

# Short- and long-term subjective medical treatment outcome of trauma surgery patients: the importance of physician empathy

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**Purpose:** To investigate accident casualties' long-term subjective evaluation of treatment outcome 6 weeks and 12 months after discharge and its relation to the experienced surgeon's empathy during hospital treatment after trauma in consideration of patient-, injury-, and health-related factors. The long-term results are compared to the 6-week follow-up outcomes.

**Patients and methods:** Two hundred and seventeen surgery patients were surveyed at 6 weeks, and 206 patients at 12 months after discharge from the trauma surgical general ward. The subjective evaluation of medical treatment outcome was measured 6 weeks and 12 months after discharge with the respective scale from the Cologne Patient Questionnaire. Physician Empathy was assessed with the Consultation and Relational Empathy Measure. The correlation between physician empathy and control variables with the subjective evaluation of medical treatment outcome 12 months after discharge was identified by means of logistic regression analysis under control of sociodemographic and injury-related factors.

**Results:** One hundred and thirty-six patients were included within the logistic regression analysis at the 12-month follow-up. Compared to the 6-week follow-up, the level of subjective evaluation of medical treatment outcome was slightly lower and the association with physician empathy was weaker. Compared to patients who rated the empathy of their surgeon lower than 31 points, patients with ratings of 41 points or higher had a 4.2-fold higher probability to be in the group with a better medical treatment outcome (3.5 and above) on the Cologne Patient Questionnaire scale 12 months after discharge from hospital ( $P=0.009$ ,  $R^2=33.5$ , 95% confidence interval: 1.440–12.629).

**Conclusion:** Physician empathy is the strongest predictor for a higher level of trauma patients' subjective evaluation of treatment outcome 6 weeks and 12 months after discharge from the hospital. Interpersonal factors between surgeons and their patients are possible key levers for improving patient outcomes in an advanced health system. Communication trainings for surgeons might prepare them to react appropriately to their patients' needs and lead to satisfactory outcomes for both parties.

**Keywords:** long-term outcome, patient-reported outcome, physician–patient interaction, communication, accident, trauma surgery, injury

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## Introduction

Longitudinal studies on consequences of injuries and patients' recovery after accidents showed that about 30% to 80% of the affected patients found their way back to work or education, according to the time of measurement after the injury.<sup>1–4</sup> A very small percentage, depending on severity of injury and other aspects, recovered completely 1 year after discharge from the hospital.<sup>1,4–7</sup> A large number of patients still experience constraints in daily life, ie, 80% still have functional impairments or mental disorders

1 year or later after trauma.<sup>2,4,8,9</sup> The early onset of medical, nursing, physical, or psychological treatment and emotional support – tailored to the patient’s needs – can accelerate the healing process or at least help to reduce negative effects of long-term outcomes.<sup>10–13</sup> Outcome measurement of medical treatment aspects should be conducted at different levels and dates.<sup>14–17</sup> To control for possible treatment effects, a time horizon of 1 year is frequently used for checking trauma surgery patients’ outcomes in the long run.<sup>18</sup> Recovery may be measured with variables such as physical- and mental-health-related quality of life or return to work after injury.<sup>14,15,19–21</sup> In addition to the assessment of health-related quality of life, the patient’s subjective evaluation of treatment success provides information on how patients perceive the benefits of inpatient care in relation to treatment outcome.<sup>22</sup> The subjective evaluation of the medical treatment outcome is similar to the concept of “treatment satisfaction” described by Revicki,<sup>23</sup> as both constructs assess “the level of satisfaction with [...] health status outcomes” and we assume a link with patients’ expectations for treatment.<sup>23–25</sup> The “subjective evaluation of medical treatment outcome” scale (SEMTO) of the Cologne Patient Questionnaire is a brief generic instrument to capture these data and might be sensitive to interpersonal aspects of health care.<sup>26–28</sup> Interhuman aspects in delivering medical treatment still seem to be underestimated in surgery.<sup>29</sup> Dealing with matters of life and death and encountering severely injured patients are daily routine for trauma surgeons, but for the patient it is an exceptional situation.<sup>29,30</sup> Physical or mental impairments after an accident often do not improve despite the best possible treatment even over a long period. Therefore, substantial increases in the measured quality of life can not always be expected. Patients need to be carefully prepared for their altered circumstances, ie, helped to adjust their expectations towards a more realistic notion of their treatment outcome.<sup>24,31</sup> The authors have published the short-term results on the subjective evaluation of treatment outcome (6 weeks after discharge) regarding the correlation with physician empathy, showing that the latter was connected with a higher probability for better subjective treatment outcomes.<sup>28</sup> It is desirable that positive effects of treatment should be robust over a longer period. Therefore, in the present analysis, the temporal changes in patient-reported outcomes are investigated with a focus on the correlation of physician empathy with the long-term subjective evaluation of treatment outcome. The authors defined physician empathy as follows:

