TraumaRegister DGU®
DEUTSCHE GESELLSCHAFT FÜR UNFALLCHIRURGIE

German Trauma Society (DGU)

Committee on Emergency Medicine, Intensive Care and Trauma Management (Sektion NIS)

and AUC - Academy for Trauma Surgery

TraumaRegister DGU®

Annual Report 2014

with patients admitted until end of 2013

TraumaRegister DGU®

TR-DGU

This report does not contain results from an individual hospital but provides summary data from the whole registry.

Preface

Dear Participant,

we are pleased to present the Annual Quality Report 2014 of the TraumaRegister DGU® for your hospital. This report includes all data from severely injured cases admitted to your hospital until the end of 2013 and documented until the end of March 2014.

Last year the 20th birthday of the TraumaRegister DGU® took place. Since more than 20 years severely injured patients are documented in the registry and made it a well-known and leading international registry.

On the occasion of this birthday a **special issue** of the journal ***Injury*** will be published, including actual scientific articles and descriptions of the registry regarding its methodology and previous development. In addition to this special issue many scientific analyses were published. You'll find a listing of all actual papers from the last three years in the annex to this report; a list of all publications is available at *www.traumaregister.de.*

What's new in 2014?

Even in the last year the number of participating hospitals could be increased again (n=614) while the number of documented patients (n=34.878 in 2013) was also significant higher in comparison to the previous year. The total number of cases documented in the TraumaRegister DGU® is now 159.449, of which 93% have been collected since the introduction of the online documentation system in 2002. In 2013, about half of all patients (50%) were documented with the standard dataset. In every tenth case the patient was treated in a hospital outside Germany.

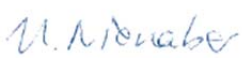
In this Annual Report there are some new aspects. First of all, the adjustment of severity was converted consistently to the **new RISC II** prognostic score. Details about the new score, meanwhile published in *Critical Care*, you can find on the pages 10.3-10.4.

Another important change is the complete redesign of page 7 (previous: trauma scores). There you can find **subgroup comparisons**, which allow a differentiated view on your patients. Moreover there are specific data for the three levels of care (local, regional and supra-regional trauma center) to enable a better comparison of the results.

The results from TraumaRegister DGU® are as good as the quality of the data. Even though we could notice some improvement we would like to draw attention on the **data quality**. On page 8 you can find completion rates for some important variables. Although we are far apart from this in some variables our aim must be a completeness rate of >95%. The high overall data quality in our registry is an international trademark of the TraumaRegister DGU®. Please help us to ensure that this further improves.

With best wishes





Rolf Lefering Thomas Paffrath Ulrike Nienaber

Sektion NIS of DGU – Working Group TraumaRegister and AUC - Akademie der Unfallchirurgie GmbH

Content

Page

1. Observed Mortality and Prognosis

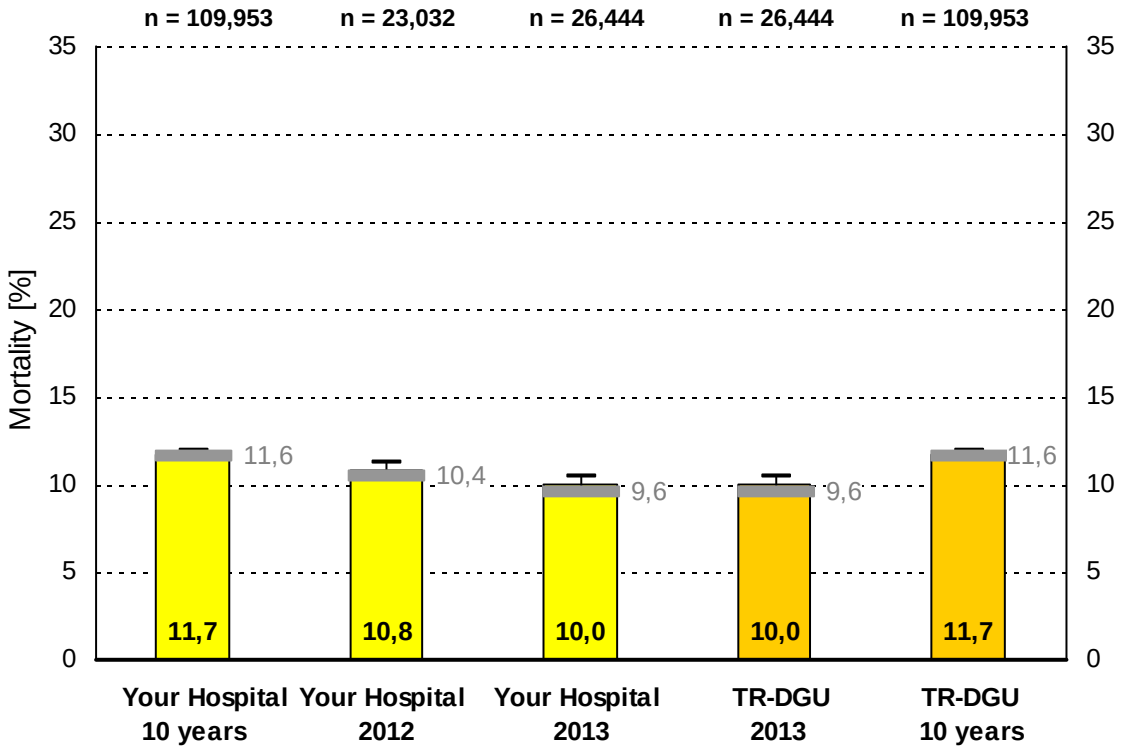
Comparing the **observed mortality** of severely injured trauma patients with their **prognosis** is a central element of quality assessment in the TraumaRegister DGU®. Here the prognosis is derived from the **newly developed RISC II** (Revised Injury Severity Classification, version II) prognostic score. Details of this new **RISC II** score could be found on page 10.3 and 10.4.

The **total number** of patients documented from your hospital is: n = **159,449**
- among these, documented in the **recent 10 years** (2004-13): n = **142,424**
- among these, documented last year (**2013**): n = **34,878**

Primary patients are those who were not transferred in from another hospital (n=2839) nor were they transferred out within 48 hours (n=2109). In 2013, the rate of primary patients was **86%**: n = **29,930**

A RISC II prognosis will not be calculated for patients with ISS < 4 points (n=3547), nor if the documented age was 0 years (n=128). Thus the remaining patients for this analysis are: n = **26,444**

The average age of these 26444 patients was 49.5 years, and 69% were males. The mean ISS was 16.9 points. Of these patients 2645 died in hospital, which is **10.0%** (95% confidence intervall: 9.6 - 10.4). The risk of death prognosis based on RISC II was **9.6%**. You find these values in the figure below, where also your hospital results from previous years are presented together with the overall result in the registry.



Legend to the figure:

The yellow 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 into **green** or **red** in case that the observed mortality is significantly lower (i.e., better) or higher than expected, respectively.

The interpretation of the results has to consider that these findings depend on statistical uncertainty. Therefore, the 95% confidence interval for the observed mortality rate is given as well (***vertical line***). The confidence interval 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 confidence interval. In case that the expected prognosis lies outside the confidence interval, it could be interpreted as a significant deviation ($p<0.05$).

If the observed mortality rate is based on ***less than 5 cases***, no confidence interval will be presented.

2. Basic data from the last 3years

Attention: Results have to be interpreted with caution when the number of patients is low!

	Your Hospital				TraumaRegister DGU®	
	10 years	2011	2012	**2013**	2013	10 years
Total no. of patients [n]	159,449	24,688	29,998	**34,878**	34,878	159,449
Primary adm. & treated [n]	120,010	20,719	25,430	**29,930**	29,930	120,010
Early transferred out [n]	7,967	1,676	1,985	**2,109**	2,109	7,967
All primary admissions [n]	127,977	22,395	27,415	**32,039**	32,039	127,977
From other hospital [n]	14,447	2,293	2,583	**2,839**	2,839	14,447
Patients						
Mean Age [years]	46.7	47.1	47.7	**48.7**	48.7	46.7
Male patients [%]	71%	71%	70%	**69%**	69%	71%
Trauma						
Blunt trauma [%]	95%	95%	95%	**95%**	95%	95%
Mean ISS [points]	18.3	18.3	17.0	**15.7**	15.7	18.3
ISS ≥ 16 [%]	53%	53%	49%	**44%**	44%	53%
Head injury (AIS head ≥ 3) [%]	36%	35%	32%	**30%**	30%	36%
Pre-hospital Care (only primary admissions)						
Intubation [%]	29%	26%	23%	**20%**	20%	29%
Unconscious (GCS ≤ 8) [%]	19%	17%	17%	**15%**	15%	19%
Shock (BP ≤ 90 mmHg) [%]	12%	12%	10%	**9%**	9%	12%
Avg. amount of volume [ml]	850	808	734	**651**	651	850
Shock Room / ER (only primary admissions)						
Whole body CT [%]	67%	71%	71%	**71%**	71%	67%
X-ray of thorax [%]	49%	46%	44%	**42%**	42%	49%
Blood transfusion [%]	11%	9%	9%	**7%**	7%	11%
Treatment in the Hospital						
Operated patients [1) 4)] [%]	69%	71%	67%	**58%**	58%	69%
Operations per pat. [1) 4)] [n]	3.6	3.8	3.6	**3.3**	3.3	3.6
Intensive care unit [%]	79%	78%	78%	**75%**	75%	79%
LOS on ICU [2)] [days]	7.8	7.2	6.8	**6.4**	6.4	7.8
Intubated/ventilated [2)] [%]	51%	48%	44%	**40%**	40%	51%
Days intubated [2)] [days]	4.1	3.6	3.3	**2.9**	2.9	4.1
Outcome						
LOS in hospital [3)] [days]	17.2	17.0	16.3	**14.9**	15.1	17.2
Hospital mortality [3)] [%]	10.3%	9.6%	9.3%	**8.6%**	8.6%	10.3%
Early mortality (<24h) [3)] [%]	5.2%	4.9%	4.4%	**3.9%**	3.9%	5.2%
Organ failure [1) 3)] [%]	37%	36%	35%	**32%**	32%	37%
Discharge to other hosp. [%]	16%	16%	16%	**15%**	15%	16%

LOS = Length of Stay ICU = Intensive Care Unit ISS = Injury Severity Score CT = Computed Tomography
[1)] not available in the reduced QM dataset [2)] only ICU patients [3)] without patients transferred out early [4)] Years with incomplete documentation excluded

3. Quality Indicators

The results on this page only refer to primary admitted cases, or subgroups thereof. For the calculation of the time from hospital admission until various diagnostic procedures, only patients with valid time data were considered (see also remarks below). A standard deviation (SD) is presented only if more than one value was available.

