Committee on Emergency Medicine, Intensive Care and Trauma Management of German Trauma Society

AUC - Academy for Trauma Surgery

Annual Report 2018

TraumaRegister DGU®

for the time period until end of 2017

TR-DGU

All hospitals

DEUTSCHE GESELLSCHAFT FÜR UNFALLCHIRURGIE

AUC Akademie der Unfallchirurgie GmbH

Annual Report 2018 - TraumaRegister DGU®

for the time period 2017

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Editors:

Dr. Ing. Christine Höfer
AUC – Academy for Trauma Surgery
Registries and Research Coordination
Ostmerheimer Str. 200, Haus 23
51109 Köln
www.auc-online.de
E-Mail: support-tr@auc-online.de
Phone: +49 221 888239-10

Professor Dr. Rolf Lefering
Institute for Research in Operative Medicine (IFOM)
Faculty for Health of Witten/Herdecke University
Ostmerheimer Str. 200
51109 Köln
E-Mail: rolf.lefering@uni-wh.de
Phone: +49 221 98957-19

Thanks for the outstanding collaboration during the preparation goes to:

AUC Office Registries and Research Coordination: R. Volland, U. Nienaber

Working group TraumaRegister of the Committee on Emergency Medicine, Intensive Care and Trauma Management (Sektion NIS) of the German Trauma Society (DGU). (Head: Professor Dr. S. Huber-Wagner)

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Preface

Dear participants in TraumaRegister DGU®,

we are pleased to hand you the **2018 annual report** of TraumaRegister DGU® for your hospital. This issue includes - as usual - the data analysis for the seriously injured in 2017 (basic group), which you have documented until the end of March 2018. This basic group, in the sense of the TraumaRegister DGU® definition of a seriously injured person, counts 34.897 cases in 2017.

The documentation of a total of 43.289 patients also includes patients with less severe injuries (e.g. concussion). For reasons of better comparability, these are not included in the scientific analysis.

With a total of 675 hospitals participating in TraumaRegister DGU® at the end of 2017, this is a comparable number to previous years. In addition to the 620 hospitals from Germany, there are participating hospitals from eight other countries in the registry. Of these, 24 hospitals come from Austria, 11 from Switzerland and 7 from Belgium.

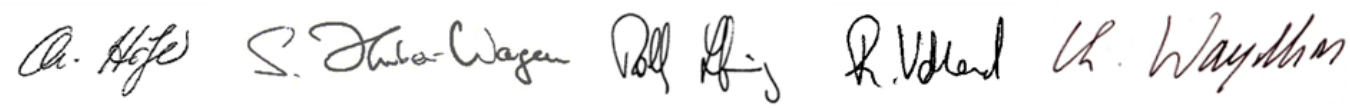
What is new in the 2018 annual report?

At the suggestion of one hospital, in chapter 5, the variable „patient' volition" was added to the presentation of the deceased with a favourable prognosis.

With the adaptation of the layout and a more reader-friendly structuring, the report aims to give you an even better overview of your results.

We very much hope that the annual report – in terms of healthcare research - will provide you all in your hospitals with findings that can contribute to further improve the treatment of seriously injured patients in Germany.

Yours sincerely



Christine Höfer Stefan Huber-Wagner Rolf Lefering Ruth Volland Christian Waydhas

1 Number of cases

Admission via the emergency room and need for intensive care are the official inclusion criteria for documenting a patient in the TraumaRegister DGU® (TR-DGU). 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 injuries.

However, in recent years, the number of patients with only minor injuries continuously increased. On the one hand, this means a higher workload, but more important it limits also the comparability of findings both between hospitals and over time. Therefore, a **„basic group"** has been defined in 2015, and nearly all analyses presented in this report refer to this patient group only (and not to all documented patients).

The severity of an injury is determined by the Abbreviated Injury Scale (**AIS**) which assigns a severity grade from 1 (minor) to 6 (maximal) points to each injury. Using these severity grades, more sophisticated measures like the maximum AIS (**MAIS**), the Injury Severity Score (**ISS**) or the New ISS (**NISS**) could be derived.The **basic group** is defined as:

All patients with MAIS ≥ 3 are included as well as MAIS 2 patients that have died or were treated on the intensive care unit (patients also have to have valid age data).

The following table gives an overview about the number of cases of the last year.

Table 1: Number of cases in 2017 your hospital *vs.* TR-DGU

	Your hospital 2017	primary admitted	transfer in	early transfer out	**TR-DGU 2017**
Total number of documented patients	**43.289**	37.158	3.310	2.821	43.289
MAIS 1 The most severe injury of these patients were of AIS grade 1 (MAIS = 1). Thus they were not severely injured. Furthermore, the RISC II prognostic score has not been validated for these cases. These cases were excluded from further analysis (except chapter 5.3)	**5.469** (13%)	5.249	41	179	5.469 (13%)
MAIS 2 The worst injury was of AIS grade 2	**9.610** (22%)	8.710	358	542	9.610 (22%)
MAIS 3+ The worst injury was of AIS grade 3 or more (MAIS 3+) which recently was defined as a *„serious injury"* by the EU when looking for an internationally agreed definition for road traffic research.	**28.183** (65%)	23.180	2.905	2.098	28.183 (65%)
Intensive care Patients who required intensive care due to their injuries (admission to ICU)	**33.220** (77%)	29.121	2.999	1.100	33.220 (77%)
Deceased These patients died in the acute care hospital	**3.607** (8%)	3.206	401	0	3.607 (8%)
Basic group This definition includes all MAIS 3+ patients. MAIS 2 patients were included only if they died or were treated on the intensive care unit. Patients also have to have valid age data	**34.897** (81%)	**29.396**	**3.201**	**2.300**	**34.897** (81%)
ISS 16+ The definition ISS ≥ 16 (or > 15) is used in many scientific papers on trauma patients	**18.805** (43%)	14.999	2.284	1.522	18.805 (43%)
Life-threatening severe injury Injury severity (ISS ≥ 16) is combined with physiological consequences as done with the new „polytrauma" definition (Paffrath et al. 2014, Pape et al. 2014)	**10.576** (24%)	8.667	1.133	776	10.576 (24%)
Polytrauma According to the „Berlin Definition" two body regions need to be severely affected (MAIS 3+ in each), and one or more physiological problems are present (Pape et al. 2014)	**4.996** (12%)	4.265	424	307	4.996 (12%)

2 Observed mortality and prognosis

Comparing the observed **mortality** of severely injured trauma patients with their **prognosis** is a central element of quality assessment in the TraumaRegister DGU®. Here the prognosis is derived from the newly developed **RISC II** prognostic score (Revised Injury Severity Classification; Lefering et al. 2014). This score can be calculated for all primary admitted patients. The analysis in chapter 2 is limited to the **basic group** as defined on page 5.

No. of patients of your hospital (basic group) documented in the last 10 years (2008-2017)	n = **240.383**
- among them, documented last year (2017)	n = **34.897**
- among them, primary admitted cases (no transfer in; no early transfer out)	n = **29.396**

Comparisons of outcome and prognosis will be performed for **primary admitted patients** only (Figure 1). For patients **transferred in** from another hospital (n = 3.201 in 2017) initial status from primary admission is missing; patients **transferred out early** (within 48 hours after admission; n = 2.300 in 2017) have no final outcome documented.

The mean age of the 29.396 patients was 51,6 years, and 70% were males. The mean ISS was 17,8 points. Of these patients 3.182 died in hospital, which was **10,8%** (95% confidence interval: 10,5 - 11,2). The risk of death prognosis based on RISC II was **10,1%**. You find these values in figure 1, where also your hospital results from previous years are presented together with the overall result in the registry.

Details and definition of data quality are given on the following page.

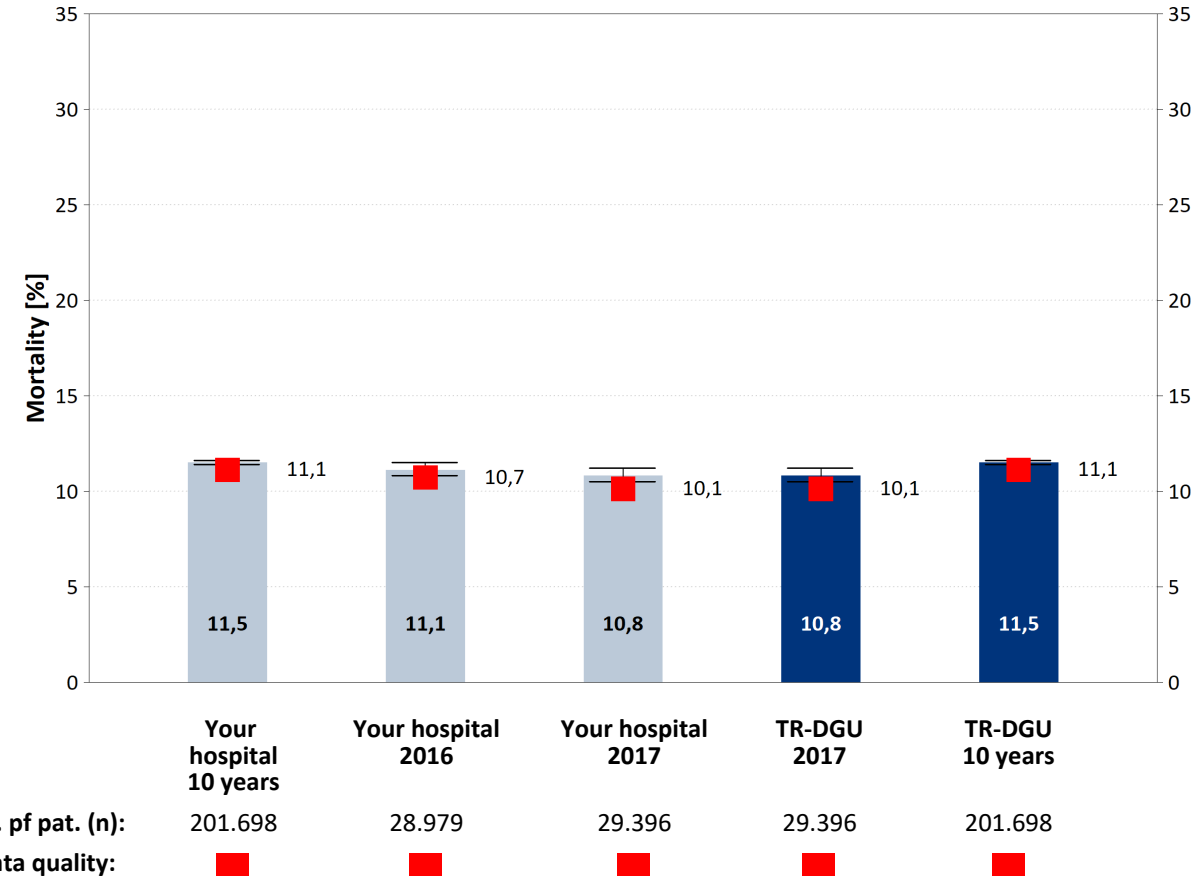


Figure 1: Observed mortality and risk of death prognosis

Legend to the figure:
The bars represent the observed mortality rate; percentages are given at the bottom of each bar. The predicted mortality rate based on RISC II is given as a grey vertical **bar**. This bar 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 should be considered that these findings depend on statistical uncertainty. Therefore, the 95% confidence interval (CI) for the observed mortality rate is given as well (vertical line). The CI describes a range of values which cover the „true" value with a high probability (95%). The more patients a value is based on, the narrower is the CI. If the observed mortality rate is based on less than 5 cases, the large CI will not be presented.