Physician’s ability “to understand the patient’s situation, perspective and feelings, to communicate that understanding

and check its accuracy, and to act on that understanding with the patient in a helpful (therapeutic) way” as well as the physician’s sensitivity to patient concerns [...].<sup>28,32</sup>

Based on the results of the short-term patient outcomes, the authors assume that the long-term subjective evaluation of the medical treatment outcome will correlate with the patient perceived quality of the patient–physician interaction. Janssen et al found that patients’ trust in physicians was associated positively with a higher evaluation of the subjective treatment outcome.<sup>22</sup> Adverse events occurring after receiving a dental implant were associated with worse patient-reported medical treatment outcomes.<sup>33</sup> The authors found that the subjective evaluation of medical treatment outcome 6 weeks after discharge correlates positively with living with a partner and negatively with having a mental disorder during hospitalization.<sup>28</sup> Though the subjective evaluation of medical treatment outcome by trauma patients might be influenced by further treatment and disease-specific or biopsychosocial factors, no published evidence was found on additional influencing factors.<sup>22</sup> The objective of this analysis is to investigate accident casualties’ long-term subjective evaluation of treatment outcome 6 weeks and 12 months after discharge and its relation to the experienced surgeon’s empathy during hospital treatment after trauma in consideration of patient-, injury-, and health-related factors.