	Your Hospital				**TR-DGU**	
Indicator	10 years	2011	2012	**2013**	2013	10 years
Primary admitted patients	n=127,977	n=22,395	n=27,415	n=32,039	n=26,377	n=97,101
1. Pre-hospital time from the accident until hospital admission; in patients with ISS ≥ 16 [∅ min ± SD]	**71** ± 52 n=55,561	**71** ± 54 n=9,571	**70** ± 52 n=10,787	**71** ± 55 n=11,121	**71** ± 55 n=11,121	**71** ± 52 n=55,561
2. Intubation rate of unconscious patients (GCS ≤ 8) [%, n / total]	**87%** 19,542 / 22,501	**85%** 3,076 / 3,607	**84%** 3,513 / 4,189	**83%** 3,610 / 4,373	**83%** 3,610 / 4,373	**87%** 19,542 / 22,501
3. Time from hospital admission until **first x-ray of the thorax**; in patients with ISS ≥ 16 [∅ min ± SD]	**14** ± 19 n=26,944	**15** ± 20 n=4,436	**16** ± 23 n=4,885	**16** ± 21 n=4,889	**16** ± 21 n=4,889	**14** ± 19 n=26,944
4. Time from hospital admission until first **x-ray of the pelvis**; in patients with ISS ≥ 16 [∅ min ± SD]	**15** ± 18 n=18,877	**16** ± 19 n=3,060	**17** ± 21 n=3,258	**16** ± 19 n=3,382	**16** ± 19 n=3,382	**15** ± 18 n=18,877
5. Time from hospital admission until **abdominal sonography** (FAST); in patients with ISS ≥ 16 [∅ min ± SD]	**7** ± 11 n=45,163	**7** ± 11 n=7,944	**7** ± 12 n=9,056	**6** ± 10 n=9,666	**6** ± 10 n=9,666	**7** ± 11 n=45,163
6. Time from hospital admission until **CT of the head** (cCT); in patients with GCS < 15 [∅ min ± SD]	**24** ± 18 n=46,775	**23** ± 18 n=8,123	**23** ± 18 n=9,884	**22** ± 17 n=10,608	**22** ± 17 n=10,608	**24** ± 18 n=46,775
7. Time from hospital admission until **whole-body CT** (WBCT); in all patients [∅ min ± SD]	**24** ± 18 n=76,499	**24** ± 19 n=14,157	**24** ± 18 n=18,196	**23** ± 17 n=20,471	**23** ± 17 n=20,471	**24** ± 18 n=76,499
8. Time from hospital admission until first **emergency surgery**; for selected interventions (see remarks below) [∅ min ± SD]	**84** ± 40 n=15,271	**78** ± 41 n=3,288	**87** ± 39 n=4,099	**89** ± 39 n=4,240	**89** ± 39 n=4,240	**84** ± 40 n=15,271

Remarks: ∅ = average
Indicator 1: Times exceeding 8 hours were disregarded.
Indicator 3-8: Times exceeding 3 hours were disregarded.
Indicator 6: If a whole-body CT was performed, it was counted here as well.
Indicator 8 is based on the following seven interventions: craniotomy, thoracotomy, laparotomy, revascularization, embolization, and external stabilization of the pelvis or of extremities.

4. Individual Cases

4.1 Non-Survivor with a low risk of death (< 10% acc. to RISC II)

Here patients are listed who have died in hospital although their initial prognosis (based on the RISC II score) seemed to be rather low. In total, 209 such cases were observed in the whole registry for the year 2013.

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 problems** during the acute care of this patient. But this could only be clarified in a more detailed individual analysis of these cases.

Your Hospital: Among the 29930 primary admitted cases, **21380 patients** had a risk of death < 10%. From these cases, **361 patients died.** They are listed in the following table.

Patient Code*	RISC II	ISS	Age	Sex	Date of admission	LOS

4.2 Survivor with a high risk of death (> 80% acc. to RISC II)

Patients who survived although their risk of death was rather high (>80%) could be indicative for a very well-functioning **interdisciplinary cooperation** in acute care. Overall, 99 such cases were observed in the registry last year. Again, details could only be found after individual analysis of each case. Patients transferred into another hospital within the first two days were disregarded here, of course. Nevertheless, patients could have been transferred later and survival might not have been secured.

Your Hospital: Among the 29930 primary admitted cases, **943 patients** with a risk of death > 80%. The **survivor** among these cases (**n = 99**) are listed in the following table.

Patient Code*	RISC II	ISS	Age	Sex	Date of admission	LOS
EXAMPLE	92,8	41	24	F	08-SEP-2013	39

4.3 Non-survivor with ISS< 4

The RISC II score is calculated for patients with ISS ≥ 4 points only. However, in 2013 there were 3547 cases with an ISS less than 4, i.e. the most severe injury had an AIS severity grade of one. Although usually all such patients survive, we observed 28 non-survivors is this group (0,8%). These cases should be subject of a detailed internal revision, including the correctness and completeness of injury coding.

Your Hospital: **3547 patients** had an ISS < 4 points; **28** of them **died**:

Patient Code*	ISS	Age	Sex	Date of admission	LOS

* The Patient Code is composed of the hospital code, the year of trauma, and an individual patient code
LOS = length of stay in hospital (days)

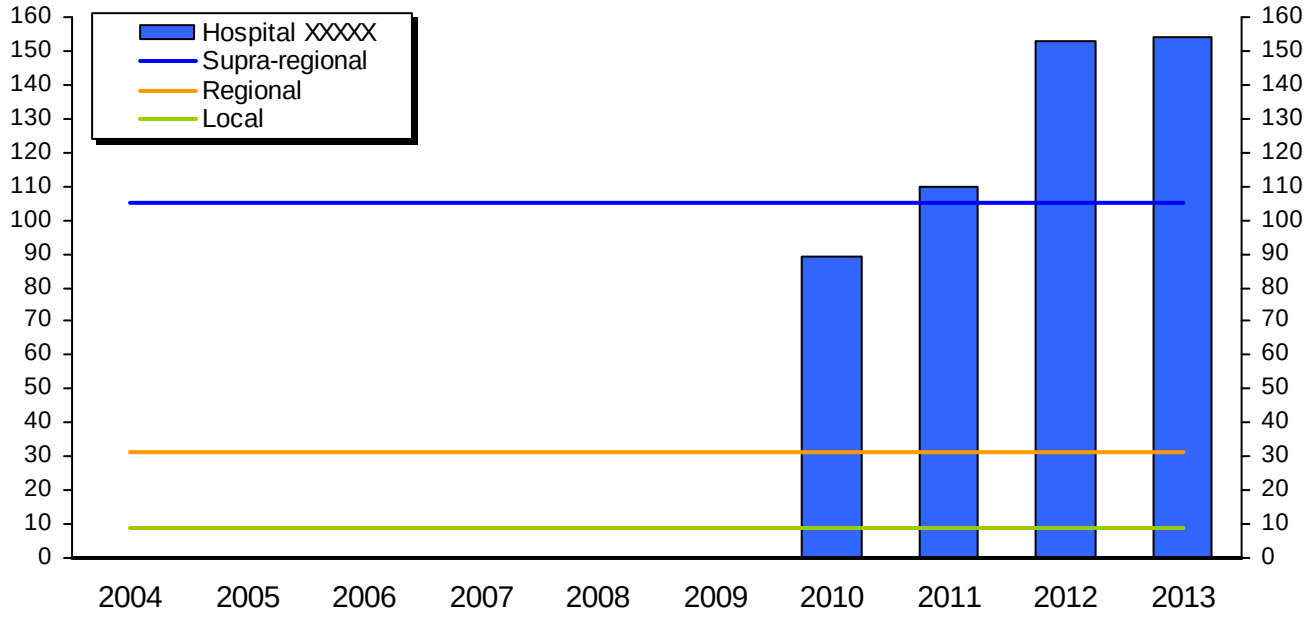
5. Graphical Comparisons

5.1 Development in the last 10 years

The following graph shows the number of cases documented in the last ten years. The total number of cases from your hospital was **159,449 patients in 21 years**. In the figure below, we **excluded** all patients who were **not treated on an intensive care unit**, according to the inclusion criteria of the TR-DGU. However, all non-survivors were included. For your hospital, this leaves: **n=116,082 of 142,424** patients in the last 10 years, and **n=26,718 of 29,998** patients in 2013.

In order to compare your case numbers with that of other hospitals, we calculated the average number of cases per year for each level of care (horizontal lines): supra-regional trauma centers (level 1) n=105 / regional trauma centers (level 2) n=31 / local trauma centers (level 3) n=9. For calculating these values annual case numbers <20 and <5 for level 1 and 2 hospitals, respectively, were disregarded. The colour of the bars indicates the level of care of your hospital **()**.

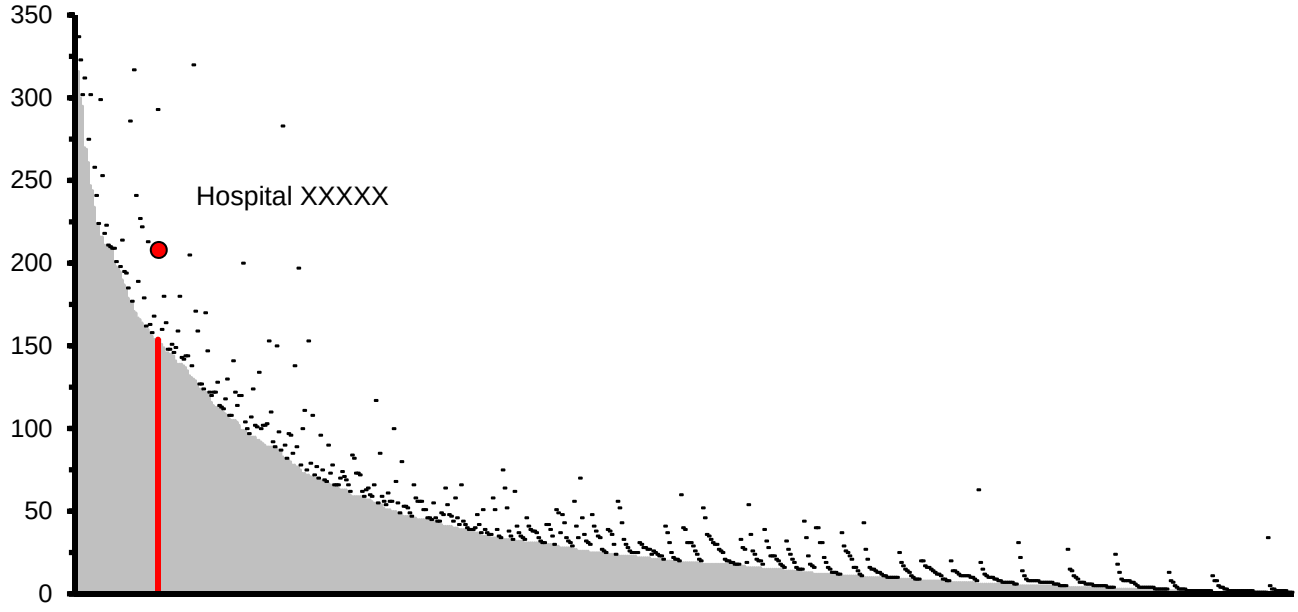
If the number of cases of your hospital lies below the average number of similar hospitals in the registry (same level of care), then an incomplete documentation of all potential patients might be one of the reasons for this.