Data quality of prognosis

The validity of a prognosis depends on the quality and the completeness of variables required for its calculation. The **RISC II score** requires 13 different items of information to be calculated. Since the revision of the dataset in 2015, all required 13 informations are also recorded by the reduced QM dataset (in the past 11). The only compulsory components are age and injury severity, however, every additional information about the patient makes the outcome prediction more precise.

Therefore, supplementary information about the data quality of the prognosis is provided here. If all data required for calculation of the RISC II 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:

- means: **95 - 100%** of cases were well documented,
- means: **80 - 94%** of cases were well documented,
- means: **less than 80%** of cases were well documented.

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

	Your hospital 10 years	Your hospital 2016	Your hospital 2017	TR-DGU 2017	TR-DGU 10 years
Total no. of cases (n)	201.698	28.979	29.396	29.396	201.698
„well documented" (n)	154.197	22.301	23.703	23.703	154.197
(%)	76	77	81	81	76
Data quality colour code					
Average no. of missing values per patient	1	1	0,8	0,8	1

Mortality *vs.* prognosis

Your hospital 2017:	Patients in the basic group:	**29.396**	primary admitted cases
	Deviation between mortality and prognosis:	**+0,7%**	(TR-DGU: 0,7%)

Figure 2 compares each hospital's **observed mortality** with the respective **RISC II prognosis in 2017**. The **deviation** of the observed mortality from the expected prognosis is plotted against the number of patients. Negative values correspond to lower than expected mortality rates. The blue lines represent the 95% confidence interval. Hospitals with **less than 5 patients** were not included due to the large statistical uncertainty.

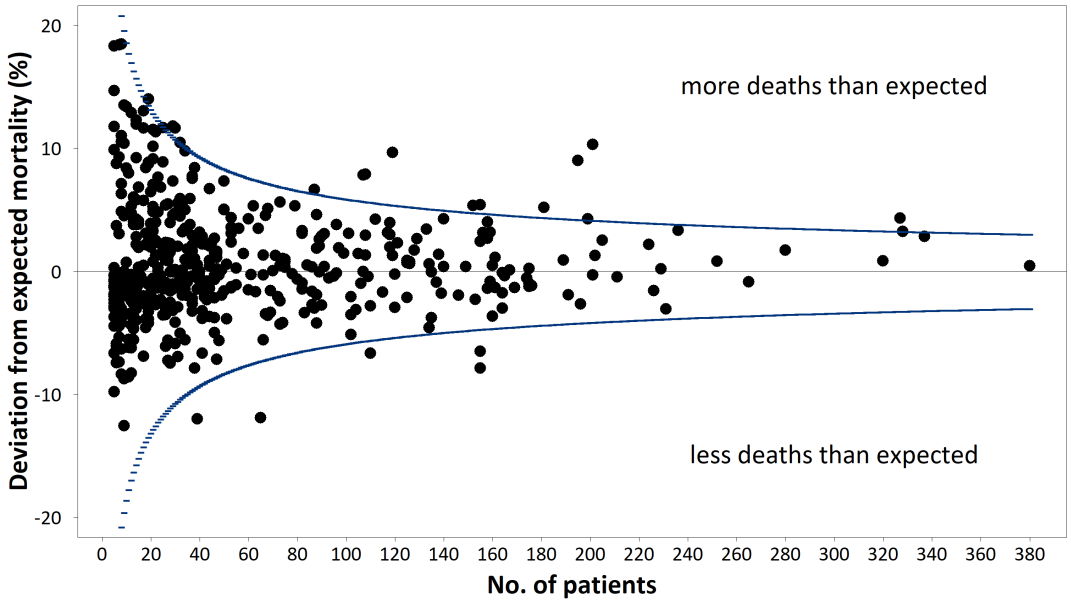


Figure 2: Observed mortality *vs.* RISC II prognosis in 2017

3 Basic data from the last 3 years

The results in table 3 refer to the **basic group** only excluding patients with minor injuries and survivors without intensive care treatment. Attention: Results have to be interpreted with caution when the number of patients is < 5!

Table 3: Overview over the data from your hospital in the basic group from the last 3 years

		Your hospital				TraumaRegister DGU®	
		10 years	2015	2016	**2017**	2017	10 years
Total number of patients	[n]	240.383	33.222	34.338	**34.897**	34.897	240.383
Primary admitted and treated patients	[n]	201.698	27.862	28.979	**29.396**	29.396	201.698
Patients early transferred out	[n]	15.249	2.257	2.274	**2.300**	2.300	15.249
All primary admissions	[n]	216.948	30.119	31.253	**31.696**	31.696	216.948
Patients transferred in	[n]	23.435	3.103	3.085	**3.201**	3.201	23.435
Demography (patients from the basic group)							
Mean age	[years]	50,1	51,4	51,4	**51,9**	51,9	50,1
70 years or older	[%]	24,3	26,4	26,1	**26,2**	26,2	24,3
Amount of men	[%]	70,3	69,1	70,2	**69,8**	69,8	70,3
Trauma (patients from the basic group)							
Blunt trauma	[%]	95,8	96,1	96,1	**95,9**	95,9	95,8
Mean ISS	[points]	19,1	18,4	18,5	**18,2**	18,2	19,1
ISS ≥ 16	[%]	56,7	54,2	55,1	**53,9**	53,9	56,7
TBI (AIS head ≥ 3)	[%]	38,2	37,1	37,8	**36,2**	36,2	38,2
prehospital care (only primary admissions)							
Intubation by emergency physician	[%]	25,4	22,3	21,8	**20,6**	20,6	25,4
Unconscious (GCS ≤ 8)	[%]	18,4	17,1	17,3	**16**	16	18,4
Shock (RR ≤ 90 mmHg)	[%]	10,4	9	8,5	**8,1**	8,1	10,4
Average amount of volume	[ml]	722	656	651	**638**	638	722
Emergency room care (only primary admissions)							
Whole-body CT	[%]	75,9	77,2	78,4	**79**	79	75,9
X-ray of thorax	[%]	39,3	36,2	33,9	**30,2**	30,2	39,3
Patients with blood transfusion	[%]	9,2	7,6	7,4	**7,1**	7,1	9,2
Treatment in hospital (patients from the basic group)							
Patients with surgery [4]	[%]	68,2	66,4	66,4	**66,3**	66,3	68,2
if yes, no. of pat. with surgery [1]	[n]	3,5	3,3	3,3	**3,3**	3,3	3,5
Patients treated on ICU	[%]	87,4	87,5	87,6	**87,6**	87,6	87,4
Length of stay on ICU [2]	[days]	6,9	6,4	6,5	**6,2**	6,2	6,9
Intubated/ventilated patients on ICU [2]	[%]	43,3	39,1	38,3	**35,8**	35,8	43,3
Length of intubation [2]	[days]	3,3	2,9	2,9	**2,6**	2,6	3,3
Outcome (patients from the basic group)							
Length of stay in hospital [3]	[days]	17,1	15,8	16	**15,4**	15,4	17,1
Hospital mortality [3]	[%]	11,5	11,3	11,2	**11**	11	11,5
Multiple organ failure [1] [3]	[%]	21,5	20,5	20,4	**18,7**	18,7	21,5
Discharge to other hospital	[%]	17,4	17,6	17,9	**17,8**	17,8	17,4

[1] not available in the reduced QM dataset [2] only ICU patients [3] without patients transferred out early

[4] years with less than 20% patients with surgery are excluded

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 **primary admitted cases only from the basic group in 2017** (your hospital = 29.396) with valid data, or respective subgroups thereof. This includes early transfer out cases.

For each indicator the distribution of all participating hospital values is presented graphically. The grey box covers 80% of all hospital values, with the median (50%) value in the middle. The range of values for the 10% best and worst hospitals is given in green and red colour, respectively. Your hospital value is marked with a blue diamond.

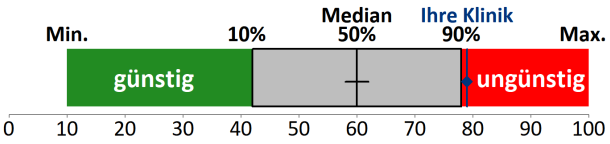


Figure 3: Example image

4.1 Prehospital indicators

4.1.1 Prehospital time

The faster a patient reaches a trauma center, the earlier life-saving interventions could be performed. Only patients with ISS ≥ 16 were included here. The time period from accident until hospital admission in minutes is presented as an average value. Implausible time values < 5 minutes and > 4 hours were excluded.

	Patients	Mean	Min-Max
Your hospital:	12.603	65 min.	5-240 min.
TR-DGU:	12.603	65 min.	5-240 min.

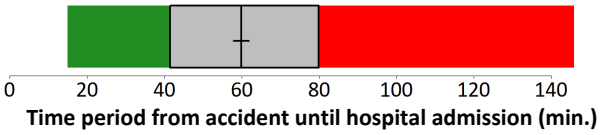


Figure 4: Distribution of the mean duration from accident until hospital admission over all hospitals

4.1.2 Capnometry in intubated patients

A capnometry in intubated patients allows to detect a malpositioning of the tubus. Only patients with a prehospital endotracheal intubation with valid data for capnometry were considered here (available since 2016). Intubated patients without data to the capnometry could not be analysed.

	Intubated pat. with capnometry	Amount	Information capnometry is missing
Your hospital:	3.599 of 4.290	84%	(n = 1.962)
TR-DGU:	3.599 of 4.290	84%	(n = 1.962)

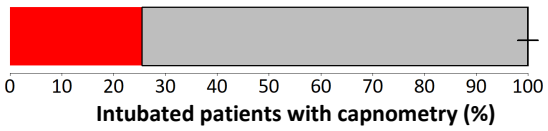


Figure 5: Distribution of the capnometry rate in intubated patients over all hospitals

4.1.3 Intubation of unconscious patients

The prehospital intubation of unconscious patients grants the oxygen supply until the hospital is reached. Only patients with a prehospital documented GCS ≤ 8 were considered here, independent from the injury severity. A missing information about intubation was considered as „no intubation", but an alternative airway counts as „yes".

	Unconscious pat.	Thereof intubated	Ratio intubated pat.
Your hospital:	4.676	3.948	84%
TR-DGU:	4.676	3.948	84%

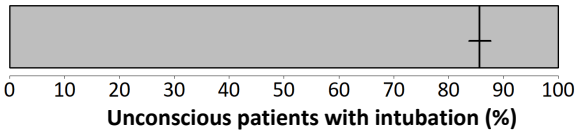


Figure 6: Distribution of the intubation rate in unconscious patients over all hospitals

4.1.4 Pelvic binder in pelvic fracture

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

	Pat. with pelvic fracture	Thereof with pelvic binder	Ratio pelvic binder
Your hospital:	1.464	450	31%
TR-DGU:	1.464	450	31%

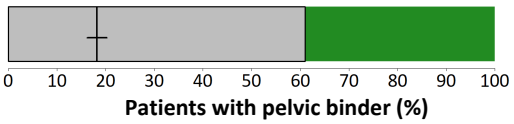


Figure 7: Distribution of the pelvic binder rate in patients with an instable pelvic fracture over all hospitals

4.2 Times in the emergency room

4.2.1 Time period to 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 without loss of time. Time periods > 2 hours are excluded. All patientes who received a whole-body CT are considered here.

	Patients	Mean	Min-Max
Your hospital:	24.347	22 min.	1-120 min.
TR-DGU:	24.347	22 min.	1-120 min.