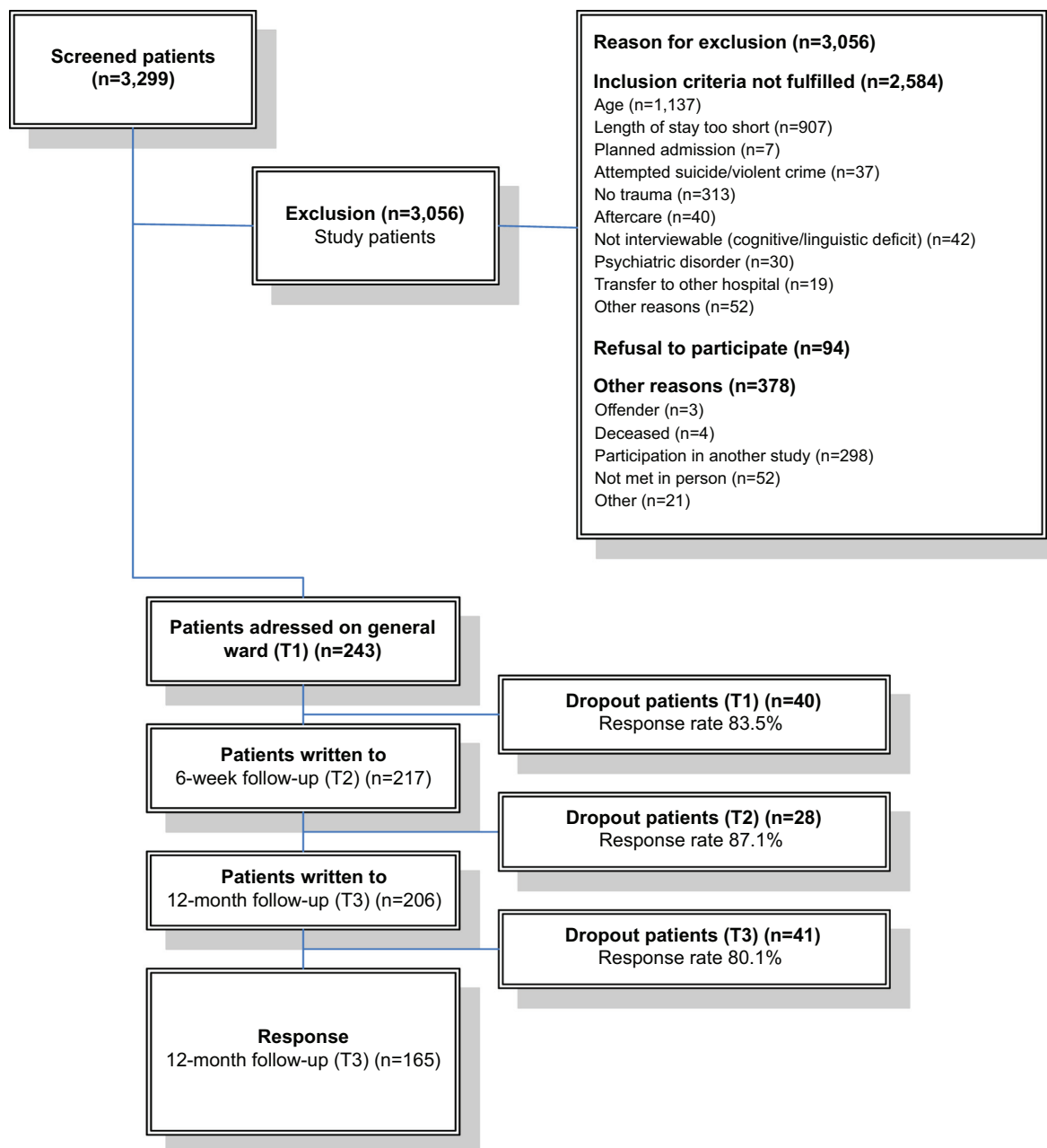
## Materials and methods

### Study design, population, and ethics

Data for this analysis were collected within a pre–post-design study on the effects of communication training for trauma surgeons, named “Advanced Trauma Psychosocial Support – ATPS”, funded by the German Research Foundation (Deutsche Forschungsgemeinschaft [DFG] grant number PF 407/2-1). Patients hospitalized between May 2008 and April 2011 at a German trauma–surgical ward of a level one trauma center were included in the study. Inclusion and exclusion criteria were described previously.<sup>28</sup> The study was approved by the Medical Ethics Committee of Witten/Herdecke University on April 8, 2008, number 14/2007.

### Sample and procedure

A total of 3,299 patients admitted to the trauma center were screened for study inclusion. Three thousand and fifty-six patients did not meet the inclusion criteria or refused to participate. The flow chart in Figure 1 shows the inclusion and exclusion flows of patients as well as the study participation. Data from patients were collected using three different questionnaires: 243 patients between the ages of 18 and



**Figure 1** Flowchart of study participants.

70 remained and received the first questionnaire at the surgical ward with questions regarding social demographics and psychological assessment during hospitalization.<sup>34</sup> Two hundred and three of them returned a completed questionnaire. Six weeks after discharge, 217 patients received a questionnaire by post (6-week follow-up questionnaire) including questions about physician empathy, the subjective evaluation of treatment outcome, and health-related quality of life. One hundred and eighty-nine patients completed the 6-week follow-up questionnaire (Figure 1). One year after discharge, a written questionnaire with questions on the subjective evaluation of medical

treatment outcome, health-related quality of life, anxiety, and depression was sent to 206 patients, of which 165 patients returned it completed. The survey was designed according to the Dillman's Total Design Method.<sup>35</sup> Questionnaires are available from the authors upon request.

## Measures

### Evaluation of medical treatment outcome

The SEMTO was measured 6 weeks and 12 months after discharge from the hospital with a module from the Cologne Patient Questionnaire (CPQ; Kölner Patientenfragebogen,

KPF) and represents an outcome measure of patients' subjective impression of the treatment and its results.<sup>26</sup> The CPQ was validated in several research projects.<sup>36–39</sup> The four items of the SEMTO index are: (1) I was very satisfied with my medical treatment. (2) I believe that the treatment provided is effective. (3) The treatment makes me feel better. (4) The treatment has improved my quality of life. Patients were asked to express their approval on a four-point Likert scale from “do not agree at all” (=1), “rather disagree” (=2), “rather agree” (=3), to “completely agree” (=4). Valuations were added up and divided by the number of answered items to form the variable SEMTO. Possible ratings had scores between 1 and 4; higher values represented a higher evaluation of SEMTO. Since the frequency analyses and Kolmogorov–Smirnov tests (not presented) of SEMTO 6 weeks and 12 months after discharge showed a right-skewed non-normal distribution, the scales were divided into dichotomized variables by a split at 3.5 points. Patients were split into two subgroups: “high” (=3.5 to 4 points) versus “low” (=1 to <3.5 points) according to their score on the SEMTO.