5.2 Number of Patients in 2013

your hospital: **n = 34,878 / 26,718** TR-DGU: n = 34,878 / 26,718

In 2013, there were 34,878 patients documented from your hospital (red dot); among them were 26,718 patients treated on the ICU (red bar). The hospital values were ranked according to the number of intensive care cases.



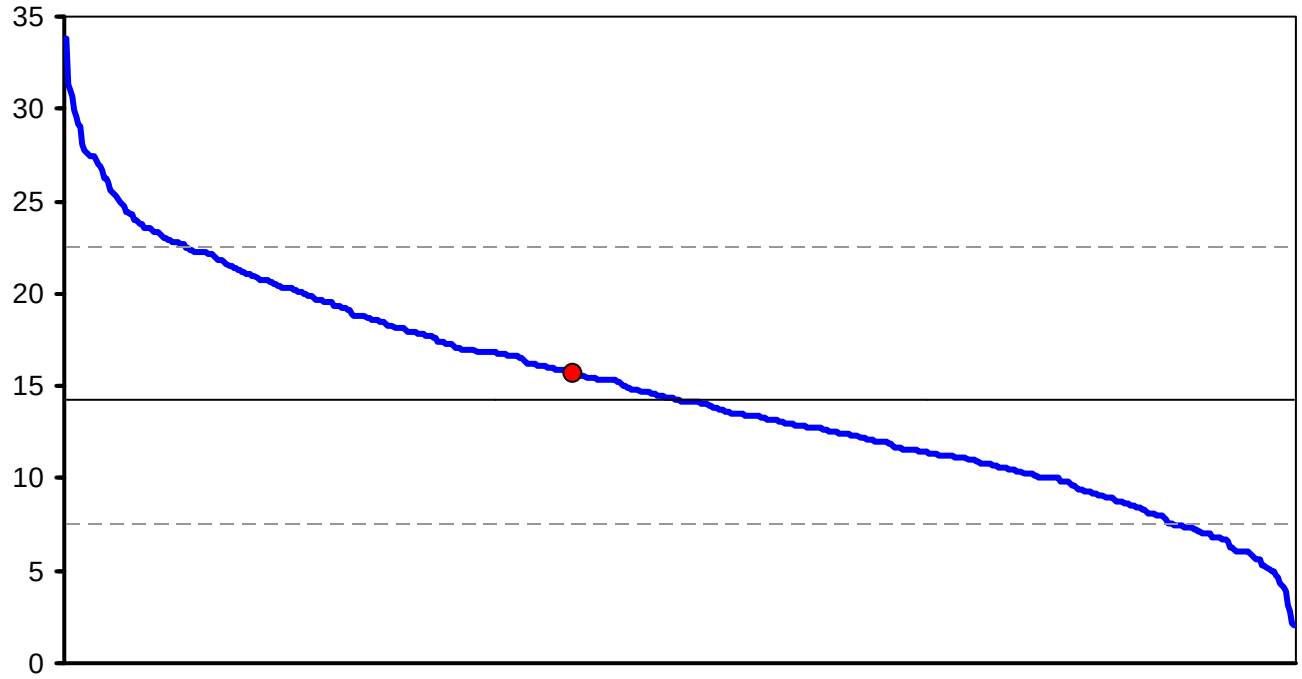
Graphical Comparisons with other Hospitals in 2013

In the following figures selected data from your patients from 2013 are compared with the overall result in the registry. Your hospital is marked with a **red dot** in the figures, if there are **at least three patients** with valid data. The horizontal line represents the median value of all hospitals included in the figure, and the broken lines represent the 10% and 90% percentiles.

Mean ISS (Injury Severity Score)

Your Hospital: **15.7 points**; Median: 14.3 points

Your hospital value is based on **34,878** patients from 2013.



Hospital Mortality (%)

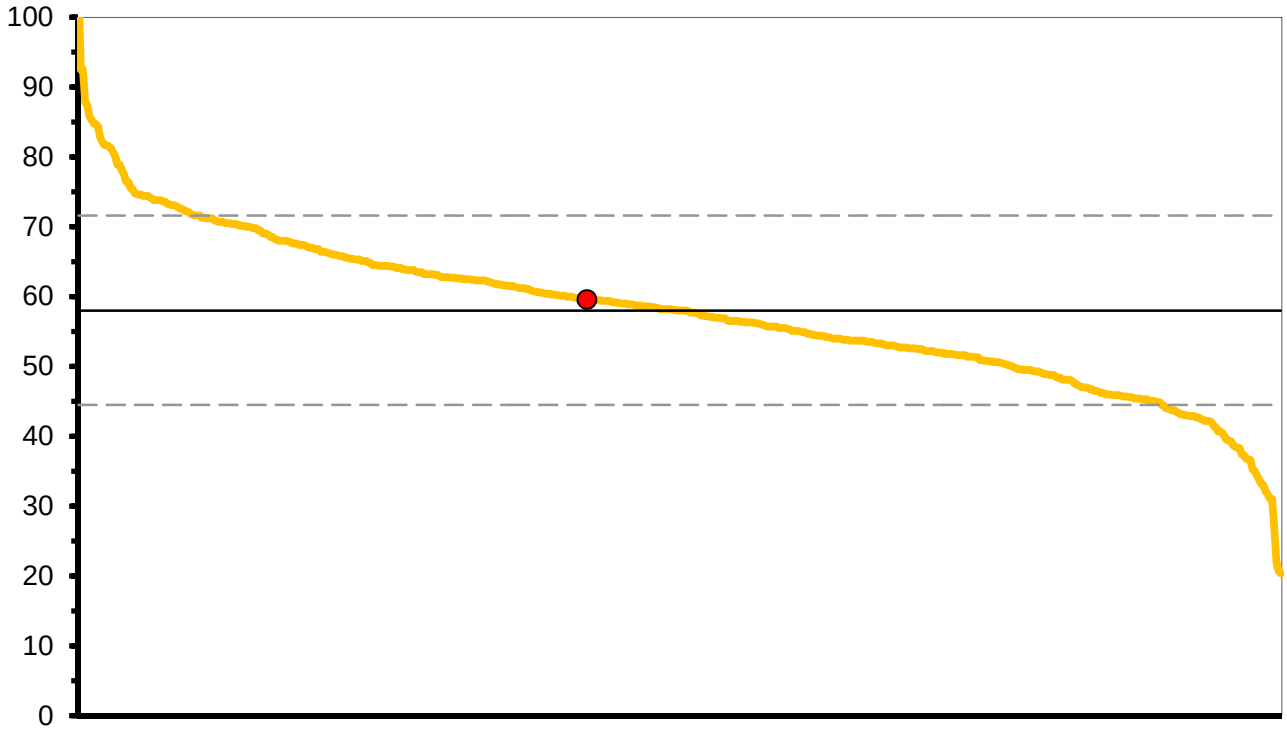
Your hospital: **9.2%** (3,009 of 32,769); Median: 6.7%

Only pimary admitted patients and those transferred in; patients transferred out within 48 hours were excluded here. If there were less than three cases from your hospital, then your hospital value was not included in this figure.

Pre-hospital Time (from accident to hospital admission in min)

Your hospital: **59.6 min.**; Median:58.0 min.

The mean value of your hospital is based on **26060** (out of 32039) **primary admitted patients** with valid time data for both the accident and the hospital admission. If there were less than three cases with valid data, then your hospital was not included in this figure.

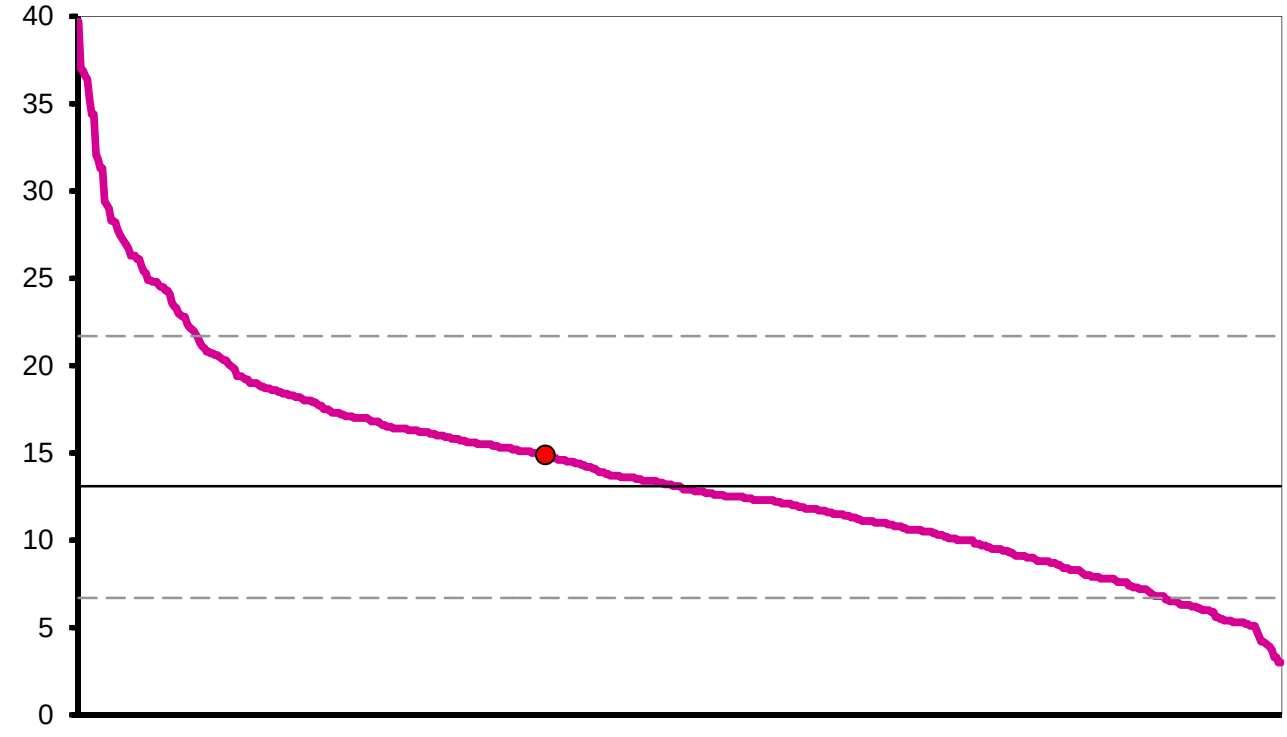


Length of Stay in Hospital (days)

Your hospital: **14.9 days**; Median: 13.1 days

Patients transferred out within 48 h (n=2109) were **not** included here.