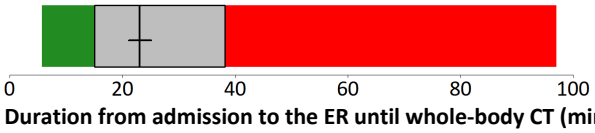


Figure 8: Distribution of the mean duration from admission to the ER until whole-body CT over all hospitals

4.2.2 Time period until first emergency surgery

Eight different emergency interventions are documented in TR-DGU (surgical liquor drain or brain decompression, laminectomy, thoracotomy, laparotomy, revascularisation, embolisation, 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 > 2 hours are excluded.

	Patients	Mean	Min-Max
Your hospital:	5.044	73 min.	1-120 min.
TR-DGU:	5.044	73 min.	1-120 min.

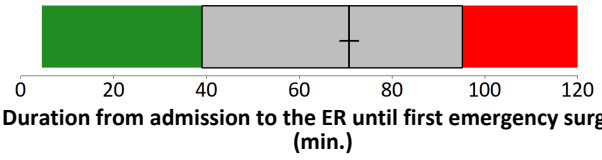


Figure 9: Distribution of the mean duration from admission to the ER until the first emergency surgery over all hospitals

4.2.3 Time period to 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 over 2 hours are excluded.

	Pat. with penetrating trauma	Thereof with surgery	Mean
Your hospital:	1.284	499	66 min.
TR-DGU:	1.284	499	66 min.

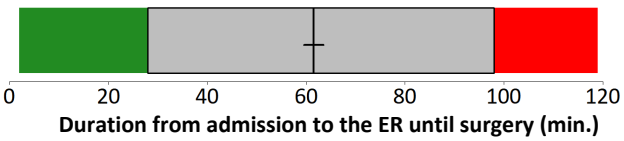


Figure 10: Distribution of the mean duration from admission to the ER until surgery in patients with penetrating trauma over all hospitals

4.2.4 Time period to surgery in patients with shock

Time period from admission to the ER to first surgical intervention (list of procedures, see 4.2.3) in patients with shock, defined as systolic blod pressure ≤ 90 mmHg. Time periods over 2 hours were excluded.

	Pat. with shock	thereof with surgery	Mean
Your hospital:	2.199	732	68 Min.
TR-DGU:	2.199	732	68 Min.

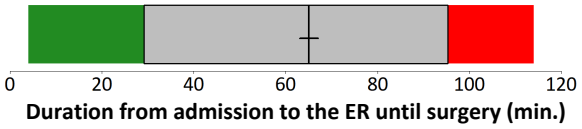


Figure 11: Distribution of the mean duration from admission to the ER until surgery in patients with shock over all hospitals

4.2.5 Time period to start of blood transfusion

If blood substitution is necessary this should be done as early 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 2 hours are excluded.

	transfused patients	Thereof with valid transfusion time	Mean
Your hospital:	2.237	1.425	48 min.
TR-DGU:	2.237	1.425	48 min.

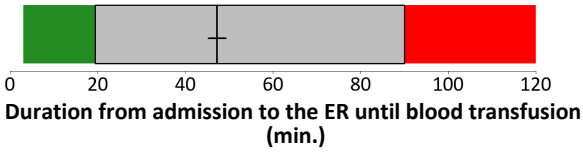


Figure 12: Distribution of the mean duration from admission to the ER until start of the transfusion over all hospitals

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 operated cases with a valid time to surgery (max. 2 hours) are considered here.

	Pat. with severe TBI	Thereof with valid surgery time	Mean
Your hospital:	2.809	757	71 min.
TR-DGU:	2.809	757	71 min.

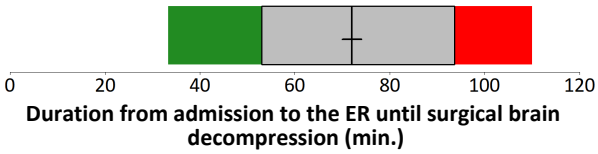


Figure 13: Distribution of the mean duration from admission to the ER until surgical brain decompression over all hospitals

4.3 Diagnostics and interventions

4.3.1 Cranial CT (cCT) with GCS < 14

A reduced consciousness could be indicative for a TBI and should be investigated with a cranial CT (cCT) or whole-body CT. All patients with a GCS < 14 will be included, either prehospital or on admission (if not intubated). Patients who died within the first 30 minutes between admission to the ER and cCT / whole-body CT are excluded. A missing value regarding cCT / whole-body CT is considered as „not performed".

	Pat. with GCS < 14	Thereof with cCT	Ratio cCT
Your hospital:	9.741	9.390	96 %
TR-DGU:	9.741	9.390	96 %

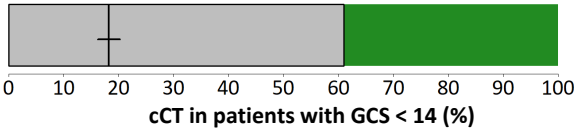


Figure 14: Distribution of the cCT rate in patients with GCS < 14 over all hospitals

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 with no documented whole-body CT / cCT are included. A missing value regarding the FAST is considered as „not performed".

	Pat. without whole-body CT / cCT	Thereof with FAST	Ratio FAST
Your hospital:	2.866	2.024	71 %
TR-DGU:	2.866	2.024	71 %

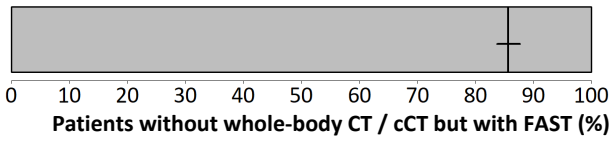


Figure 15: Distribution of the sonography rate in patients without whole-body CT / ccT over all hospitals

4.3.3 Prehospital tranexamic acid in patients with blood transfusion

Based on a randomized trial, tranexamic acid (TXA) is assumed to reduce amount or even avoid the blood transfusion or the transfused volume. Therefore, patients who required a blood transfusion should have been given TXA perviously. 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".

	Pat. with transfusion	Thereof with preclinical TXA	Ratio prehospital TXA
Your hospital:	2.237	488	25 %
TR-DGU:	2.237	488	25 %

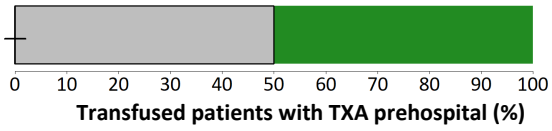


Figure 16: Distribution of the prehospital tranexamic acid rate in transfused patients over all hospitals

4.3.4 Tranexamic acid in the ER in patients with blood transfusion

Actually, tranexamic acid in the ER is recorded only 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".

	Pat. with transfusion	Thereof with TXA in ER	Ratio TXA in ER
Your hospital:	1.591	952	60 %
TR-DGU:	1.591	952	60 %

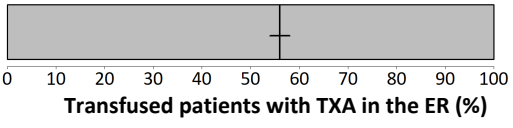


Figure 17: Distribution of the TXA admission rate in the ER in transfused patients over all hospitals

4.4 Data quality

4.4.1 Blood gas analysis performed / BE 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 patient files. Specifically the base excess (BE) is an important outcome predictor that is used in the RISC II prognostic score. Detailed results regarding the completeness of data are presented in chapter 9. 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 and the amount of valid BE values is calculated. BE values less than -50 mmol/l or greater than 20 mmol/l are excluded.

	Patients	Thereof with BE	Ratio documented BE
Your hospital:	29.396	23.635	80 %
TR-DGU:	29.396	23.635	80 %

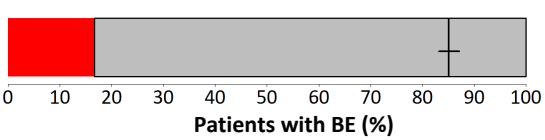


Figure 18: Distribution of the patient rate with documented BE over all hospitals

5 Individual cases

5.1 Non-survivors with a low risk of death (< 15% according to RISC II)

Patients from the **basic group** who **died** in hospital although their initial **prognosis to die** (based on the RISC II score) seemed to be rather low are listed here. In total, 628 of such cases were observed in the whole registry in 2017.

A low risk of death does not mean that none of these patients would die; however, this does not happen very often. Therefore, a detailed analysis of such cases may lead to relevant quality problems during the acute care of these patients. But this could only be judged in a more detailed individual analysis of these cases.

Your hospital: Among the 37.158 primary admitted cases, **26.633 patients had a risk of death < 15%. From these cases** 628 patients died. They are listed in the following table (LOS = length of stay).

Table 4: Non-survivors with a low risk of death

Patient ID*	RISC II	ISS	Age	Sex	Date of admission	LOS in the hospital	Patients volition

5.2 Survivors with a high risk of death (> 70% according to RISC II)

Patients who **survived** although their risk to die was rather high (> 70%) could be indicative for a **very well functioning interdisciplinary approach in acute care**. Overall, 227 such cases were observed in the total registry in 2017. Again, details could only be found after individual analysis of each case. Because of the RISC II prognosis only primary admitted patients are considered here. That means, patients transferred into another hospital within the first two days were disregarded.

Your hospital: Among the 37.158 primary admitted cases, **1.572 patients** had a risk of death > 70%. The **survivors** among these patients (**n = 227**) are listed below.

Table 5: Survivors with a high risk of death

Patient ID*	RISC II	ISS	Age	Sex	Date of admission	LOS in the hospital

5.3 Non-survivors with minor injuries (MAIS 1)

In 2017 there were 5.469 patients with the most severe injury of AIS severity grade = 1 (MAIS 1). These patients are **excluded** from the **basic group**. Although such patients usually survive, we observed 23 deaths in this subgroup (0,4%). These cases should be subject of a detailed internal revision, including the correctness and completeness of injury coding.

Your hospital: **5.469 patients** had a max. AIS = 1; **23 of them died**.

Table 6: Non-survivors with minor injuries

Patient ID*	ISS	Age	Sex	Date of admission	LOS in the hospital	Patients volition

* The ID corresponds to your individual patient code as recorded in the data base.

6 Graphical Comparisons

6.1 Documented patients of your hospital in the last 10 years

The following figure presents the number of documented trauma patients in the last ten years. Only cases from the **basic group** are considered here (see page 5 for definition). From your hospital **240.383 patients** were documented in the last 10 years, among them **34.897 patients from 2017**.

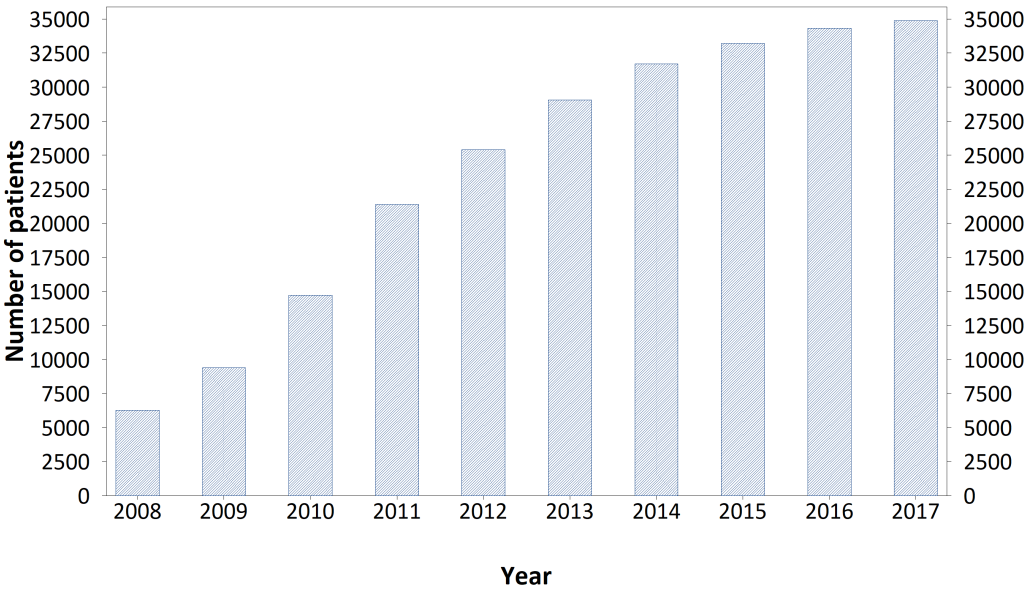


Figure 19: Documented patients of your hospital from 2008-2017

6.2 Number of patients within the level of care

In 2017, your hospital documented **34.897 patients** in the basic group. The value of your hospital within your level of care is marked with a **blue diamond with a line**. The values in figure 20 represent the median (vertical line), the interquartile range (grey box) and minimum / maximum. Hospitals without a TraumaNetzwerk DGU® certification are excluded here.