### Physician empathy

Physician empathy was assessed with the German version of the Consultation and Relational Empathy (CARE) Measure.<sup>40,41</sup> The one-dimensional CARE Measure comprises 10 items related to patients' perception of physicians' understanding of and response to their concerns and fears.<sup>42</sup> The items of the CARE Measure in our questionnaire were introduced with the sentence: “How did your attending physicians behave?” Patients can indicate their agreement to 10 statements on a five-point scale from 1 (“Does not apply at all”) to 5 (“Fully applies”); eg, “Did the physician behave in a manner that made you feel completely at ease?” The entire questionnaire can be obtained from the authors. The psychometric properties of the German version of the CARE Measure are very satisfactory and have already been reported.<sup>40</sup> The ratings of all items were added up so the possible score had values between 10 and 50. Mercer et al depicted differences by “high”, “average,” and “low” as well as by “above average”, “average,” and “below average” physician empathy depending on study-based results.<sup>43,44</sup> In the present analysis, the score of the CARE Measure was also divided into three groups for a better interpretation of the results, but the authors chose cutoffs based on theoretical considerations. According to the German version of the CARE Measure, an approach based on its response categories was chosen; with respect to a sufficient group size in each category. In the German version of the CARE Measure, the response categories are “fully applies”, “largely applies”, “partially applies”, “does

rather not apply”, and “does not apply at all”.<sup>45</sup> Values in the range of 41 to 50 suggest that the majority of questions were answered with “largely applies” (=4) and at least one “fully applies” (=5). This might be considered as perceiving “high” physician empathy, also because this range of values is higher than the mean and median values. Values between 31 to 40 points can be achieved if most of the items are rated with the categories “partially applies” (=3) or “largely applies” (=4) or if the lowest ratings are equalized by the highest ratings. This value range was defined as “middle” physician empathy. The mean (38.26) and median (40) fall within this category. Values of 30 and lower were considered as “low” empathy as ratings have to range between “partially applies” (=3), “does rather not apply” (=2), and “does not apply at all” (=1) or the highest ratings were set off by the lowest ratings. The coefficient of covariation was computed for each case and it ranged from zero to 0.71. That means that in no case was the standard deviation (SD) higher than the mean value. There was a strong tendency within the present study population to rate the ten items of the CARE Measure with similar values on an individual level. Thus “physician empathy” was divided into three groups: “low” for empathy scores from 10 to 30 points, “middle” for empathy scores from 31 to 40 points, and “high” for empathy scores from 41 to 50 points.

### Health-related quality of life and psychosocial care

Health-related quality of life at 6 weeks and 12 months after discharge was measured using the 36-Item Short Form Survey Instrument (SF-36).<sup>46</sup> The physical- and mental-health-related quality of life summary scores were computed according to Bullinger et al.<sup>46</sup> Psychosocial care by physicians was measured with the respective CPQ subscale.<sup>47</sup>

### Sociodemographics and disease characteristics

Sociodemographics were taken from the first questionnaire on general wards. Length of stay, injury severity, and existence of an extremity injury were derived from medical records. Education was operationalized as having a “high school graduation”, coded with “1” if the patient had a high school education or with “0” if not. Length of stay represents the number of days in hospital from admission to discharge. Injury severity was determined by the Injury Severity Score (ISS) within a range from 1 to 75.<sup>48</sup> The variable “extremity injury” was divided into three groups: “no”, “Abbreviated Injury Scale (AIS) ≤2”, and “AIS ≥3”. Mental disorders at the time of hospitalization were measured with the German version of the Hospital Anxiety and Depression Scale (HADS-D) and the Impact of Event