The mean value of your hospital is based on **32573 patients;** 2839 patients (**9%**) were transferred to another hospital at the end of their stay. If there were less than three cases with valid data, then your hospital was not included in this figure



5.4 Length of Stay and Injury Severity

This figure describes the association of **length of stay** (LOS) in hospital and **injury severity** (ISS). The mean values were calculated for survivors only. Patients transferred into another hospital (n=0) were also excluded. Hospitals with less than three patients were not included in this figure.

■ Your hospital 2013:

The results of your hospital are based on **26965 patients.**

Liegedauer: **15.6** Tage

ISS: **13.5** Punkte

◆ TR-DGU 2013:

Patients: 26,965

LOS in hospital: 15.6 days

ISS: 13.5 points

5.5 Mortality *versus* Prognosis

The following figure compares each hospital's **observed mortality rate** with the respective **RISC II prognosis in 2013,** like on page 1. The difference of observed and expected mortality rate is plotted against the number of patients. Negative values correspond to mortality rates which are lower than the prognosis. The dotted lines represent the 95% confidence interval. Only primary admitted cases without early transfers with a valid RISC II prognosis are considered. Hospitals with **less than five patients** were **not included** in this figure, due to the large statistical uncertainty.

Your hospital 2013: No. of cases: **26,444 patients** with RISC II prognosis (excluding transfers)
Letalität: **10.0%** Prognose: **9.6%** Differenz: **+ 0.4%** (TR-DGU: + 0.4%)

6. Basic Data

On the following three pages basic data from five different phases are presented: Demographics/Accident (S); Pre-hospital Phase (A); Emergency Room (B); Intensive Care (C) and Final Assessment / Discharge (D). Your hospital data refer to the year 2013. Comparative registry data are provided from the same year (**TR-DGU 2013**) and from the last ten years 2004-2013 (**TR-DGU 10**).

	Your Hospital 2013		**TR-DGU 2013**		**TR-DGU 10**	
Number of patients	**34878**		**34,878**		**142,424**	

(S) Demographics / Accident

Primary Admissions / Transfers	**%**	n	**%**	n	**%**	n
Primary admitted	**91.9**	32,039	**91.9**	32,039	**89.9**	127,977
among these transferred out within 48h	***6.0***	*2,109*	***6.0***	*2,109*	***5.6***	*7,967*
Transferred in within 24h after trauma	**7.2**	2,503	**7.2**	2,503	**9.0**	12,810
Transferred in later	**1.0**	336	**1.0**	336	**1.1**	1,637
Patient Characteristics						
Age in years (M ± SD, n)	**48.7** ± 22.6	34,828	**48.7** ± 22.6	34,828	**46.7** ± 22.1	141,876
Children/Adolescents (<16y.) (%, n)	**5.0**	1,745	**4.9**	1,745	**5.1**	7,279
Males (%, n)	**69.0**	24,060	**70.2**	24,060	**70.5**	100,366
ASA 3-4 prior to trauma * (%, n)	**14.2**	4,025	**13.7**	4,025	**13.5**	13,052
Mechanism of Injury	**%**	n	**%**	n	**%**	n
Blunt	**95.4**	31,314	**95.4**	31,314	**95.2**	128,518
Penetrating	**4.6**	1,526	**4.6**	1,526	**4.8**	6,533
Type and Cause of Accident	**%**	n	**%**	N	**%**	n
Traffic – car	**23.9**	7,578	**23.9**	7,578	**25.7**	33,749
Traffic – motor bike	**12.4**	3,922	**12.4**	3,922	**13.3**	17,505
Traffic – bicycle	**9.2**	2,902	**9.2**	2,902	**8.8**	11,563
Traffic – pedestrian	**7.0**	2,231	**7.0**	2,231	**7.2**	9,523
High fall (>3m)	**15.9**	5,037	**15.9**	5,037	**16.4**	21,529
Low fall	**24.4**	7,724	**24.4**	7,724	**20.1**	26,468
Suicide (suspected)	**4.1**	1,359	**4.1**	1,359	**4.5**	6,183
Assault (suspected)	**2.4**	805	**2.4**	805	**2.5**	3,465

(A) Pre-hospital Phase

Results only for **primary admitted** cases	**32039**		**32,039**		**127,977**	
Vital Signs	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Systolic blood pressure sBP [mm Hg]	**131** ± 32	27,966	**131** ± 32	27,966	**127** ± 33	112,064
Respiratory rate RR [/min]	**15.7** ± 5.7	19,656	**15.7** ± 5.7	19,656	**16.0** ± 6.0	77,028
Glasgow Coma Scale (GCS)	**12.8** ± 3.8	29,286	**12.8** ± 3.8	29,286	**12.0** ± 4.0	118,896
Findings	**%**	n	**%**	n	**%**	n
Shock (sBP ≤ 90 mmHg)	**9.0**	2,525	**9.0**	2,525	**12.1**	13,613
Unconscious (GCS ≤ 8)	**15.1**	4,415	**15.1**	4,415	**19.1**	22,721
NACA Index	**%**	n	**%**	n	**%**	n
at least grade IV („life threatening“)	**78.2**	8,128	**78.2**	8,128	**82.7**	46,269
Therapy	**%**	n	**%**	n	**%**	n
Cardio-pulmonary resuscitation (CPR)	**2.3**	714	**2.3**	714	**2.7**	3,441
Intubation	**19.6**	6,154	**19.6**	6,154	**28.2**	36,046
Volume administration	**76.5**	23,989	**76.5**	23,989	**82.2**	102,856
Chest tube ***	**2.3**	340	**2.3**	340	**3.6**	2,605
Analgo-sedation ***	**54.5**	8,153	**54.5**	8,153	**66.1**	47,631
Volume Administration	**M** ± SD	n	**M** ± SD	N	**M** ± SD	n
Average amount in all patients (ml)	**651** ± 587	29,209	**651** ± 587	29,209	**850** ± 724	116,820
Crystalloids (ml) **	**737** ± 488	23,626	**737** ± 488	23,626	**802** ± 509	100,726
Colloids (ml) **	**582** ± 309	2,344	**582** ± 309	2,344	**651** ± 358	25,425

M ± SD = mean and standard deviation; NACA = National Advisory Committee for Aeronautics
* available since 2009 only
** average amount per patient if given
*** not available in the reduced QM dataset

	Your Hospital 2013	TR-DGU 2013	TR-DGU 10 years
Total no. of patients	**34,878**	34,878	142,424

(B) Emergency Room

Results for **primary admitted** cases only	**n = 32,039**		**n = 32,039**		**n = 127,977**	
Transportation to hospital	**%**	n	**%**	n	**%**	n
with helicopter	**17.0%**	5,440	**17.6%**	5,440	**23.4%**	28,819
Shock on admission	**%**	n	**%**	n	**%**	n
Systolic blood pressure ≤ 90 mmHg	**6.4%**	2,061	**7.0%**	2,061	**9.1%**	10,483
Glasgow Coma Scale (GCS)	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
if intubated on admission	**3.2** ± 1.3	3,328	**3.2** ± 1.3	3,328	**3.2** ± 1.4	23,487
if not intubated	**13.9** ± 2.4	10,404	**13.9** ± 2.4	10,404	**13.8** ± 2.5	43,060
Initial diagnostics	**%**	n	**%**	n	**%**	n
Sonography (FAST)	**78.6%**	25,170	**82.3%**	25,170	**81.3%**	101,790
X-ray of thorax	**40.1%**	12,840	**42.0%**	12,840	**48.5%**	60,776
Cranial CT (isolated or WBCT)	**82.2%**	26,336	**86.1%**	26,336	**85.8%**	107,388
Whole-body CT	**67.5%**	21,629	**70.7%**	21,629	**66.9%**	83,784
ER diagnostic not completed *	**2.8%**	432	**2.8%**	432	**2.8%**	1,962
Time in the ER *	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
if diagnostics not completed [min] *	**48** ± 37	354	**48** ± 37	354	**42** ± 36	2,258
if send to the operation room [min] *	**67** ± 46	3,358	**67** ± 46	3,358	**71** ± 45	18,900
if transferred to the ICU [min] *	**69** ± 48	6,307	**69** ± 48	6,307	**70** ± 45	27,391
Treatment in the ER	**%**	n	**%**	n	**%**	n
Ccardio-pulmonary resuscitation (CPR) *	**2.2%**	336	**2.2%**	336	**3.2%**	2,361
Chest drain *	**8.3%**	1,280	**8.3%**	1,280	**12.3%**	9,152
External fracture stabilisation *	**5.8%**	889	**5.8%**	889	**7.0%**	5,179
Blood transfusion	**6.9%**	2,195	**6.9%**	2,195	**11.2%**	14,318
Hemostasis treatment *	**11.0%**	1,430	**11.0%**	1,430	**11.8%**	5,655
Initial laboratory values	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Base excess [mmol/l]	**- 1.8** ± 4.6	20,606	**- 1.8** ± 4.6	20,606	**- 2.1** ± 4.7	72,608
Hemoglobine [g/dl]	**13.3** ± 2.2	29,087	**13.3** ± 2.2	29,087	**12.9** ± 2.5	117,211
Quick's value - PT [%]	**88** ± 21	27,270	**88** ± 21	27,270	**85** ± 22	109,001
Int. Normalized Ratio INR **	**1.18** ± 0.55	27,686	**1.18** ± 0.55	27,686	**1.20** ± 0.60	110,582
Partial Thromboplastin Time PTT [sec] *	**30** ± 15	11,863	**30** ± 15	11,863	**32** ± 17	57,050
Temperature [°C] *	**36.2** ± 1.2	6,898	**36.2** ± 1.2	6,898	**36.1** ± 1.2	30,397

(C) Intensive Care Unit

Patients with **intensive care therapy** only	**n = 26,179 (75.1%)**		**n = 26,179 (75.1%)**		**113,049 (79.4%)**	
Severity	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
SAPS II score on ICU admission *	**25.0** ± 16.0	7,840	**25.0** ± 16.0	7,840	**26.0** ± 17.0	40,322
Treatment *	**%**	n	**%**	n	**%**	n
Hämostatic drugs *	**6.6%**	1,621	**6.6%**	1,621	**8.9%**	7,895
Dialysis / hemofiltration *	**2.5%**	298	**2.5%**	298	**2.5%**	1,619
Blood transfusion * within the first 48 h after admission	**21.1%**	2,887	**21.1%**	2,887	**18.6%**	12,721
Mechan. ventilation / intubated	**39.8%**	10,424	**39.8%**	10,424	**51.5%**	58,179
Complications *	**%**	n	**%**	n	**%**	n
Organ failure (OF) *	**33.1%**	4,098	**33.1%**	4,098	**38.8%**	25,516
Multiple organ failure (MOV) *	**19.7%**	2,443	**19.7%**	2,443	**23.5%**	15,454
Sepsis *	**4.7%**	576	**4.7%**	576	**6.8%**	4,434
Length of stay and ventilation	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
Length of intubation [days]	**2.9** ± 7.7	25,999	**2.9** ± 7.7	25,999	**4.1** ± 8.9	112,030
LOS on ICU [days]	**6.4** ± 10.3	26,179	**6.4** ± 10.3	26,179	**7.8** ± 11.3	112,972