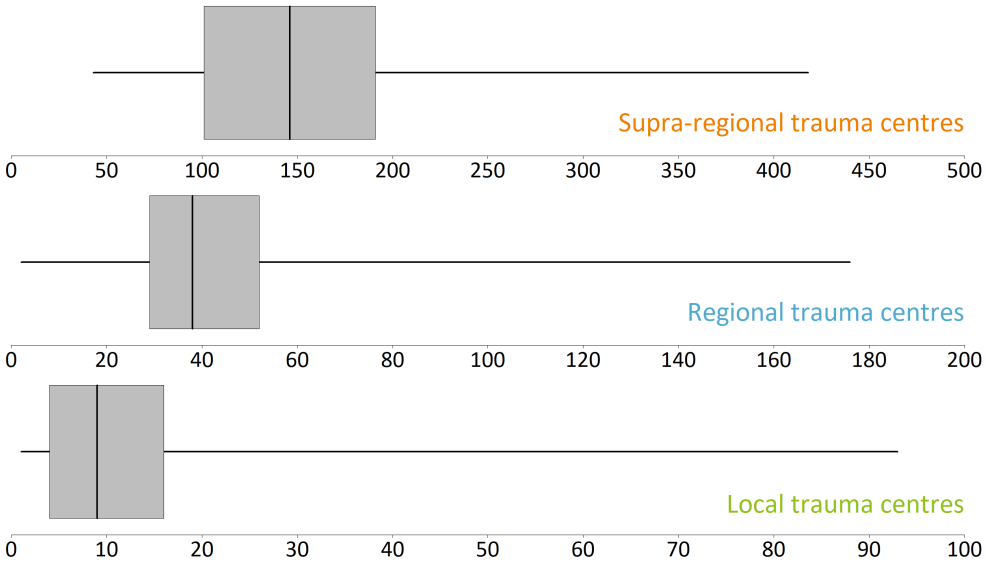


Figure 20: Number of your hospital patients within the level of trauma care

6.3 Graphical comparisons with other hospitals 2017

The following figures compares selected informations of your patients from 2017 with respective data from all other hospitals in the TraumaRegister DGU®. Only cases from the **basic group** will be considered (see page 5). In contrast to chapter 3, only hospitals are analysed where **at least 3 patients** were available. Your hospital's value is indicated as a **red point**. The horizontal line is the median value of all hospitals and the broken lines are the 10% and 90% percentiles.

Age (mean) Your hospital: **51,9 years** (34.836 patients)

The median age value of all 626 hospitals in 2017 (**with at least 3 cases**) was 52,6 years.

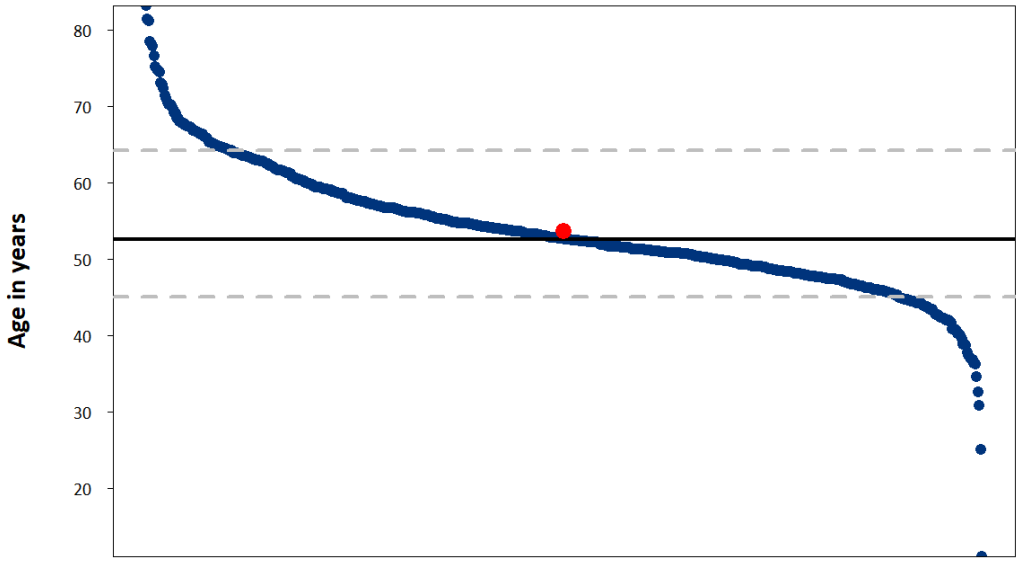


Figure 21: Distribution of the mean age over all hospitals

Hospital mortality (%) Your hospital: **10,3%** (3.572 of 34.729 patients)

Only primary admitted patients and those transferred in are considered here. Early transfers out (within 48 h) are excluded. The median mortality rate of all 600 hospitals in 2017 (with at least 3 cases) is 7,7%.

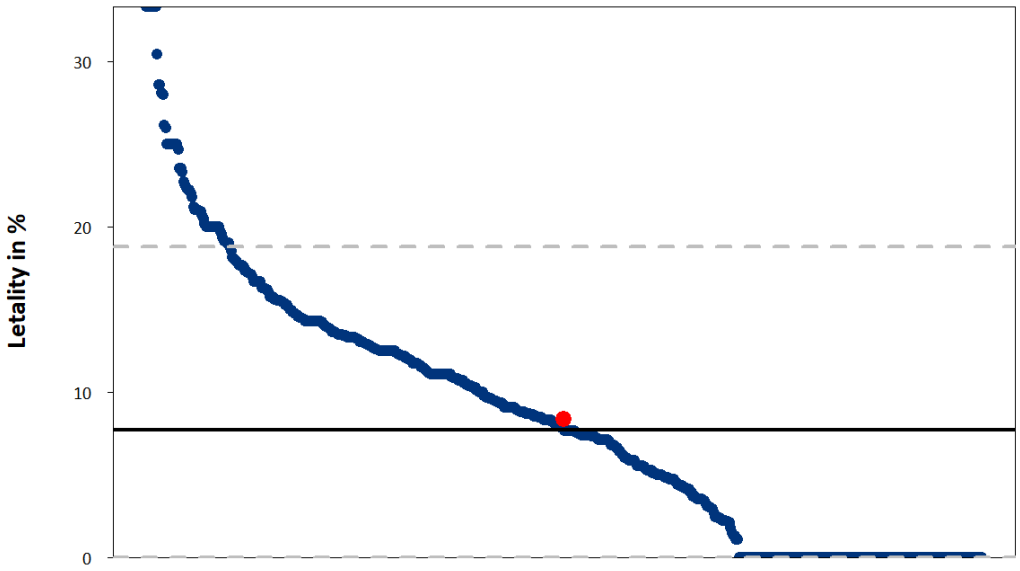


Figure 22: Distribution of the mortality rate over all hospitals

Prehospital time period (mean in min.) Your hospital: **66,2 min.** (25.430 patients)

Your hospital value is based on 25.430 of **31.696 primary admitted patients** from the basic group with valid time points for both accident **and** hospital admission. Time periods below 5 minutes or above 4 hours are disregarded.
The median value of all 606 hospitals with at least 3 valid cases in 2017 is 58 minutes.

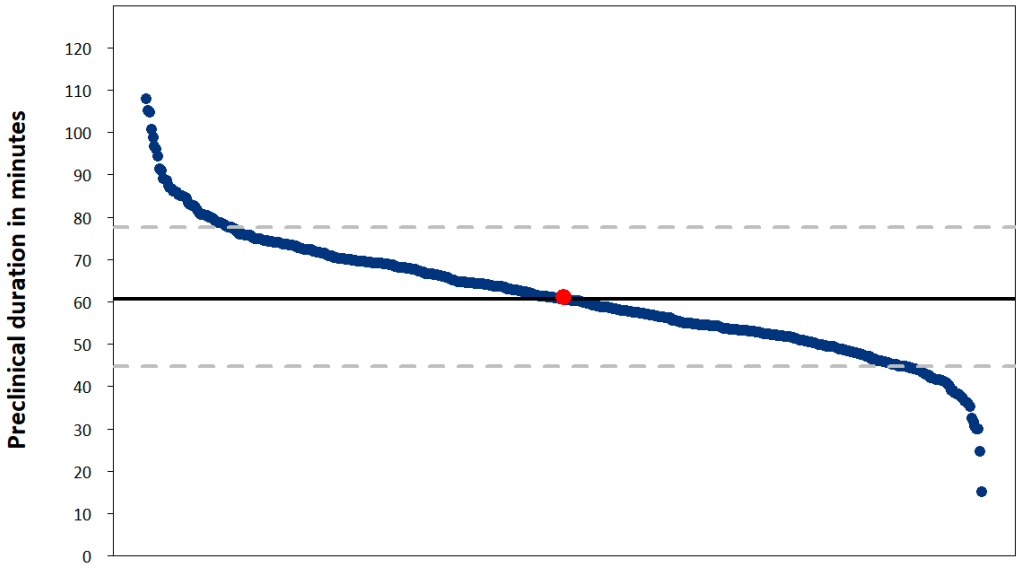


Figure 23: Distribution of the mean prehospital duration over all hospitals

6.4 Length of stay and injury severity

The length of stay of the patients is very variable and depends on diverse factors. Figure 24 describes the association between the average length of stay (LOS) in hospital and injury severity (ISS). The mean value is calculated for survivors from the basic group. Patients transferred to another hospital (n= 5.567) are excluded here. Hospitals with **less than 3 patients** are **not** displayed in the figure due to their statistical uncertainty.

Your hospital 2017:

Your value is based on:

25.748 patients

Length of stay: **16,4 days**

ISS: **16 points**

TR-DGU 2017:

Patients: 25.748

Length of stay: 16,4 days

ISS: 16 points

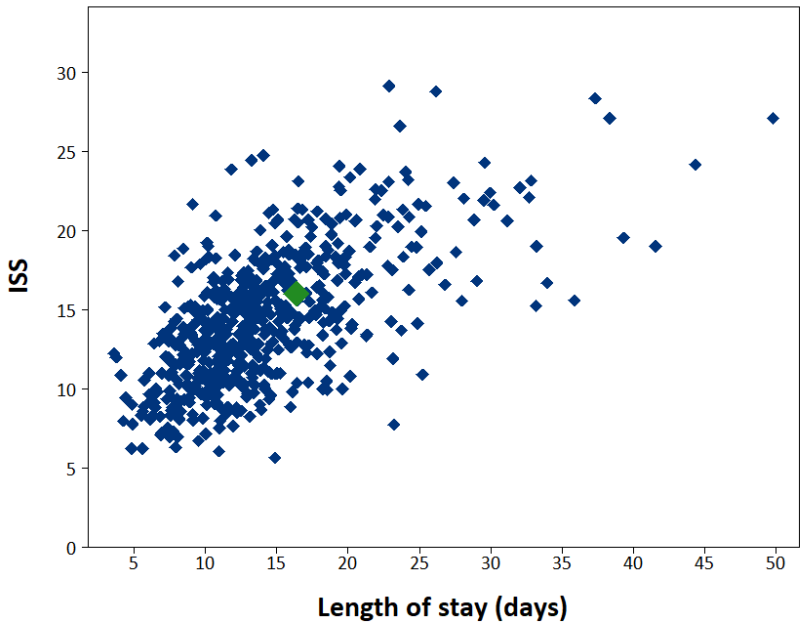


Figure 24: Association between length of stay and injury severity over all hospitals

7 Basic data of trauma care

The following pages present basic data from the trauma care of the actual year 2017. Your hospital data refer to patients from the **basic group** (see page 5). Comparison groups are respectively data from the TraumaRegister DGU® basic group of the same year (**TR-DGU 2017**) and of the last 10 years 2008-2017 (**TR-DGU 10 years**).