**Table 1** Evaluation plan

Characteristics	On general wards	6 weeks after discharge	12 months after discharge	From medical records
Sociodemographics	×			×
ISS				×
Extremity injury				×
Length of stay				×
Posttraumatic stress (IES-R)	×			
Anxiety (HADS-D)	×		×	
Depression (HADS-D)	×		×	
Empathy (CARE measure)		×		
Patient satisfaction:				
CPQ-PSC		×		
CPQ-SEMTO		×	×	
Quality of life (SF-36)		×	×	

**Abbreviations:** CARE, Consultation and Relational Empathy; CPQ, Cologne Patient Questionnaire; HADS-D, German Hospital Anxiety and Depression Scale; IES-R, Impact of Event Scale – Revised; ISS, Injury Severity Score; PSC, psychosocial care; SEMTO, subjective evaluation of medical treatment outcome; SF-36, 36-Item Short Form Survey Instrument.

Scale (IES-R).<sup>49–51</sup> HADS-D was also used within the 12-month follow-up. Table 1 shows an overview of evaluation time and measures.

## Statistical analysis

Statistical analyses were carried out with the statistical package SPSS (Version 21; IBM Corporation, Armonk, NY, USA). Only a small amount of patients showed symptoms on the HADS-D and IES-R scales during hospitalization. Therefore a new variable, “mental disorder”, was computed with the value “0” for the absence of symptoms and “1” meaning that the patients had at least one symptom on one or both scales. Descriptive analyses were conducted to present means and frequency distributions of relevant variables (Tables 2 and 3). Changes over time in SEMTO and SF-36 Summary Scores were computed (Table 3). Chi-square, Mann–Whitney *U*-tests, and two-sided *t*-tests for independent samples were performed to check for statistically significant differences between the dichotomous, categorical, and metric variables for the high and the low SEMTO groups for the 6-week and the 12-month follow-up (Tables 4 and 5). Spearman or Pearson correlation analyses were conducted to identify possible associations among the relevant variables. Analyses of variance were executed to check for group differences between the “low”, “middle”, and “high” physician empathy groups. The correlation of physician empathy with SEMTO 6 weeks and 12 months after discharge was determined with a logistic regression under control for relevant sociodemographic and health-related variables (Tables 6 and 7). Regression analyses were conducted for both the SEMTO 6 weeks and 12 month after discharge to investigate if the correlations found for physician empathy and SEMTO 6 weeks after discharge were

replicable and valid 1 year after discharge. The variables age, sex, high school graduation, living with a partner, length of stay in hospital, and injury severity were included in the first block (Model 1A, Table 6 and Model 1B, Table 7). For the 6-week follow-up data, the variable “mental disorder at hospitalization” was included within the basic logistic regression, as significantly more patients with a mental disorder at hospitalization were identified within the lower SEMTO group at the 6-week follow-up. The three-group variable “physician empathy” was added in the final block (Model 2A, Table 6 and Model 3B, Table 7). The SF-36 Mental and Physical Summary Scores 6 weeks after discharge were introduced in Model 2B (Table 7). Since the SEMTO scale contains a question on health-related quality of life and since health-related quality was also measured with the SF-36 at the same time, a conceptual overlap with the SF-36 Summary Scores might lead to a bias. Thus, the authors decided to omit the SF-36 Summary Scores of the 6-week follow-up in the logistic regression analysis for the short-term outcome. Due to the assumed overlap, the SF-36 summary scores 12 months after discharge were not included in the regression models for the long-term subjective evaluation of the medical treatment outcome, although mean differences for the high and low SEMTO groups were identified. On the other hand, the health-related quality of life measured 6 weeks after discharge and referring to the “last 4 weeks” was added as a predictor for the SEMTO 12 months after discharge. As the survey time points were different, the short-term health-related quality of life should not skew the validity of the analysis. The SF-36 Physical Summary Score 6 weeks after discharge had significant mean differences from the long-term SEMTO group in the bivariate analysis (Table 5).

Regression analyses included 169 patients for SEMTO 6 weeks after discharge and 136 patients for SEMTO 12 months after discharge. Patients with incomplete data on partnership and high school graduation were included in all regressions by introducing a category “unknown” for the missing values, as valid estimations were not possible. This approach applied to 13 and seven patients with no details on high school graduation and for nine and four patients with no details on life partnership for the regression analyses on the SEMTO 6 weeks and 12 months after discharge, respectively. In the 12-months follow-up, no significant group differences in frequency distribution were identified for mental disorders at time of hospitalization or at 12 months after discharge (Table 5). So the authors decided to exclude this variable from the logistic regression analysis.

