unfallchirurgie GmbH)
BE	Base excess
BGA	Blood gas analysis
CI	Confidence interval
CT	Computer tomography
cCT	Cranial computer tomography
CPR	Cardio-pulmonary resuscitation
DGU	German Trauma Society (Deutsche Gesellschaft für Unfallchirurgie e.V.)
DVT	Deep vein thrombosis
EMS	Emergency medical services
ER	Emergency room
FAST	Focused assessment with sonography for trauma
FFP	Fresh frozen plasma
GCS	Glasgow coma scale
h	Hours
ICU	Intensiv care unit
IFOM	Institute for Research in Operative Medicine (Institut für Forschung in der Operativen Medizin)
INR	International normalised ratio
ISS	Injury severity score
LOS	Length of stay
LTC	Local trauma centre
M	Mean
m	Metre
MAIS	Maximum AIS severity score
Max	Maximum
MCI	Mass casualty incident
MI	Myocardial infarction
[min]	Minute
Min	Minimum
ml	Millilitre
mmHg	Millimetre of mercury
mmol	Millimol
MOF	Multiple organ failure
NIS	Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society DGU (Sektion Notfall-, Intensivmedizin und Schwerverletztenversorgung (Sektion NIS) der DGU)
NISS	New injury severity score
No.	Number

OP	Operation
Pat.	Patients
phys.	physiological
PICUP	Prolonged ICU Prediction
PICUS	Prolonged ICU Stay
pRBC	packed red blood cells
QM	Quality management
REBOA	Resuscitative endovascular balloon occlusion of the aorta
RTC	Regional trauma centre
RISC	Revised injury severity score (prognostic score)
RR	Systolic blood pressure (according to Riva-Rocci in mmHg)
S	Standard dataset
sBP	Systolic blood pressure
SD	Standard deviation
SMR	Standardised mortality ratio
STC	Supra-regional trauma centre
tab.	table
TBI	Traumatic brain injury
TR-DGU	TraumaRegister DGU®
TXA	Tranexamic acid
vs.	versus
WBCT	Whole-body computer tomography