* not available in the reduced TR-QM dataset ** approximated from Quick's value (PT) if not documented
ICU = Intensiv Care Unit ER = Emergency Room LOS = Length of stay CT = Computed Tomography
M ± SD = mean and standard deviation k.A. = no data available

	Your Hospital 2013	TR-DGU 2013	TR-DGU 10 years
Total no. of patients	**34,878**	34,878	142,424

(D) Discharge / Outcome

Diagnoses	**M**	n	**%**	n	**%**	n
Number of injuries per patient	**4.0**	34,878	**4.0**	34,878	**4.3**	142,424
Operations *	**%**	n	**%**	n	**%**	n
Patients with surgery *	**57.7%**	10,077	**57.7%**	10,077	**69.3%**	55,437
No. of procedures if operated * [Mean]	**3.3**		**3.3**		**3.6**	
Thrombo-embolic Events (MI; pulmonary embolism; DVT; stroke; etc.)	**%**	n	**%**	n	**%**	n
Patients with at least one event *	**2.2%**	349	**2.2**	349	**2.6**	1,777
Outcome (without early transfers)	**%**	n	**%**	n	**%**	n
Survivor	**90.8%**	29,760	**90.8%**	29,760	**89.1%**	119,842
Hospital mortality	**9.2%**	3,009	**9.2%**	3,009	**10.9%**	14,615
Died within 30 days	**8.8%**	2,876	**8.8%**	2,876	**10.4%**	14,024
Died within 24 hours	**4.2%**	1,377	**4.2%**	1,377	**5.5%**	7,337
Transfer / Discharge (all patients)	**%**	n	**%**	n	**%**	n
Survivor who were discharged and …	**100%**	31,869	**100%**	31,869	**100%**	127,585
transferred into another hospital	**14.8%**	4,711	**14.8%**	4,711	**16.2%**	20,732
among them early discharges (<48h)	**6.6%**	2109	**6.6%**	2,109	**6.2%**	7,967
transferred into a rehabilitation center	**16.7%**	5,326	**16.7%**	5,326	**22.3%**	28,396
other discharges	**4.5%**	1,431	**4.5%**	1,431	**3.2%**	4,093
sent home	**64.0%**	20,401	**64.0%**	20,401	**58.3%**	74,364
Condition at the time of discharge (Glasgow Outcome Scale; GOS) (without early transfers)	**%**	n	**%**	n	**%**	n
Patients with valid GOS		30,056		30,056		126,905
Surviving patients	**100%**	27,047	**100%**	27,047	**100%**	112,209
– good recovery	**72.4%**	19,590	**72.4%**	19,590	**66.6%**	74,814
– moderate disability	**20.1%**	5,435	**20.1%**	5,435	**23.6%**	26,446
– severe disability	**6.2%**	1,689	**6.2%**	1,689	**8.2%**	9,221
– persistant vegetative state	**1.2%**	333	**1.2%**	333	**1.6%**	1,809
Length of stay in hospital (all patients)	**M** ± SD	n	**M** ± SD	n	**M** ± SD	n
All patients. mean	**14.1** ± 17.0	34,682	**14.1** ± 17.0	34,682	**17.0** ± 20.2	142,143
median	**9**		**9**		**11**	
Only non-survivors	**7.5** ± 13.3	3,006	**7.5** ± 13.3	3,006	**7.1** ± 13.0	14,610
Only survivors. …	**14.7** ± 17.1	31,676	**14.7** ± 17.1	31,676	**18.1** ± 20.6	127,533
… if transferred into a rehab center	**29.1** ± 22.3	5,326	**29.1** ± 22.3	5,326	**31.5** ± 23.9	28,388
… if transferred into another hospital	**9.6** ± 13.7	4,711	**9.6** ± 13.7	4,711	**11.6** ± 19.1	20,721
… if sent home	**12.1** ± 13.9	20,400	**12.1** ± 13.9	20,400	**14.7** ± 19.9	74,341
Sum of all days in hospital [days]	489.045		489,045		2,412,508	
Costs of treatment (without early transfers; see footnote)	**M €**	n	**M €**	n	**M €**	n
Average costs per patient in Euro						
… all patients	**13.140**	32,364	**13,140**	32,364	**16.525**	132,678
… only non-survivors	**11.503**	2,899	**11,503**	2,899	**12.119**	13,785
… non-survivors	**13.301**	29,465	**13,301**	29,465	**17.036**	118,893
… only patients with ISS ≥ 16	**20.304**	13,950	**20,304**	13,950	**23.156**	70,084
Sum of all costs	425,255,826 €		425,255,826 €		2,192,544,291 €	
Average costs per day	**881.15 €**		**881.15 €**		**921.78 €**	

* not available in the reduced TR-QM dataset M ± SD = mean and standard deviation

Costs: The estimated treatment costs are based on data of 1002 German TR-DGU patients treated in 2007 and 2008. For these patients a detailed cost analysis was available (for details. see the TR-DGU annual report 2011).

7. Subgroup Analysis

Overall outcomes are not always helpful in search of causal associations. Therefore on this page specific subgroups are considered and analyzed. The results include data from patients, details of care, and the outcome (hospital mortality) together with the respective RISC II prognosis. In order to reduce statistical uncertainty, data from the **last three years** are considered together here (2012-2014).

7.1 Subgroups within your hospital

The data in the tables below relates to primary admitted patients which are treated on the intensive care unit, or died. From your hospital data of 63,602 of 89,564 patients (71.0%) are considered here from the last three years.

Parameters			All Patients	Subgroups					
				Without TBI*	Combined Trauma*	Isolated TBI*	Shock **	ISS ≥ 25	Age ≥ 60
No. of cases		n	63,602	31,522	24,464	7,616	5,558	17,970	20,408
		%	100%	50%	39%	12%	9%	28%	32%
Patients	Age	[years]	48.1	45.3	48.8	57.6	48.7	50.7	74.2
	Age ≥ 60	%	32%	25%	34%	53%	34%	37%	--
	Males	%	71%	73%	70%	65%	70%	71%	62%
Injury Severity Score		[points]	18.5	14.3	23.9	18.7	31.3	34.9	19.5
Pre-hospital	Intubation	%	27%	17%	39%	37%	66%	54%	26%
	Volume	[ml]	784	788	843	572	1204	986	677
Emergency Room	Transfusion	%	10%	10%	12%	3%	39%	23%	9%
	Whole body CT	%	75%	76%	81%	53%	75%	80%	69%
LOS	Intubation	[days]	3.0	1.7	4.4	3.6	6.3	6.8	3.5
	ICU	[days]	6.3	4.8	8.1	6.6	10.1	11.2	7.0
	Hospital	[days]	16.5	16.7	17.2	13.0	20.0	21.3	16.6
Outcome and Prognosis	Pat. without transfers		56,873	26,888	23,077	6,908	5,191	16,877	18,839
	Mortality	%	12.7%	5.9%	16.0%	28.1%	38.7%	32.4%	23.3%
	RISC II	%	11.8%	5.3%	15.5%	24.7%	38.8%	30.6%	21.0%

* Isolated traumatic brain injury = AIS ≥ 3 in the region 'Head'(according to ISS) and AIS ≤ 1 in all other body regions. Patients in the subgroup 'Without TBI' max. suffered a grade 1 injury of the head. All other patients are considered in the group 'Combined Trauma'

** The subgroup 'Shock' considers all patients with sBP ≤ 90 mmHg on admission to hospital.

7.2 Level of care

The table below allows comparing your hospital data with results from hospitals at the same level of care. All patients from the **last three years** are considered here.

Parameters			Your Hospital	Trauma Center			
				local	regional	Supra-regional	TR-DGU
Level of care / Trauma Center							
Documented cases per year		n	**29,855** /year	**14** /year	**43** /year	**150** /year	**53** /year
Primary admitted		%	85% (n=76079)	78%	86%	86%	85%
Early transferred out (<24h)		%	6% (n=5770)	20%	11%	2%	6%
Transferred in from other hospitals		%	9% (n=7715)	2%	4%	13%	9%
Age		[years]	47.9	50.0	48.7	47.1	47.9
Injury Severity Score		[points]	16.8	12.1	15.6	18.4	16.8
ISS ≥ 16		%	48%	30%	44%	54%	48%
Head injury (AIS ≥ 3)		%	32%	18%	26%	38%	32%
Rescue time (accident to hospital)		[min]	n=66,803; 59.9	55.4	57.1	62.8	59.9
Length of stay on ICU		[days]	5.5	2.9	4.6	6.4	5.5
Length of stay in hospital		[days]	15.9	11.5	14.5	17.4	15.9
Outcome and Prognosis	Patients	n	n=68,530	n=6,075	n=22,411	n=40,044	n=68,530
	Mortality in hospital	%	10.5%	6.1%	9.0%	12.0%	10.5%
	RISC II prognosis	%	10.2%	6.1%	8.5%	11.8%	10.2%

8. Data Quality and Completeness

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 needed, for example, for prognostic scores, then these patients have to be excluded from analysis. The following table describes the **completeness rates (%)** of several important variables, together with the **number of patients with missing data (∅)**. The list also contains a short description of the importance of these variables.

Good completeness rates are indicated with green color (96% or better), variables with moderate completeness are marked in yellow (90-95%), and insufficient completeness (below 90%) is indicated in red. The categories for completeness are thresholds defined by the TraumaRegister DGU®. They are not derived from the data.

The completeness rates of your hospital **in 2013** are compared with your hospital's data from the previous years (**since 2004**) and with actual overall data from the whole registry (**TR-DGU 2013**). Besides the rates also the number of patients with missing data is given, marked with the ∅ sign, including also cases with implausible data.