## Results

### Sociodemographic and injury-related characteristics

Patient characteristics and injury-related variables are displayed in Table 2. Age ranged from 18 to 70 years with a mean of 45.8 years (SD 14.6 years). One hundred and twenty-six (58.1%) out of 217 respondents were male and 91 (41.9%) were female. One-quarter of the respondents had a high school graduation (n=57, 26.3%); over 60% of the patients were not high school graduates (n=138); and 22 patients did not specify their level of education. One hundred and thirty-five (62.2%) respondents were living together with a partner, 63 (29.0%) were not, and 19 patients (8.8%) did not specify. The default minimum length of stay in hospital was 5 days, the longest stay amounted to 95 days. Seventeen of the included patients stayed only 3 or 4 days but were not excluded from the analyses (intention-to-treat). The patients showed ISS values from 1 to 48, with a mean of 6.35 (SD 5.5). Forty-nine (24.3%) patients had no extremity injury, about 75% had extremity injuries with an AIS up to 2 (59.9%, n=121) or from 3 to 4 (15.8%, n=32). Thirty-nine (19.9%) of 196 respondents had at least one mental disorder diagnosed at time of hospitalization with the HADS-D or IES-R (anxiety, depression, or posttraumatic stress). Twelve months after discharge, 25 (17.9%) of 140 patients had at least one symptom on the HADS-D scale. IES-R was not assessed. We found significant differences in mean age ( $P=0.021$  and  $P=0.002$ ) and in the frequency distribution of sex ( $P=0.001$  and  $P=0.005$ ) between study participants and dropout patients for the 6-week follow-up and the 12-month follow-up, respectively (Table 8).

**Table 2** Patient and health-related characteristics

	N	%		
Sex	217			
Male	126	58.1		
Female	91	41.9		
High School	217			
Yes	57	26.3		
No	138	63.6		
Unknown	22	10.1		
Living with partner	217			
Yes	135	62.2		
No	63	29.0		
Unknown	19	8.8		
Extremity injury	202			
None	49	24.3		
Up to AIS 2	121	59.9		
AIS 3 to 4	32	15.8		
Anxiety <sup>a</sup>	194			
Yes	31	16.0		
No	91	84.0		
Depression <sup>a</sup>	195			
Yes	12	11.3		
No	96	88.7		
Posttraumatic stress <sup>a</sup>	194			
Yes	14	7.2		
No	180	92.8		
Mental disorder <sup>a</sup>	196			
Yes	39	19.9		
No	157	80.1		
Anxiety <sup>b</sup>	140			
Yes	20	14.3		
No	120	85.7		
Depression <sup>b</sup>	140			
Yes	14	10.0		
No	126	90.0		
Mental disorder <sup>b</sup>	140			
Yes	25	17.9		
No	115	88.1		
	<b>Mean</b>	<b>SD</b>	<b>Range [possible]</b>	
Age (years)	45.8 (N=217)	14.6	18–70 [18–70]	
Length of stay (days)	13.1 (N=216)	13.2	3–5 [5–∞]	
ISS	6.35 (N=202)	5.5	1–48 [1–75]	

**Notes:** <sup>a</sup>At hospitalization. <sup>b</sup>At 12-month follow-up.

**Abbreviations:** AIS, Abbreviated Injury Scale; ISS, Injury Severity Score; SD, standard deviation.

### Patient-reported outcomes measures

The descriptive statistics for the SEMTO 6 weeks and 12 months after discharge, physician empathy, and SF-36 Summary Scores are displayed in Table 3. One-fifth of patients rated physician empathy not higher than 30 points. From the 6-week to the 12-month follow-up, SEMTO ratings fell on average by  $-0.102$  (SD 0.66) points, and health-related quality of life increased on average by 9.15 (SD 9.01) points on the Physical Summary and by 5.32 points on the