Table 7: Data of your hospital and the TR-DGU to patients, accident and findings at the accident scene

(S) Patient and accident	Your hospital 2017		TR-DGU 2017		TR-DGU 10 years	
Patients of the **basic group** (n)	34.897		34.897		240.383	
Primary admissions / transfers	%	n	%	n	%	n
Primary admitted	**90,8%**	31.696	**90,8%**	31.696	**90,2%**	216.948
among these transferred out within 48 h	**6,6%**	2.300	**6,6%**	2.300	**6,3%**	15.249
Transferred in within 24 h after accident	**8,3%**	2.903	**8,3%**	2.903	**8,7%**	20.977
Transferred in after 24 h	**0,8%**	298	**0,8%**	298	**1%**	2.458
Patient characteristics	**M** ± SD*/%	n	**M** ± SD*/%	n	**M** ± SD*/%	n
Age [years]	**51,9** ± 22,6	34.897	**51,9** ± 22,6	34.897	**50,1** ± 22,4	240.383
Children under 16 years	**4%**	1.413	**4%**	1.413	**4,1%**	9.858
Elderly over 70 years	**26,2%**	9.152	**26,2%**	9.152	**24,3%**	58.426
Males	**69,8%**	24.368	**69,8%**	24.368	**70,3%**	168.512
ASA 3-4 prior to trauma (since 2009)	**18,4%**	5.916	**18,4%**	5.916	**16,3%**	33.021
Mechanism of injury	%	n	%	n	%	n
Blunt	**95,9%**	32.057	**95,9%**	32.057	**95,8%**	218.744
Penetrating	**4,1%**	1.371	**4,1%**	1.371	**4,2%**	9.551
Type and cause of accident	%	n	%	n	%	n
Traffic: car	**20,7%**	7.134	**20,7%**	7.134	**21,5%**	50.443
Traffic: motor bike	**12,5%**	4.322	**12,5%**	4.322	**12,4%**	29.215
Traffic: bicycle	**9,4%**	3.265	**9,4%**	3.265	**8,9%**	20.931
Traffic: pedestrian	**5,9%**	2.036	**5,9%**	2.036	**6,5%**	15.273
High fall (> 3m)	**14,3%**	4.943	**14,3%**	4.943	**15,8%**	37.066
Low fall (≤ 3m)	**26,2%**	9.042	**26,2%**	9.042	**23,4%**	54.911
Suicide (suspected)	**4,4%**	1.491	**4,4%**	1.491	**4,6%**	10.560
Assault (suspected)	**2,7%**	928	**2,7%**	928	**2,5%**	5.771

Time point A: Findings at the accident scene	Your hospital 2017		TR-DGU 2017		TR-DGU 10 years	
Results only for **primary admitted** patients (n)	31.696		31.696		216.948	
Vital signs	**M** ± SD*	n	**M** ± SD*	n	**M** ± SD*	n
Systolic blood pressure [mmHg]	**134** ± 32,8	27.617	**134** ± 32,8	27.617	**130,6** ± 33,5	189.022
Respiratory rate [/min]	**15,7** ± 5,6	20.303	**15,7** ± 5,6	20.303	**15,6** ± 5,9	132.238
Glasgow Coma Scale (GCS) [points]	**12,7** ± 3,9	29.307	**12,7** ± 3,9	29.307	**12,4** ± 4,1	201.195
Findings	%	n	%	n	%	n
Shock (systolic blood pressure ≤ 90 mmHg)	**8,1%**	2.232	**8,1%**	2.232	**10,4%**	19.602
Unconsciousness (GCS ≤ 8)	**16%**	4.676	**16%**	4.676	**18,4%**	37.016
Therapy	%	n	%	n	%	n
Cardio-pulmonary resuscitation	**3%**	909	**3%**	909	**3%**	6.287
Endotracheal intubation	**20,6%**	6.252	**20,6%**	6.252	**25,4%**	53.438
Alternative airway *NEW*	**1,6%**	485	**1,6%**	485	**0,6%**	1.230
Analgo-sedation **	**59,9%**	9.187	**59,9%**	9.187	**63,1%**	68.587
Chest drain **	**3,1%**	471	**3,1%**	471	**3,2%**	3.471
Catecholamines **	**8,6%**	1.327	**8,6%**	1.327	**8%**	8.720
Pelvic binder ** *NEW*	**9,9%**	1.522	**9,9%**	1.522	**2,5%**	2.686
Tranexamic acid *NEW*	**6,7%**	2.038	**6,7%**	2.038	**1,8%**	3.669
Volume administration	**M** ± SD*/%	n	**M** ± SD*/%	n	**M** ± SD*/%	n
Patients without volume administration	**17,1%**	5.044	**17,1%**	5.044	**15,7%**	31.803
with volume administration	**82,9%**	24.499	**82,9%**	24.499	**84,3%**	170.688
with colloids	**3,7%**	1.044	**3,7%**	1.044	**11,4%**	22.147
Average amount	**638** ± 525	29.543	**638** ± 525	29.543	**722** ± 612	202.491
in patients with and without volume administration [ml]	Median **500**		Median **500**		Median **500**	

* M = Mean; SD = Standard deviation

** not available in the reduced QM dataset

Table 8: Data of your hospital and the TR-DGU to emergency room, surgery and intensive care unit

Time point B: Emergency room / surgery	Your hospital 2017		TR-DGU 2017		TR-DGU 10 years	
Primary admitted patients from the basic group	31.696		31.696		216.948	
Transportation to the hospital	**%**	n	**%**	n	**%**	n
With helicopter	**18,6%**	5.899	**18,6%**	5.899	**20,3%**	44.024
Glasgow Coma Scale (GCS)	**MW** ± SA*	n	**MW** ± SA*	n	**MW** ± SA*	n
Prehospital intubated patients	**3,3** ± 1,6	3.837	**3,3** ± 1,6	3.837	**3,2** ± 1,3	31.343
Patients not intubated	**13,9** ± 2,3	10.932	**13,9** ± 2,3	10.932	**13,7** ± 2,5	70.281
Initial diagnostics	**%**	n	**%**	n	**%**	n
Sonography of the abdomen	**83%**	26.163	**83%**	26.163	**81,3%**	174.073
X-ray of the thorax	**30,2%**	9.504	**30,2%**	9.504	**39,3%**	84.160
cCT (isolated or whole-body)	**91%**	28.830	**91%**	28.830	**89%**	193.080
Whole-body CT	**79%**	24.903	**79%**	24.903	**75,9%**	162.584
Time period in the emergency room	**M** ± SD*/%	n	**M** ± SD*/%	n	**M** ± SD*/%	n
Transfer to the operation room *NEW*	**23,9%**	7.222	**23,9%**	7.222	**24,2%**	16.168
if so: duration from admission to the ER* until surgery [min]	**75,8** ± 62,7	6.478	**75,8** ± 62,7	6.478	**75,1** ± 60,6	14.132
Transfer to intensive care unit *NEW*	**64,3%**	19.395	**64,3%**	19.395	**64%**	42.742
if so: duration from admission to the ER* until ICU* [min]	**83,8** ± 73,6	16.759	**83,8** ± 73,6	16.759	**83,6** ± 73,2	35.392
Bleeding and transfusion	**M** ± SD*/%	n	**M** ± SD*/%	n	**M** ± SD*/%	n
Pre-existing coagulopathy *NEW*	**19,3%**	4.875	**19,3%**	4.875	**18,8%**	10.263
Systolic blood pressure ≤ 90 mmHg	**7,3%**	2.199	**7,3%**	2.199	**8,6%**	17.193
Hemostasis therapy **	**19,9%**	2.915	**19,9%**	2.915	**15,6%**	14.581
Administration of tranexamic acid ** *NEW*	**15,1%**	2.242	**15,1%**	2.242	**15%**	4.837
ROTEM / thrombelastography ** *NEW*	**8,8%**	1.166	**8,8%**	1.166	**10,4%**	7.510
Patients with blood transfusion	**7,1%**	2.237	**7,1%**	2.237	**9,2%**	19.632
Number of pRBC, if transfused	**4,7** ± 5,7	2.237	**4,7** ± 5,7	2.237	**5,8** ± 7,1	19.632
Number of FFP, if transfused	**2,8** ± 5,1	2.237	**2,8** ± 5,1	2.237	**3,6** ± 6,3	19.632
Treatment in the ER	**%**	n	**%**	n	**%**	n
Cardio-pulmonary resuscitation **	**2,4%**	367	**2,4%**	367	**2,8%**	3.055
Chest drain **	**10,5%**	1.639	**10,5%**	1.639	**11,7%**	12.519
Endotracheal intubation ** *NEW*	**14,7%**	2.259	**14,7%**	2.259	**18,3%**	19.310
Initial laboratory values	**M** * ± SD	n	**M** * ± SD	n	**M** * ± SD	n
Base excess [mmol/l]	**-1,5** ± 4,7	25.234	**-1,5** ± 4,7	25.234	**-1,9** ± 4,7	151.682
Hemoglobine [g/dl]	**13,2** ± 2,2	30.915	**13,2** ± 2,2	30.915	**13** ± 2,3	205.251
INR	**1,2** ± 0,5	29.860	**1,2** ± 0,5	29.860	**1,2** ± 0,6	196.529
Quick's value [%]	**87,7** ± 21,1	29.079	**87,7** ± 21,1	29.079	**86,2** ± 21,7	192.573
Temperature [C°] **	**36,2** ± 1,1	9.446	**36,2** ± 1,1	9.446	**36,2** ± 1,2	55.771

Time point C: Intensive care unit	Your hospital 2017		TR-DGU 2017		TR-DGU 10 years	
Patients from the basic group with **intensive care therapy**	30.560 (88%)		30.560 (88%)		210.114 (87%)	
Treatment	**%**	n	**%**	n	**%**	n
Hemostasis therapy **	**14,9%**	2.340	**14,9%**	2.340	**15,8%**	16.047
Dialysis / hemofiltration **	**2,1%**	333	**2,1%**	333	**2,4%**	2.514
Blood transfusion ** (within the first 48 h after admission on ICU)	**23,8%**	3.051	**23,8%**	3.051	**29%**	24.800
Mechanical ventilation / intubated	**35,8%**	10.954	**35,8%**	10.954	**43,3%**	90.959
Complications on ICU	**%**	n	**%**	n	**%**	n
Organ failure **	**31,5%**	4.998	**31,5%**	4.998	**36%**	39.058
Multiple organ failure (MOF) **	**18,7%**	2.926	**18,7%**	2.926	**21,5%**	23.221
Sepsis **	**6,6%**	15.607	**6,6%**	15.607	**6,1%**	106.049
Length of stay and ventilation	**M** ± SD*	n	**M** ± SD*	n	**M** ± SD*	n
Length of intubation [days]	**2,6** ± 6,9	30.447	**2,6** ± 6,9	30.447	**3,3** ± 7,9	208.744
	Median **0**		Median **0**		Median **0**	
Length of stay on ICU* [days]	**6,2** ± 9,8	30.560	**6,2** ± 9,8	30.560	**6,9** ± 10,6	210.112
	Median **2**		Median **2**		Median **3**	