Variable	Improtance	Category (%)			Your hospital 2013	Your hospital 2004-2012	TR-DGU 2013
Pre-clinical data (A)							
		only primary admitted cases			n=32,039	n=95,938	n=32,039
GCS	Required for TRISS and RISC II; also needed to define cases for two audit filters	96+	90-95	<90	**91%** ∅ 2753	**93%** ∅ 6328	**91%** ∅ 2,753
Syst. blood pressure	Required for TRISS and RISC II as indirect sign of bleeding; required also to define shock	96+	90-95	<90	**87%** ∅ 4073	**88%** ∅ 11840	**87%** ∅ 4,073
CPR	Cardio-pulmonary resuscitation is seldom (3-4%) but highly predictive for outcome; required for RISC II	96+	90-95	<90	**90%** ∅ 3164	**94%** ∅ 6124	**90%** ∅ 3,164
Respiratory rate	As part of the RTS required for TRISS (but not for RISC / RISC II)	96+	90-95	<90	**61%** ∅ 12,383	**80%** ∅ 19,656	**61%** ∅ 12,383
Emergency room (B)							
		only primary admitted cases			n=32,039	n=95,938	n=32,039
Time of admission	Required to calculate the time until diagnostics were performed	96+	90-95	<90	**99%** ∅ 323	**98%** ∅ 2,063	**99%** ∅ 323
Base Excess	Base excess is part of the RISC II and an independent prognostic factor	96+	90-95	<90	**64%** ∅ 11,445	**54%** ∅ 44,005	**64%** ∅ 11,445
Coagula-tion	At least one coagulation marker (PTT, Quick, INR) is needed for the RISC II	96+	90-95	<90	**86%** ∅ 4,353	**86%** ∅ 13,042	**86%** ∅ 4,353
Hemo-globin	Is part of the RISC II score as an indirect bleeding sign	96+	90-95	<90	**91%** ∅ 2,952	**92%** ∅ 7,814	**91%** ∅ 2,952
Diagnoses / Outcome (D)							
		all cases			n=34,878	n=142,424	n=34,878
GOS	The Glasgow Outcome Scale (GOS) describes the patient's condition at discharge or transfer	96+	90-95	<90	**90%** ∅ 3,425	**95%** ∅ 6,890	**90%** ∅ 3,425
Severe Injuries	Patients with ISS<9 without intensive care lie outside the scope of this registry (maybe not all injuries coded)	96+	90-95	<90	**87%** ∅ 4,385	**94%** ∅ 8,476	**87%** ∅ 4,385
Surgical treatment	A low rate of surgical patients could be based on incomplete documenta-tion (only standard dataset; not QM)	70+	50-69	<50	**55%** 9602 / 17464	**67%** 45608 / 68418	**55%** 9602 / 177464
Process data							
		all cases			n=34,878	n=142,424	n=34,878
Time of documen-tation	Data quality correlates with the time of documentation. The average time (in months) from accident to docu-mentation in the TR-DGU is given	Case is created Case is completed			**3.6** mon. **5.4** mon.	**4.9** mon. **6.8** mon.	**3.6** mon. **5.4** mon.
Low sample size	Only for Supra-regional & Regional Trauma Centers: Low sample size compared to the expected amount could be based on not documented cases	60+	40-59	<40	**98%** n=101		

100% corresponds to
n=104 for STC and
n= 31 for RTC (see 5.1)

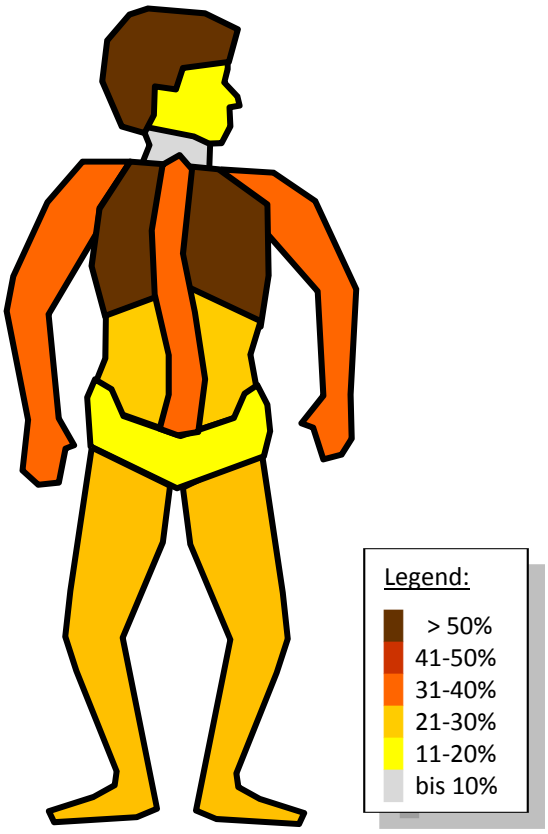
9. Pattern of Injury

The figure below shows the average injury pattern of your patients compared with the TraumaRegister DGU®. For these data only severely injured patients with **ISS ≥ 16** points were considered. In order to reduce the statistical uncertainty, all patients from the last three years **(2011-2013)** were evaluated together.

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, for example, radius fractures, spine fractures, lung contusions, etc.). The coloured figure refers to data from the whole registry (TR-DGU).

In 2011-2013 **42954 patients** (of 89564) from your hospital had an ISS of at least 16 points (**48.0%**). For comparison: TR-DGU: n=42,954; 48.0%.

Head	Your hospital	**60.7%**	(n = 26075)
	TR-DGU	60.7%	(n = 26,075)
Face	Your hospital	**15.3%**	(n = 6556)
	TR-DGU	15.3%	(n = 6,556)
Neck	Your hospital	**1.6%**	(n = 684)
	TR-DGU	1.6%	(n = 684)
Thorax	Your hospital	**59.2%**	(n = 25418)
	TR-DGU	59.2%	(n = 25,418)
Abdomen	Your hospital	**21.6%**	(n = 9278)
	TR-DGU	21.6%	(n = 9,278)
Spine	Your hospital	**33.6%**	(n = 14430)
	TR-DGU	33.6%	(n = 14,430)
Arms	Your hospital	**32.3%**	(n = 13876)
	TR-DGU	32.3%	(n = 13,876)
Pelvis	Your hospital	**19.7%**	(n = 8473)
	TR-DGU	19.7%	(n = 8,473)
Legs	Your hospital	**28.5%**	(n = 12237)
	TR-DGU	28.5%	(n = 13,237)



Injury Severity Score

The **Injury Severity Score (ISS)** is also based on the AIS codes, however, only six body regions are considered here which partly deviate from the AIS body regions (for example, spinal injuries were counted for head, thorax,or abdomen, respectively; all soft tissue injuries constitute a separate body region, etc.). The percentage of patients with **'serious' injuries (defined as AIS ≥ 3)** in four of the six ISS body regions is given below. The prevalence of serious injuries in the remaining body regions 'face' and 'external/soft tissue' is below 7%.

These results also refer to patients with ISS ≥ 16 only, documented in the last three years (2011-2013).

Serious injuries (AIS ≥ 3)	**Your hospital** n = 42954	**TR-DGU** n = 42,954
… of the **head/neck**	**54.9%** (n=23563)	54.9% (n=23,563)
… of the **thorax**	**52.9%** (n=22718)	52.9% (n=22,718)
… of the **abdomen**	**15.6%** (n=6699)	15.6% (n= 6,699)
… of the **extremities/pelvic girdle**	**29.8%** (n=12795)	29.8% (n=12,795)

10. General Results

Some results of the actual analysis of 2013 data from the TraumaRegister DGU® are of general interest. They will be presented here without reference to individual hospitals' results.

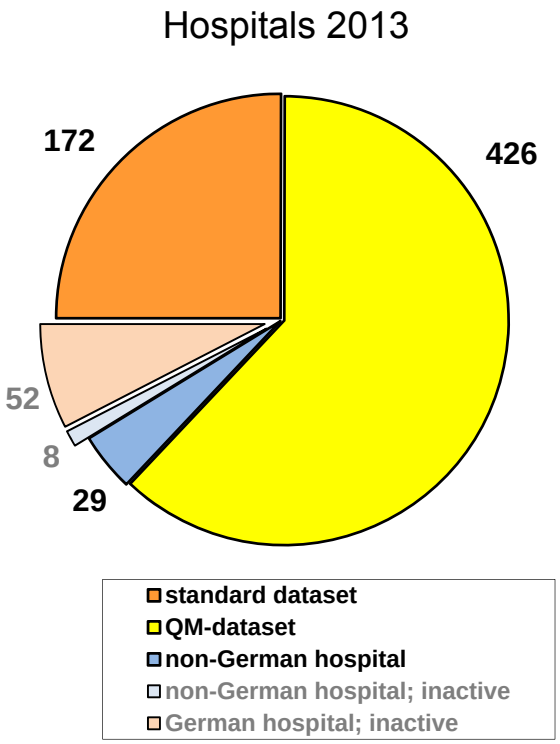
10.1 Hospitals and Patients

Hospitals

In 2013 data of **34,878 patients** from **614 actively participating hospitals** have been documented in the TraumaRegister DGU®. Thus the total number of patients documented since 1993 rose to **159,449** cases.

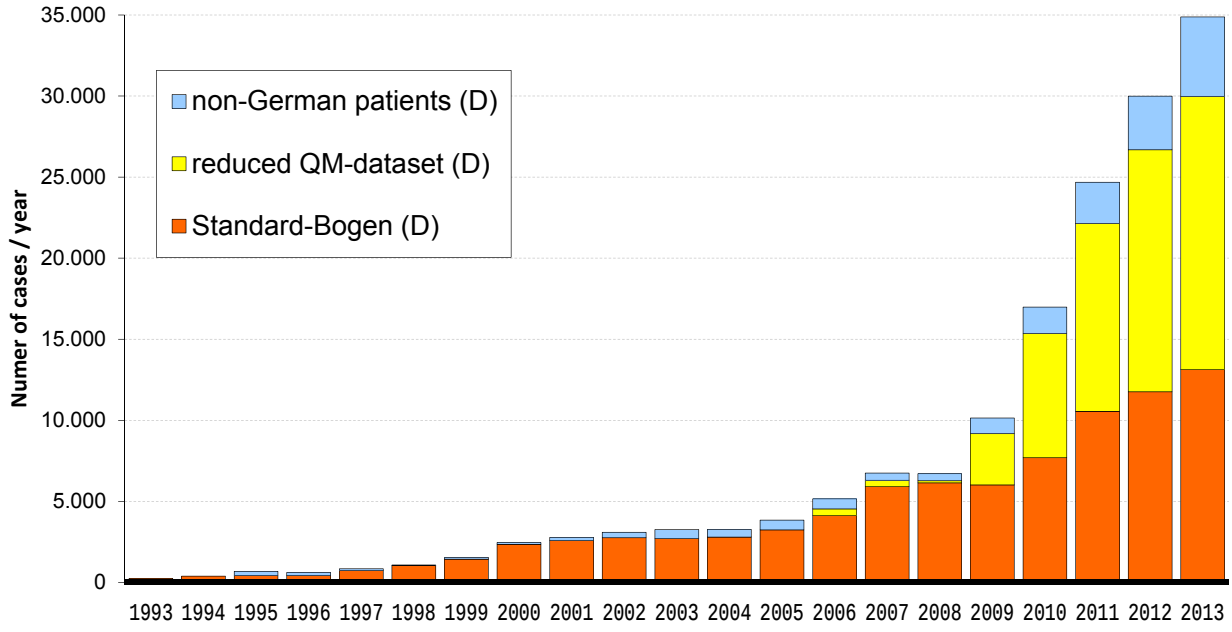
Among the total number of 674 hospitals (including the inactive ones) there are 37 hospitals from outside Germany (active 29): Austria 18, Slovenia 5, Netherlands 4, Switzerland 3, Luxembourg 2, Belgium 2, Finland 1, United Arab Emirates 1, and China 1. From Germany 585 hospitals actively participated in 2013.