* ICU = Intensiv care unit; ER = Emergency room; M = Mean; SD = Standard deviation
** not available in the reduced QM dataset

Table 9: Data of your hospital and the TR-DGU to discharge and outcome

Time point D: Discharge / outcome	Your hospital 2017		TR-DGU 2017		TR-DGU 10 years	
Patients from the basic group	34.897		34.897		240.383	
Diagnoses	**M** ± SD*/%	n	**M** ± SD*/%	n	**M** ± SD*/%	n
Number of injuries / diagnoses per patient	**4,5** ± 2,9		**4,5** ± 2,9		**4,5** ± 2,9	
Patients with only **one** injury	**9,9%**	3.441	**9,9%**	3.441	**9,7%**	23.329
Surgeries	**MW** ± SA*/%	n	**MW** ± SA*/%	n	**MW** ± SA*/%	n
Patients with surgery	**66,3%**	12.304	**66,3%**	12.304	**68,2%**	84.591
Number of surgeries per patient, if operated **	**3,3** ± 3,5		**3,3** ± 3,5		**3,5** ± 4,1	
Thrombo-embolic events (MI; pulmonary embolism; DVT; stroke; etc.)	**%**	n	**%**	n	**%**	n
Patients with at least one event **	**2,6%**	432	**2,6%**	432	**2,8%**	3.185
Outcome (without early transfers out)	**%**	n	**%**	n	**%**	n
Survivors	**89%**	29.017	**89%**	29.017	**88,5%**	199.191
Hospital mortality	**11%**	3.580	**11%**	3.580	**11,5%**	25.942
Died within 30 days	**10,5%**	3.432	**10,5%**	3.432	**11%**	24.852
Died within 24 hours	**4,2%**	1.353	**4,2%**	1.353	**4,8%**	10.753
Died in the ER (without ICU)	**1,5%**	489	**1,5%**	489	**1,7%**	3.787
Transfer / discharge (all survivors)	**%**	n	**%**	n	**%**	n
Survivor who were discharged and …	**100%**	31.317	**100%**	31.317	**100%**	214.406
transferred into another hospital	**17,8%**	5.567	**17,8%**	5.567	**17,4%**	37.256
among them early discharges (< 48 h)	**7,3%**	2.300	**7,3%**	2.300	**7,1%**	15.249
transferred into a rehabilitation center	**15,4%**	4.840	**15,4%**	4.840	**20,3%**	43.515
other destination	**3,7%**	1.151	**3,7%**	1.151	**3,5%**	7.501
sent home	**63,1%**	19.759	**63,1%**	19.759	**58,8%**	126.134
Condition at the time of discharge (according to the parameter „outcome"; without early transfers out)	**%**	n	**%**	n	**%**	n
Patients with a valid value		32.276		32.276		216.994
of these surviving patients	**100%**	28.696	**100%**	28.696	**100%**	191.052
- good recovery	**65%**	18.651	**65%**	18.651	**65,4%**	124.870
- moderate disability	**24,7%**	7.084	**24,7%**	7.084	**24,5%**	46.772
- severe disability	**9%**	2.581	**9%**	2.581	**8,6%**	16.461
- persistant vegetative state	**1,3%**	380	**1,3%**	380	**1,5%**	2.949
Length of stay in hospital [days] (all patients from the basic group)	**M** ± SD*	n	**M** ± SD*	n	**M** ± SD*	n
All patients	**14,5** ± 16,5	34.895	**14,5** ± 16,5	34.895	**16,1** ± 18,4	240.341
Median	Median **10**		Median **10**		Median 11	
Only survivors	**15,3** ± 16,8	31.315	**15,3** ± 16,8	31.315	**17,2** ± 18,7	214.403
Only non-survivors	**7,4** ± 11,9	3.580	**7,4** ± 11,9	3.580	**7,2** ± 12,3	25.938
Median survivors	**11**		11		**12**	
Median non-survivors	3		3		3	
Length of stay for transfers into a rehabilitation center	**28,5** ± 21,5	4.838	**28,5** ± 21,5	4.838	**29,8** ± 22,4	43.509
for transfers into another hospital	**10,3** ± 14,7	5.567	**10,3** ± 14,7	5.567	**10,6** ± 15,2	37.252
of patients sent home	**13,2** ± 13,6	19.759	**13,2** ± 13,6	19.759	**14,6** ± 15,7	126.109
Costs of treatment * (without early transfers out)	**€**	n	**€**	n	**€**	n
Average costs in € per patient						
... all patients	**13.866**	32.491	**13.866**	32.491	**15.726**	224.053
... only non-survivors	**10.789**	3.561	**10.789**	3.561	**11.156**	25.709
... only survivors	**14.245**	28.930	**14.245**	28.930	**16.318**	198.344
... only patients with ISS ≥ 16	**18.435**	17.201	**18.435**	17.201	**20.481**	125.493
Sum of all costs	450.524.973 €		450.524.973 €		3.523.454.186 €	
Sum of all days in hospital	500.333 days		500.333 days		3.839.713 days	
Average costs per day per patient	900,4 €		900,4 €		917,6 €	

* M = Mean; SD = Standard deviation

** 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 was available (Lefering et al., Unfallchirurg, 2017). Assuming a cost increase of 2% per year the costs today would be 21% higher.

8 Subgroup analyses

Certain subgroups are presented on these page. Besides descriptive data about the patients and the process of care also hospital outcome and prognosis are presented here for each subgroup. In order to reduce the statistical uncertainty involved in subgroup analyses, patients from the last three years (2015-2017) are pooled together. Again, only patients from the **basic group** are considered here.

8.1 Subgroups within your hospital

All results in table 10 refer to **primary admitted cases** from the basic group. Patients transferred in as well as those transferred out early (within 48 h) are not considered here. There are a total of **86.237 patients** from your hospital in the last three years.

Table 10: Basic data of your hospital to selected subgroups

		Primary patients 3 years	Subgroups					
			No TBI	Combined trauma	Isolated TBI	Shock	Severe injuries	Elderly
Definition of the subgroups		All	AIS head ≤ 1	Head and body at least AIS 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	86.237	43.078	32.183	10.976	6.296	26.138	22.056
	%	100%	50%	37,3%	12,7%	7,3%	30,3%	25,6%
Patients								
Age [years]	M	51,3	48,4	52,1	60	51,6	60	80
Males	%	69,7%	71,5%	68,8%	64,9%	67,4%	65,5%	55,2%
ASA 3-4	%	16,9%	13,2%	17,4%	30,5%	20,4%	28%	46,5%
Injuries								
ISS [points]	M	18	14,5	22,7	18,1	30,2	28,6	18,8
Head injury (AIS ≥ 3)	%	33,9%		56,7%	100%	46%	64,7%	46,7%
Thoracic injury (AIS ≥ 3)	%	38,1%	44,3%	42,8%		57,5%	51,4%	34,8%
Abdominal injury (AIS ≥ 3)	%	9,4%	13,3%	7,4%		22,9%	14,1%	4,8%
Prehospital care								
Duration from accident to hospital [min]	M	63	62	64	65	69	68	65
Intubation	%	22,2%	11,6%	32,3%	33,6%	63,2%	49,2%	21,3%
Volume [ml]	M	653,7	657,5	696	510,9	999,1	788,9	548,4
Emergency room								
Blood transfusion	%	7,5%	7,3%	9,3%	2,7%	35,5%	18,1%	6,6%
Whole-body CT	%	78,9%	80,9%	83,5%	57,7%	79,4%	80,6%	70,4%
Cardio-pulmonary resuscitation	%	2,5%	2,1%	3,2%	1,8%	14%	6,6%	2,7%
Physiological problems *								
Age ≥ 70 years	%	25,6%	19,1%	27,8%	44,6%	27,2%	48,5%	100%
Shock (sBP ≤ 90 mmHg)	%	12,2%	10,8%	14,6%	9,9%	100%	30,8%	12,2%
Acidosis (BE < -6)	%	11,7%	9,3%	14,9%	11,6%	42,4%	28,6%	11,9%
Coagulopathy	%	12%	9,1%	14,5%	16,2%	35,6%	28,2%	22,4%
Unconsciousness (GCS 3-8)	%	17%	4,5%	26,9%	36,6%	47%	45,9%	19,5%
Length of stay								
Patients with intensiv care therapy	n	77.809	37.831	29.981	9.997	5.370	23.758	19.610
- Intubation on intensiv care unit [days]	M	2,7	1,4	4,1	3,7	6,8	6,3	3
- Intensiv care unit [days]	M	6,3	4,7	8	7,1	11,7	11,1	6,8
Days in hospital, all patients	M	15,5	15,5	16,3	13,1	19,6	19,5	15,2
Outcome and prognosis								
Non-survivors	n	9.551	1.996	4.676	2.879	2.357	8.033	5.378
Hospital mortality	%	11,1%	4,6%	14,5%	26,2%	37,4%	30,7%	24,4%
RISC II prognosis	%	10,5%	4,2%	14,4%	23,9%	38,8%	29,6%	22,2%

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

8.2 Level of trauma care in the TraumaNetzwerk DGU®

Table 11 allows a comparison of your hospital with hospitals of the same level of trauma care in the TraumaNetzwerk DGU®. There are **three levels of trauma care** (local, regional, and supra-regional). Non-certified trauma centers are excluded from these analyses. The column with comparative data for your hospital **(TR-DGU)** is marked with a blue box. The total values of all certified trauma centers 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 11: Basic data from your hospital in comparison to the total data from the levels of trauma care over the past three years

			Trauma center			
Characteristics		Your hospital	local	regional	supra-regional	TR-DGU
Level of trauma care						
Number of hospitals			300	215	121	636
Amount of patients in the TR-DGU			12%	30%	58%	100%
Patients per year	n	**49** / year	**12** / year	**44** / year	**151** / year	**49** / year
All patients (3 years)	n	94.149	10.856	28.344	54.949	94.149
Primary admitted and treated	n (%)	79.475 (84%)	8.325 (77%)	23.957 (85%)	47.193 (86%)	79.475 (84%)
Primary admitted and early (< 48 h) transferred out	n (%)	6.514 (%)	2.413 (22%)	3.388 (12%)	713 (1%)	6.514 (7%)
Transferred in from another hospital	n (%)	8.160 (9%)	118 (1%)	999 (4%)	7.043 (13%)	8.160 (9%)
Patients						
Average age [years]	M	51,7	54,2	52,9	50,6	51,7
Elderly patients aged 70 years and older	%	26%	30%	28%	25%	26%
Males	%	70%	68%	68%	71%	70%
ASA 3-4	%	18%	20%	20%	16%	18%
Injuries						
Injury Severity Score (ISS) [points]	M	18,1	14,4	16,7	19,6	18,1
Ratio with ISS ≥ 16	%	47%	62%	52%	41%	47%
Ratio of polytrauma *	%	14%	8%	11%	17%	14%
Patients with TBI (AIS ≥ 3)	%	36%	21%	29%	42%	36%
Patients with thoracic injury (AIS ≥ 3)	%	37%	34%	37%	38%	37%
Patients with abdominal injury (AIS ≥ 3)	%	9%	8%	9%	10%	9%
Prehospital care (primary admissions only)						
Rescue time (accident to hospital) [min]	M	62,5	55,3	58,8	66,6	62,5
Prehospital volume administration [ml]	M	656,8	521,4	599,2	721,8	656,8
Prehospital intubation	%	21%	5%	12%	30%	21%
Unconsciousness (GCS ≤ 8)	%	15%	6%	9%	20%	15%
Emergency room (primary admissions only)						
Blood transfusion	%	7%	3%	4%	9%	7%
Whole-body CT	%	79%	65%	75%	84%	79%
Cardio-pulmonary resuscitation	%	3%	2%	2%	3%	3%
Shock / hypotension	%	8%	5%	6%	9%	8%
Coagulopathy	%	11%	8%	9%	12%	11%
Length of stay (without early transfers out)						
Length of intubation on the intensiv care unit [days]	M	2,6	0,6	1,5	3,4	2,6
Length of stay on the intensiv care unit [days]	M	5,9	2,9	4,4	7	5,9
Length of stay in the hospital [days]	M	15,7	11,2	13,6	17,4	15,7
Outcome and prognosis (without transfers in and early transfers out)						
Patients	n	79.475	8.325	23.957	47.193	79.475
Non-survivors	n	8.534	515	2.077	5.942	8.534
Hospital mortality	%	10,7%	6,2%	8,7%	12,6%	10,7%
RISC II prognosis	%	10,2%	5,8%	8,1%	12%	10,2%