The figure on the right shows the distribution of hospitals regarding to their status as active participant, their location as well as the use of standard or the reduced QM dataset, respectively. The reduced version of the dataset is mainly used in Germany by local (88%) and regional (76%) trauma centers. The majority of level one trauma centers is using the standard documentation sheet (79%).



Patients

The figure below demonstrates the continuous increase in the annual number of patients documented in the registry. The percentage of non-German patients actually is 11%. Only 7% of patients have been documented before 2002 when the online documentation was introduced. Last year, about half of all patients (50%) have been documented with the standard dataset.

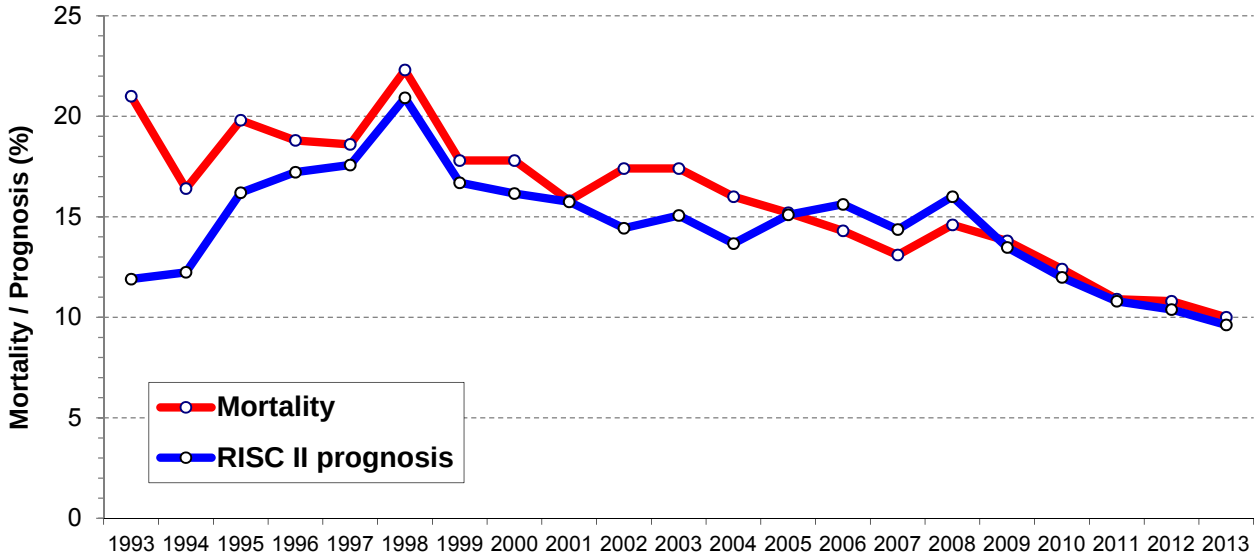


10.2 Outcome and Prognosis over Time

Since 2003 the TraumaRegister DGU® uses the **RISC** (Revised Injury Severity Classification) score for estimating the patients' prognosis (Lefering; *Europ. J. Trauma* 2009). In 2013 a new version, the **RISC II**, was developed by using more than 30,000 patients from 2010 and 2011. The **RISC II** was validated with data from 2012 (Lefering et al., *Crit. Care* 2014; see also the following two pages).

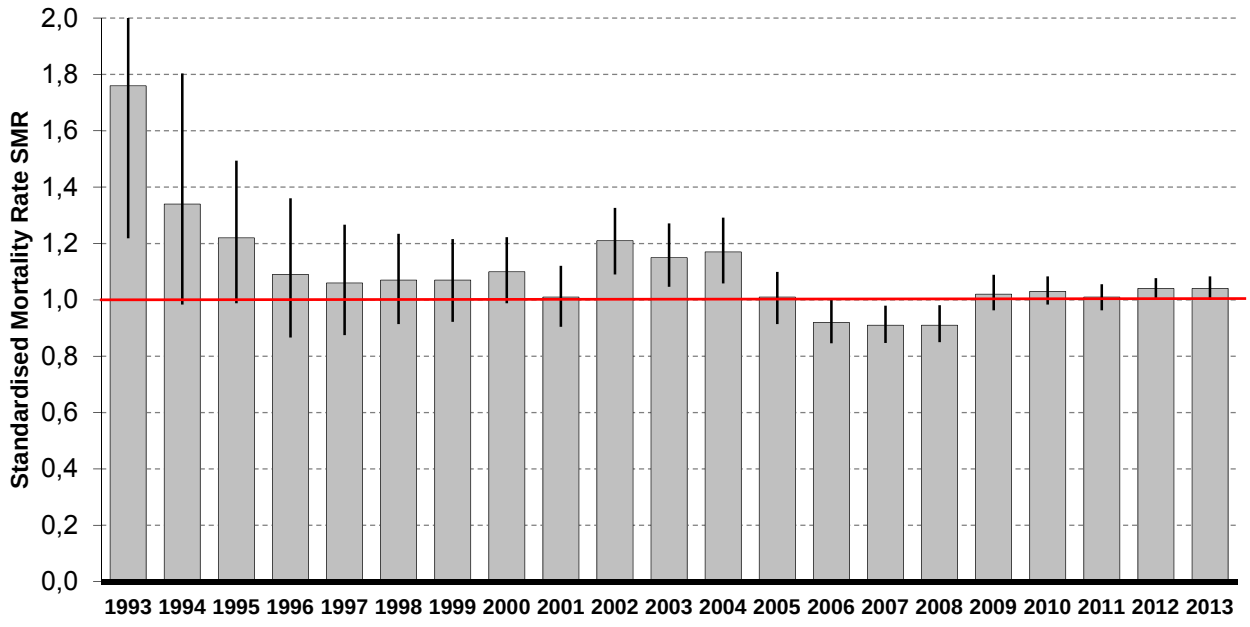
Therefore the prognosis based on the RISC II refers to the outcome of European (mainly German) trauma patients in the years 2010/2011.

Patients (ISS ≥ 4) with partial missing data could now be considered in the new **RISC II** score better than before. However, secondary admitted patients (initial status unknown) and patients transferred out early (outcome unknown) still are excluded. In 99.4% the RISC II prognosis could be calculated in primary admitted patients. The figure below shows the development of outcome and prognosis over time.



The relation of observed and expected mortality could also be demonstrated with the Standardized Mortality Rate (**SMR**). The red line (SMR=1) indicates that prognosis and outcome are identical. SMR values above or below the red line indicate a worse or better outcome than expected, respectively. The vertical line of each bar represents the 95% confidence interval (95% CI). The SMR significantly deviates from 1 if the 95% CI does not contain this value.

In 2013 the SMR was found to be 1.04 (95% CI: 1.00 – 1.08) similar to those of the last 4 years.



10.3 RISC II – Development and Validation

Registries as well as non-randomized trials often use the method of outcome adjustment to compare patient groups with different characteristics. This method not directly compares the outcome (here: hospital mortality) between the subgroups, but compares observed and expected outcome separately within each individual subgroup. Here the expected outcome is the prognosis of the trauma patients.

The TraumaRegister DGU® also applies this method for outcome comparisons, for example the inter-hospital comparisons in the annual reports, or for the evaluation of diagnostic and therapeutic interventions in scientific papers.

Initially, TR-DGU used the TRISS score for outcome adjustment which was based on data from the Major Trauma Outcome Study (MTOS). Since 2003 we used the Revised Injury Severity Classification (RISC) score which was developed and validated with TR-DGU data from 1993-2000. Thus the original RISC score refers to an expected outcome in Germany in the 1990s.

RISC II

Variable	Wert	Koeffizient
Konstante		+ 3,6
Schwerste Verletzung	AIS 3	- 0,5
	AIS 4	- 1,3
	AIS 5	- 1,7
	AIS 6	- 2,9
2. Schwerste Verletzung	AIS 0-2	+ 0,2
	AIS 3	0
	AIS 4	- 0,6
	AIS 5	- 1,4
Kopf-verletzung	AIS 0-2	0
	AIS 3/4	- 0,2
	AIS 5/6	- 0,8
Alter	1-5	+ 1,4
	6-10	+ 0,6
	11-54	0
	55-59	- 0,5
	60-64	- 0,8
	65-69	- 0,9
	70-74	- 1,2
	75-79	- 1,9
	80-84	- 2,4
	85+	- 2,7
Lichtreaktion	normal	+ 0,2
	verzögert/???	0
	keine	- 1,0
Pupillenweite	normal	+ 0,2
	anisokor/???	0
	beide weit	- 0,5

Variable	Wert	Koeffizient
Geschlecht	weiblich	+ 0,2
	männl. / ???	0
ASA vor dem Unfall	1-2	+ 0,3
	3 / ???	0
	4	- 1,3
Mechanismus	stumpf/ ???	0
	penetrierend	- 0,6
GCS Motor	normal	+ 0,6
	gezielt / ???	0
	ungezielt	- 0,4
	keine	- 0,8
Blutdruck bei Aufnahme	< 90	- 0,7
	90-110 / ???	0
	111-150	+ 0,3
	> 150	0
Reanimation	nein / ???	0
	ja	- 1,8
Gerinnung: INR	< 1,2	+ 0,6
	1,2 - 1,4	+ 0,2
	1,4 - 2,4 / ???	0
	> 2,4	- 0,4
Blut: Hb-Wert	≥ 12,0	+ 0,4
	7,0-11,9 / ???	0
	<7,0	- 0,5
Azidose: Base Deficit	< 6	+0,3
	6-9 / ???	0
	9-15	- 0,4
	15+	- 1,5

However, there were some problems with the RISC score which now required a revision:

- the data base was rather old (1993-2000),
- the prognosis was about 1-2% higher than the observed outcome in recent years,
- many variables had missing values,
- the algorithm for imputing missing values is rather complex,
- the percentage of patients in whom no prognosis could be derived (despite imputation) increased in the recent years; the rate repeatedly was above 10%,
- some prognostic factors were not included (like prior diseases, or pupil reactivity),
- and the item 'mass transfusion' in the original RISC is not available shortly after admission.

Based on these reasons, a revised score has been developed and validated in 2013, the **RISC II**. It was the aim of this update to create a score which is ***easier to use***, ***more up-to-date***, and providing a ***better prognosis*** than before. 30,000 European trauma patients documented in the TraumaRegister DGU® in the years 2010-2011 were used for the development of RISC II, and patients from 2012 served for validation.

RISC II - What is new?

Patients: Cases with ISS < 4 were excluded from the development. In these cases the worst injury had an AIS severity grade of one point only. In these patients it seemed futile to calculate a mortality prediction. Furthermore, those patients were not adequately represented in the TR-DGU.

Missing values: The most important improvement of the RISC II refers to the handling of missing values. Only age and the pattern of injury (i.e. the AIS codes of each injury) were compulsory, i.e. no missing values will be accepted. All other variables in the prediction model now are allowed to have missing values.

Missing values are no longer imputed or replaced by estimated values, like frequently done in other scores (and the original RISC), but missing values are now included in the prediction model as a separate category. The respective category (indicated by **???**) receives zero points in the final score, thus the prognosis will not be changed by a missing value. However, if a value is present, then it could modify the prognoses in both directions, either as improvement (in case of normal values) or as deterioration (in case of pathological findings), respectively.

New variables: The following variables were newly included in the RISC II score: sex, mechanism of injury, prior diseases (ASA), pupil reactivity, and the pupil size. Pupil size and reactivity will soon be included in the reduced QM dataset because of their prognostic relevance.

The RISC II score uses a total of **13 variables** to derive the prognosis (where the three items regarding injury severity were counted as one variable). The average number of variables used to calculate the RISC II prognosis could therefore be used as an indicator for data quality.

In summary, the new **RISC II** score …

→ is ***easier to use*** since no complicated imputation algorithms are required

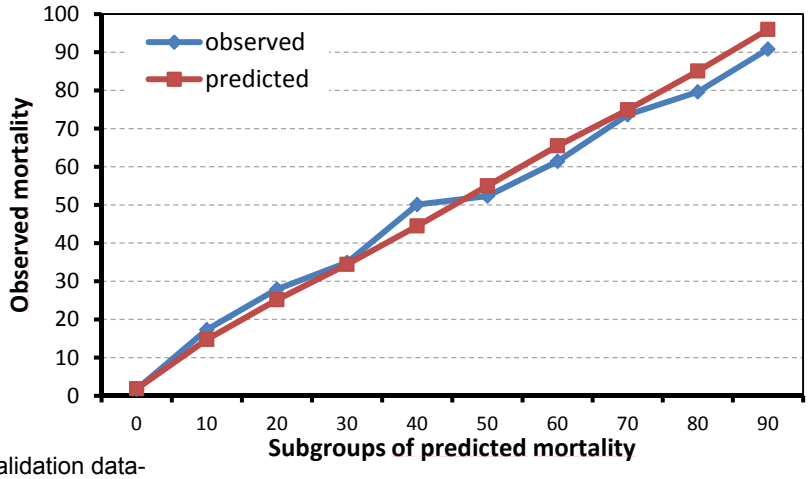
→ is ***up-to-date*** since it is based on most recent data from the years 2010/11

→ and finally, it is ***better*** than the other scores since the ROC curve shows a significant improvement.

Furthermore, the RISC II could be calculated for nearly all patients.

The following figures are taken from the publication of the RISC II (Lefering et al., *Crit. Care* 2014). They demonstrate some results from the development and validation of the score.

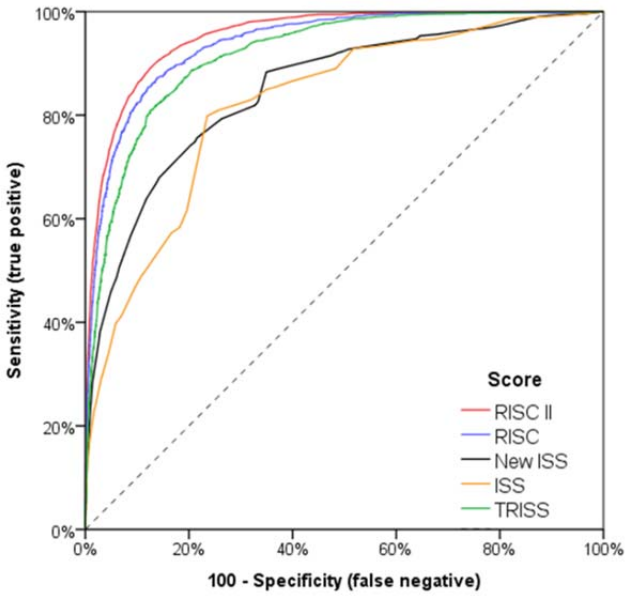
The figure on the right shows that observed and predicted outcome agree very well. In ten different patients groups with increasing injury severity, observed outcome (hospital mortality) and predicted outcome (RISC II prognosis) are presented.



The table below shows results from the validation data-set (TR-DGU 2012, n=21,981).

It could be seen that the RISC II …
- could be calculated for more patients,
- had a significantly better area under the ROC curve,
- predicts mortality much closer to the observed rate,
- and had a clearly improved calibration (H-L statistic).

	RISC	RISC II
Prognosis available	n=19.501 **87,9%**	n=21.918 **100%**
Mortality	**10,8%**	**10,9%**
RISC prognosis	**12,7%**	**11,3%**
Area under the ROC curve, with 95% confidence interval	**0,939** [0,934 - 0,944]	**0,951** [0,947 - 0,954]
H-L goodness of fit statistic	**141,2**	**50,3**



The above figure shows the ROC curves of five different scores in the development dataset. It is based on 17,414 patients in whom all five scores could be calculated. The RISC II shows the largest area under the curve.

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Statistical analyses and preparation of the annual audit reports:

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Financial disclosure

The **TraumaRegister DGU®** receives fees from the participating hospitals collected by the **AUC GmbH**. The AUC GmbH which is a 100% affiliate of the DGU (Deutsche Gesellschaft für Unfallchirurgie) also hosts the registry and is owner of the database. Hospitals certified as members of a German trauma network (TraumaNetzwerk DGU®) are obliged to participate in the TraumaRegister DGU®, all other hospitals participate voluntary.

In the past the registry received financial or other support from the following organizations and companies:

- Private University Witten/Herdecke gGmbH (2005-2013)
- Novo Nordisk A/S, Bagsværd, Denmark (2003-2009)
- Sanofi Aventis Deutschland GmbH (2008)
- German Research Foundation - DFG (1996-2003)
- Hauptverband der Berufsgenossenschaften - HVBG (2004)

Publications from the TraumaRegister DGU®

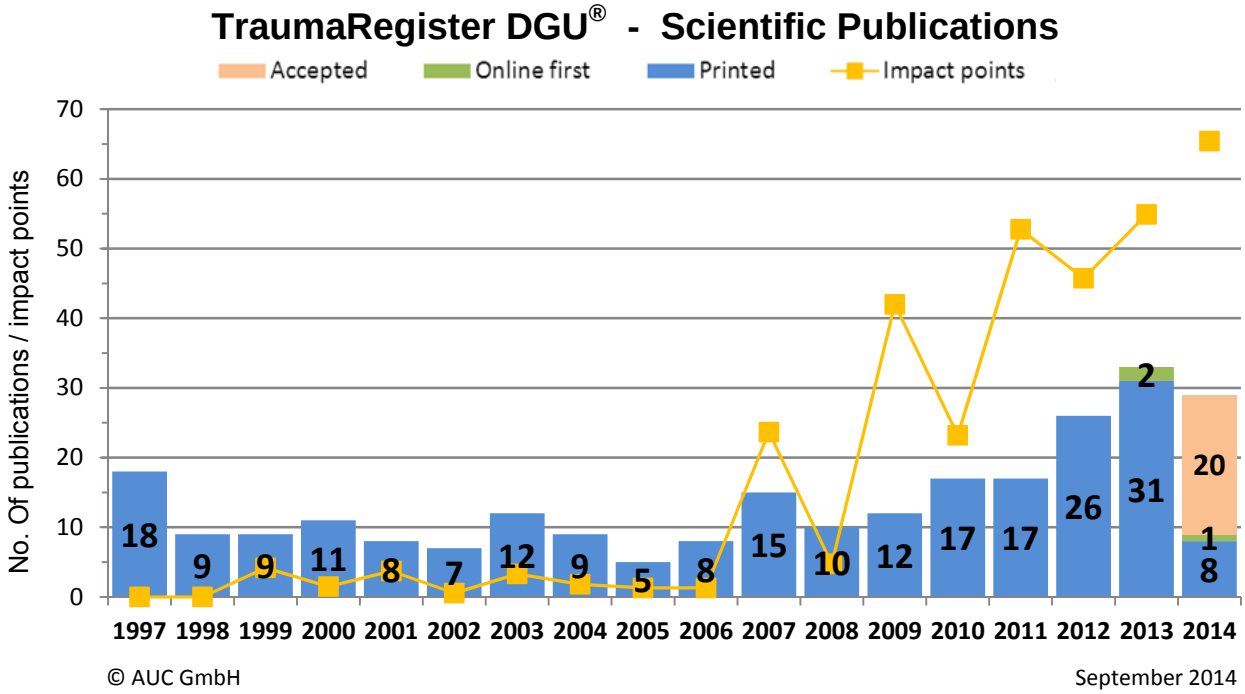
Publications from the last three years (**2012-2014**), no abstracts; last update: September 2014

An extended list of publications from the TraumaRegister DGU® including also papers published before 2012 is available on **www.traumaregister.de**.

[PDF] / [PDFprov] = this paper is available in PDF format / provisional PDF format.

The articles indicated with **[PDF]** could be provided to interested users on request if there is no direct access to the respective journal. In this case, please send an email to: traumaregister@auc-online.de.

The following figure presents the **number** of publications from the TraumaRegister DGU® since 1997 as well as the sum of **impact points** reached with these papers.



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List of abbreviations used in the report

Abbreviations

AIS	Abbreviated Injury Scale
ASA	American Society of Anaesthesiologists
AUC	AUC – Academy of Trauma Surgery (Akademie der Unfallchirurgie GmbH)
BE	Base Excess
CT	Computed tomography
CCT	Cranial computed tomography
CPR	Cardiopulmonary resuscitation
DGU	German Trauma Society (Deutsche Gesellschaft für Unfallchirurgie)
EK	Unit of packed red blood cells (pRBC)
FFP	Fresh Frozen Plasma
GCS	Glasgow Coma Scale
GOS	Glasgow Outcome Scale
h	Hour
Hb	Haemoglobin
IFOM	Institute for Research in Operative Medicine
INR	International Normalized Ratio
ISS	Injury Severity Score
LOS	Length of stay
min	Minute
ml	Milliliter
MOF	Multiple Organ Failure
NACA	National Advisory Committee for Aeronautics (Preclinical Score)
NIS	Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society (Sektion NIS)
NISS	New Injury Severity Score
OP	Operation
OF	Organ Failure
PDF	Portable Document Format (file format)
PTT	Partial thromboplastin time (in sec)
QM	Quality management, reduced data-set in TR-DGU
RISC	Revised Injury Severity Classification (prognostic score)
RISC II	Revised Injury Severity Classification, version II (prognostic score)
sBP	Systolic blood pressure
RTS	Revised Trauma Score
SAPS	Simplified Acute Physiology Score
sec	Second
SD	Standard deviation
TBI	Traumatic brain injury
SMR	Standardized Mortality Ratio
SOFA	Sequential Organ Failure Assessment
TPZ	Thromboplastin time; Quick's value
TR-DGU	TraumaRegister DGU®
TRISS	Trauma and Injury Severity Score (prognostic score)