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

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

9 Data quality and completeness

9.1 Completeness of selected variables

Registries and audit reports could 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 13 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 II. As on the previous pages only cases from the **basic group** are considered here. The completeness rates of your hospital **in 2017** are compared with your hospital's data from the previous years (**since 2008**) and with actual overall data from the **whole TR-DGU 2017**. Cases with implausible data are classified as missing.

Table 12: Definition of completeness according to desired target values (independent of the TR-DGU data)

Coding	Meaning	General definition	Definition surgery rate	Definition documentation
	Good completeness	≥ 96%	≥ 70%	< 3 months
	Moderate completeness	90%-95%	50%-69%	3-4 months
	Insufficient completeness	< 90%	< 50%	≥ 5 months

Table 13: Completeness rates and number of missing values for selected variables

Variable	Meaning	Your hospital 2017		Your hospital 2008-2016		TR-DGU 2017	
Prehospital data (A)		%	{}	%	{}	%	{}
only primary admitted patients, that are walked-in / transported by private vehicle		n = 31.150		n = 181.857		n = 31.150	
GCS	RISC II requires the motor component; quality indicators use the GCS for the definition of cases	**93%**	2.035	**94%**	11.502	**93%**	2.035
Blood pressure	Initial blood pressure is important for validating the volume therapy and for the definition of shock	**88%**	3.595	**88%**	21.151	**88%**	3.595
Pupils *	Pupil size and reactivity are relevant for prognosis (RISC II); is now also part of the reduced QM dataset	**90%**	90	**56%**	79.430	**90%**	3.250
CPR	Cardio-pulmonary resuscitation is seldom but highly predictive for outcome; required for RISC II	**91%**	2.717	**93%**	12.744	**91%**	2.717
Emergency room (B)							
only primary admitted patients		n = 31.696		n = 185.252		n = 31.696	
Time of admission	Required to calculate the time periods until diagnostics (quality indicators)	**99%**	230	**99%**	2.485	**99%**	230
Blood pressure	Blood pressure on admission is used by RISC II as a prognostic variable and to define shock	**95%**	1.737	**91%**	15.972	**95%**	1.737
Base excess	The initial base excess is part of the RISC II and an important prognostic factor	**80%**	6.487	**68%**	58.922	**80%**	6.487
Coagulation	The INR (or Quick's value) is needed for the RISC II as coagulation marker	**94%**	1.836	**90%**	18.583	**94%**	1.836
Hemoglobine	Prognostic factor; is part of the RISC II prognosis	**98%**	781	**94%**	10.916	**98%**	781
Patients and outcome							
All patients from the basic group		n = 34.897		n = 205.486		n = 34.897	
ASA	Prior diseases are relevant for outcome prediction (RISC II); documented since 2009	**92%**	2.724	**83%**	35.209	**92%**	2.724
Surgical treatment *	A low rate of surgical patients could be based on incomplete documentation	**39%**		**61%**		**39%**	
Outcome	The levels according to the parameter „outcome” describe the patient's condition at discharge or transfer	**98%**	622	**94%**	11.735	**98%**	622
Process data							
All patients from the basic group		n = 34.897		n = 205.486		n = 34.897	
Documentation **	A **timely documentation** of patients is able to improve data quality of a case in the TR-DGU. Therefore the time period in **months** from accident until start of documentation is given	**4,1**		**4,8**		**4,1**	
	Months from discharge until **completion** of documentation	**5,3**		**5,8**		**5,3**	

* since the actual dataset revision all patients are recorded
** for imported data not interpretable, because only the import date is recorded, but not creation and completion

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.

This score was calculated from the following 10 variables: from the prehospital pahse GCS, blood pressure and cardio-pulmonary resuscitation; from the emergency room phase the time of admission, blood pressure, base excess, coagulation (Quick's value or INR) and hemoglobine; finally the patient's prior health status (pre-injury ASA) and the 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 points from all **primary admitted patients in the basic group** is summarized. This leads to the calculation of an average completeness rate.

Table 14: Data completeness of your hospital in 2017 compared over time and to the TR-DGU 2017

Data quality: completeness	Your hospital 2017	Your hospital 2008-2016	TR-DGU 2017
Primary admitted patients from the basic group	n = 31.696	n = 185.252	n = 31.696
Sum over all recorded values	n = 316.960	n = 1.852.520	n = 316.960
Sum of the missing values	{} 23.574	{} 200.209	{} 23.574
Average completeness (%) based on the 10 mentioned parameters	**92,6%**	**89,2%**	**92,6%**

Graphical comparison with other hospitals

The following figure summarizes the average completeness value from all 675 hospitals who submitted cases **in 2017**. The **mean completeness in %** of your hospital is presented as a blue diamond.

The figure follows the idea of a box plot where the grey box ranging from 89% to 96,7% covers half of all hospital values. The vertical line within the box is the median average completeness value 93,3%.

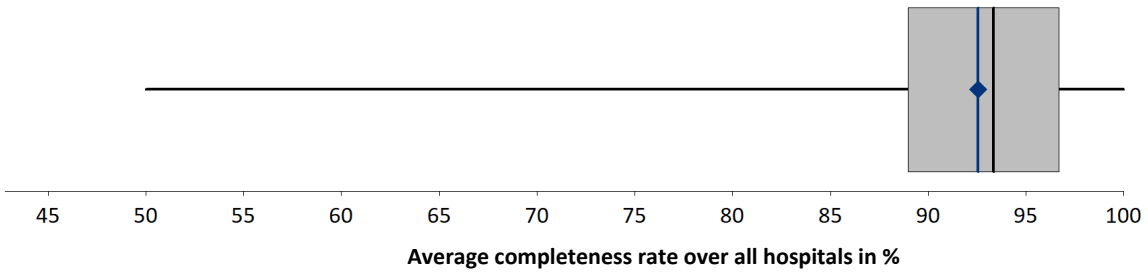


Figure 25: Distribution of the data completeness rate in 2017 over all hospitals

Development over time

Figure 26 shows the development of data completeness in the last nine years since 2009. The completeness rates are pooled separately for hospitals using the standard dataset and the reduced QM dataset.

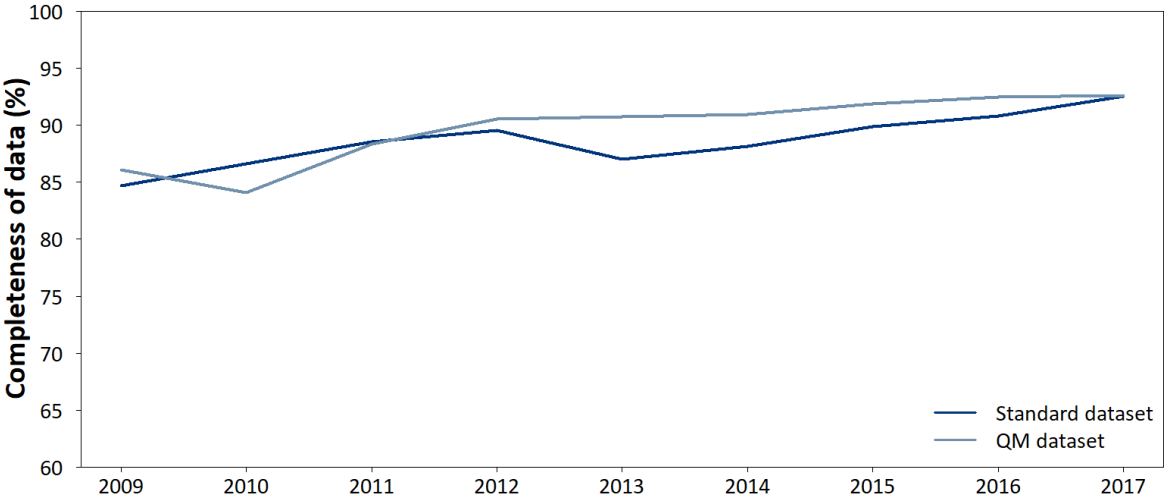


Figure 26: Development over time of the completeness rate in the TR-DGU

10 Pattern of injury

This chapter presents you the average injury pattern of your patients compared with the TraumaRegister DGU®. Only cases from the **basic group** are considered. In order to reduce the statistical uncertainty, all patients from the **last three years (2015-2017)** are pooled.

Data are presented for each of the nine body regions according to the **Abbreviated Injury Scale (AIS)**. The rates refer to injuries with an injury **severity of at least two points** (including radius fractures, spine fractures, lung contusions, etc.). Figure 27 shows the injury distribution from the whole registry.

Table 15: Distribution of the injuries from all recorded patients (basic group) for the years 2015-2017

	Your hospital 2015-2017	TR-DGU 2015-2017
Patients in the basic group	**100%** (n = 102.457)	100% (n = 102.457)
Head	**47,6%** (n = 48.730)	47,6% (n = 48.730)
Face	**11,2%** (n = 11.456)	11,2% (n = 11.456)
Neck	**1,5%** (n = 1.491)	1,5% (n = 1.491)
Thorax	**44,8%** (n = 45.935)	44,8% (n = 45.935)
Abdomen	**14,3%** (n = 14.666)	14,3% (n = 14.666)
Spine	**29,4%** (n = 30.115)	29,4% (n = 30.115)
Arms	**28,6%** (n = 29.287)	28,6% (n = 29.287)
Pelvis	**15,3%** (n = 15.686)	15,3% (n = 15.686)
Legs	**23,9%** (n = 24.478)	23,9% (n = 24.478)

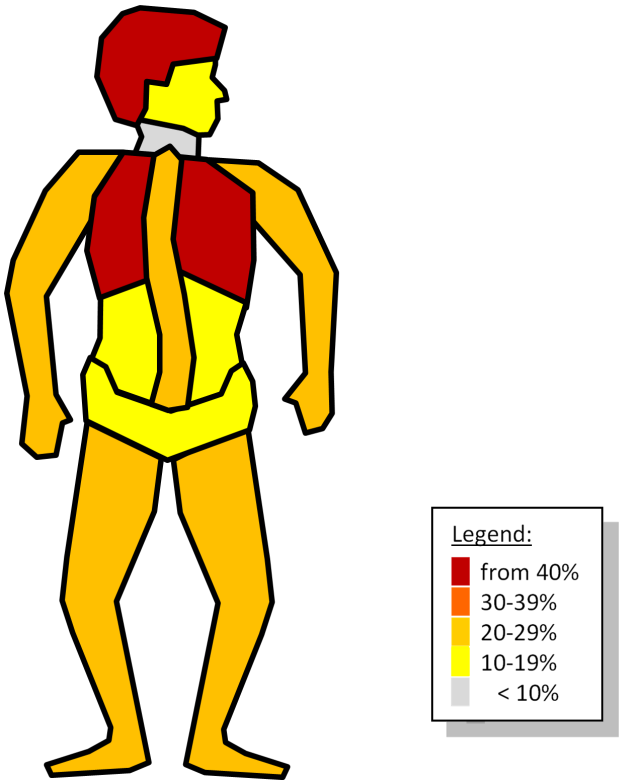


Figure 27: Pattern of injury in the TR-DGU for the basic group from 2017

Serious injuries (AIS 3+)

Injuries with a severity of 3 points or more (AIS) are considered as „serious". The prevalence of serious injuries in the four most important body regions (head, thorax, abdomen, extremities) is given in table 16. The body regions considered here refer to the respective regions of the **Injury Severity Score** (ISS), that means spine injuries are assigned to the respective regions head, thorax or abdomen.

In contrast to table 15 only patients with at least one relevant injury (MAIS 3+; see chapter 1) are considered here.

Table 16: Ratio of serious injured patients (AIS ≥ 3) per body region for the years 2015-2017 (basic group)

	Your hospital 2015-2017	TR-DGU 2015-2017
Serious injury (AIS ≥ 3)	**80,9%** (n = 82.931)	**80,9%** (n = 82.931)
... of the **head**	**45,8%** (n = 37.949)	**45,8%** (n = 37.949)
... of the **thorax**	**45,7%** (n = 37.867)	**45,7%** (n = 37.867)
... of the **abdomen**	**11,8%** (n = 9.764)	**11,8%** (n = 9.764)
... of the **extremities**	**28,5%** (n = 23.627)	**28,5%** (n = 23.627)
Patients with **more than one** seriously injured body region	**30,1%** (n = 24.991)	**30,1%** (n = 24.991)

11 General results

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

Hospitals

In 2017, 43.289 patients from 675 hospitals were documented in the TraumaRegister DGU®. The **basic group** where this report is based on consisted of **34.897 patients** last year (details to the definition see chapter 1). Already **95.708 patients** have been documented with the updated dataset introduced in 2016. The total number of cases documented since 1993 thus increased to 324.463 patients.

Among the number of **675 actively participating hospitals** there are 55 hospitals from outside Germany (8,2%): Belgium 7, Finland 3, Luxembourg 4, The Netherlands 3, Austria 24, Switzerland 11, Slovenia 2 and the United Arab Emirates 1. The number of active German hospitals was 620 last year.

Figure 28 shows the distribution of hospitals regarding their location (German vs. non-German) and the use of the standard dataset or the reduced QM dataset, respectively. The reduced dataset (QM) for the TraumaNetzwerk DGU® is mainly used in Germany by local (87,2%) and regional (76,7%) trauma centers. The majority of supra-regional trauma centers is using the standard dataset (S) (66,9%).

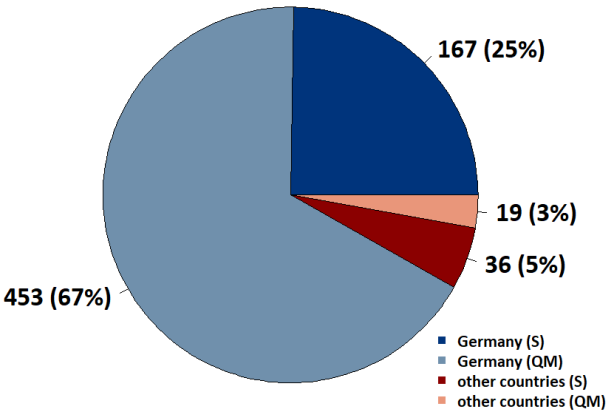


Figure 28: Used documentation version of the German and from other countries hospitals

Hospitals

Figure 29 demonstrates the continuous increase of registered patients over time since 2002. In 2017, the amount of foreign patients was 12,5%. Only 3.9% of patients have been documented on paper forms before 2002. In 2017, 50% of the patients were documented with the standard dataset.

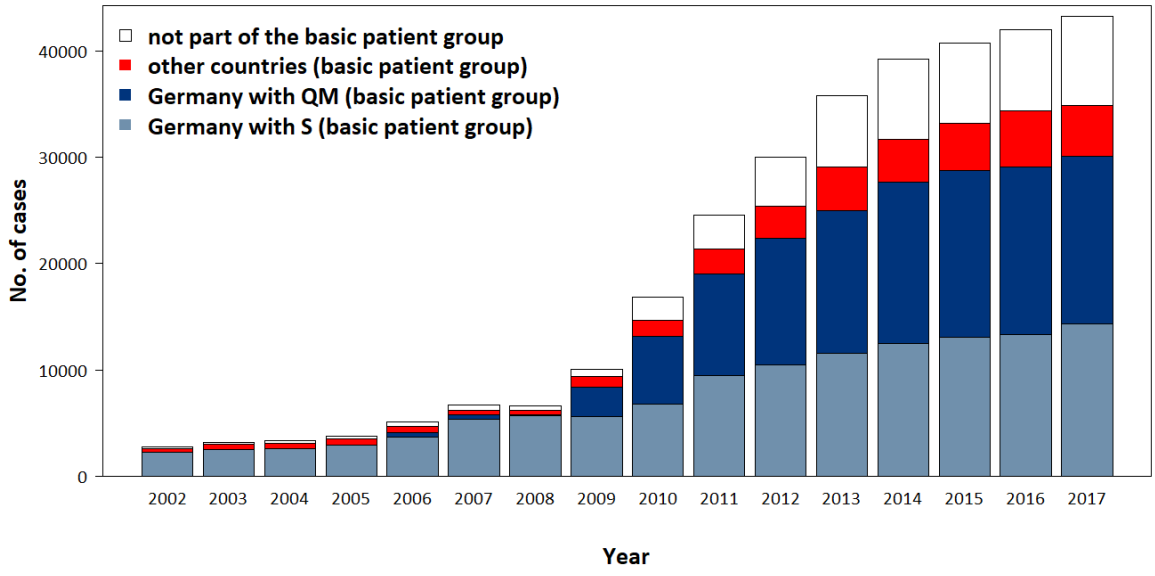


Figure 29: Number of cases in the TR-DGU over time

Publications from the TraumaRegister DGU®

Publications from the last three years (2016-2018), no abstracts; last update: August 2018.

An extended list of publications from the TraumaRegister DGU® including also papers published previously is available on **www.traumaregister-dgu.de**.

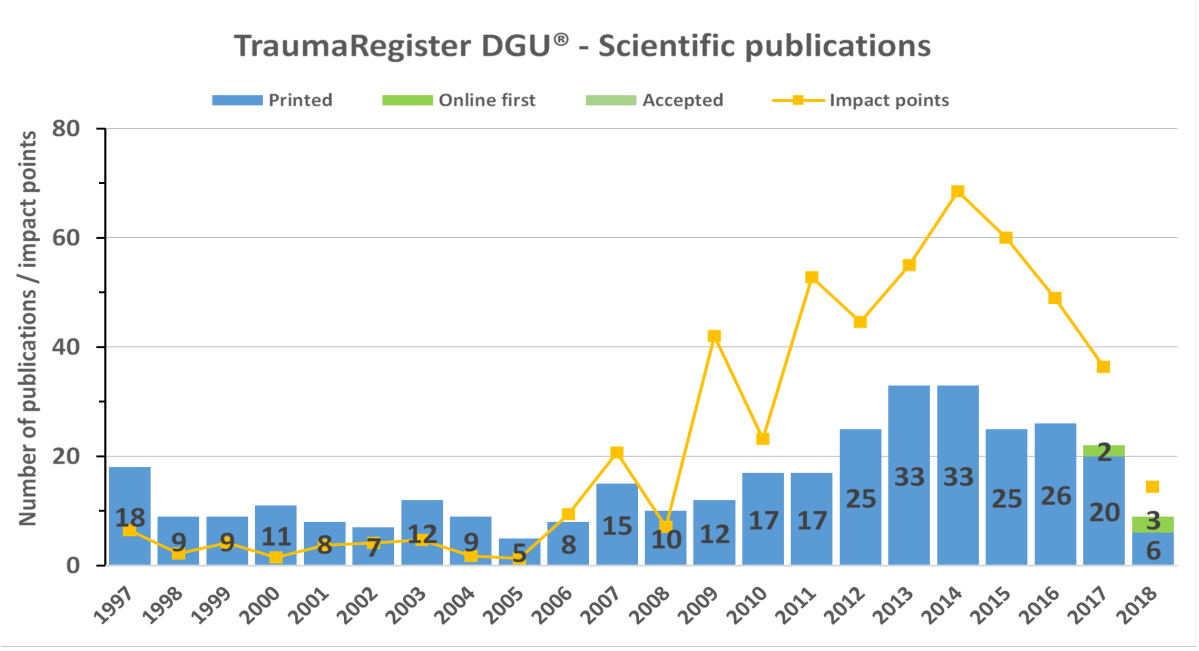


Figure 30: Number of publications from the TraumaRegister DGU® and their impact points since 1997

2018

Hilbert-Carius P, Schwarzkopf D, Reinhart K, Hartog CS, Lefering R, Bernhard M, Struck MF. Synthetic colloid resuscitation in severely injured patients: analysis of a nationwide trauma registry (TraumaRegister DGU). Sci Rep. 2018; 8: 11567.

Huckhagel T, Nüchtern J, Regelsberger J, Gelderblom M, Lefering R; TraumaRegister DGU®. Nerve trauma of the lower extremity: evaluation of 60,422 leg injured patients from the TraumaRe-gister DGU® between 2002 and 2015. Scand J Trauma Resusc Emerg Med. 2018; 26: 40.

Kamp O, Jansen O, Lefering R, Meindl R, Waydhas C, Schildhauer TA, Hamsen U; TraumaRegister DGU. Cervical Spinal Cord Injury Shows Markedly Lower than Predicted Mortality (>72 Hours After Multiple Trauma) From Sepsis and Multiple Organ Failure. J Intensive Care Med. 2018 [Epub ahead of print]

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List of abbreviations

AIS	Abbreviated Injury Scale
ASA	American Society of Anaesthesiologists (Klassifikation)
AUC	AUC – Academy of Trauma Surgery (Akademie der Unfallchirurgie GmbH)
BE	Base excess
BGA	Blood gas analysis
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
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 Normalized Ratio
ISS	Injury Severity Score
LOS	Length of stay
M	Mean
m	Metre
MAIS	Maximum AIS severity score
MI	Myocardial infarction
Min.	Minute
ml	Millilitre
mmHg	Millimetre of mercury
mmol	Millimol
MOF	Multiple organ failure
NIS	Committee on Emergency Medicine, Intensive Care and Trauma Management of the DGU (Sektion Notfallmedizin, Intensiv- und Schwerverletztenversorgung der DGU)
NISS	New Injury Severity Score
QM	Quality management
Pat.	Patients
phys.	physiological
RISC	Revised Injury Severity Score (Prognose-Score)
RR	systolic blood pressure (according to Riva-Rocci in mmHg)
S	Standard dataset
sBP	Systolic blood pressure
SD	Standard deviation
TBI	Traumatic brain injury
TR-DGU	TraumaRegister DGU®
TXA	Tranexamsäure
vs.	versus