**Table 3** Descriptive statistics for patient evaluations and outcome measures

Characteristics	N	%		
SEMTO6W dichotomized*	183			
High (3.5+)	101	55.2		
Low (<3.5)	82	44.89		
SEMTO12M dichotomized**	158			
High (3.5+)	78	49.4		
Low (<3.5)	80	50.6		
Empathy 3 groups	183			
Low (10–30)	38	20.8		
Middle (31–40)	56	30.6		
High (41–50)	89	48.6		
	<b>Mean</b>	<b>SD</b>	<b>Median</b>	<b>Range [theoretical]</b>
SEMTO6W scale	3.37	0.61	3.5	1.5–4.0 [1–4]
SEMTO12M scale	3.22	0.73	3.25	1–4 [1–4]
Δ SEMTO	–0.102	0.66	0	–2.0 to 2.0 [–4 to 4]
Empathy scale	38.26	9.19	40	12–50 [10–50]
CPQ Scale PSC	3.03	0.66	3.09	1–4 [1–4]
6 W SF-36 PSS	35.93	7.47	35.08	14–59 [0–100]
12 M SF-36 PSS	44.76	9.35	46.67	18.9–62 [0–100]
6 W SF-36 MSS	43.72	13.03	45.91	16.8–70.2 [0–100]
12 M SF-36 MSS	48.45	12.38	52.93	12.4–67.2 [0–100]
Δ SF-36 PSS	9.15	9.01	7.67	–11.1 to 37.3 [–100 to 100]
Δ SF-36 MSS	5.32	12.00	5.32	–28.9 to 38.1 [–100 to 100]

**Notes:** \*SEMTO6W split at a value of 3.5 points. \*\*SEMTO12M split at a value of 3.5 points.

**Abbreviations:** 6 W SF-36, 6-week 36-Item Short Form Survey Instrument; 12 M SF-36, 12-month 36-Item Short Form Survey Instrument; CPQ, Cologne Patient Questionnaire; MSS, Mental Summary Score; PSC, psychosocial care; PSS, Physical Summary Score; SD, standard deviation; SEMTO, subjective evaluation of medical treatment outcome; SEMTO6W, subjective evaluation of medical treatment outcome 6 weeks after discharge; SEMTO12M, subjective evaluation of medical treatment outcome 12 months after discharge; Δ, change from 6 weeks to 12 months measurement.

Mental Summary Score. The mean values for SEMTO differed significantly between the 6-week follow-up and the 12-month follow-up ( $P=0.066$ ), as a paired samples *t*-test showed.

### Bivariate analyses of the main outcome

In a Spearman correlation analysis (not presented), SEMTO 6 weeks after discharge correlated with the SF-36 Mental Summary Score at 6 weeks after discharge (0.203,  $P=0.007$ ), physician empathy (0.559,  $P<0.001$ ), and SEMTO 12 months after discharge (0.494,  $P<0.001$ ). SEMTO 12 weeks after discharge correlated with the SF-36 Physical Summary Score at 6 weeks after discharge (0.223,  $P=0.008$ ), physician empathy (0.453,  $P<0.001$ ), SF-36 Physical and Mental Summary Scores at 12 months after discharge (0.283,  $P<0.001$  and 0.225,  $P=0.005$ , respectively), and SEMTO 6 weeks after discharge (0.494,  $P<0.001$ ). Physician empathy correlated (Pearson) with the SF-36 Mental Summary scores at 6 weeks (0.160,  $P=0.033$ ) and 12 months after discharge (0.242,  $P=0.004$ ). The higher and the lower SEMTO groups 6 weeks after discharge showed significant differences in the following aspects (Table 4): the average age of 49 years in the higher SEMTO group was significantly higher than in the lower group (44.2 years,

$P=0.023$ ); a higher percentage of patients with a high SEMTO at 6 weeks after discharge lived with a partner (75.2% versus 52.4%); and the mean empathy of the higher SEMTO group of 42.3 was significantly higher than the lower SEMTO group (33.3,  $P<0.001$ ). The medium rankings of the CPQ-Scale Psychosocial Care by Physicians and the SEMTO 12 months after discharge indicated significantly higher values for the higher SEMTO group ( $P<0.001$ ). The SF-36 Mental Summary Score 6 weeks after discharge was significantly higher in the high SEMTO group (45.64) than in the low SEMTO group (41.39,  $P=0.029$ ). Significantly more patients in the high SEMTO group had no diagnosis of a mental disorder on the HADS-D and IES-R scales during hospitalization (86.9% versus 73%) and 12 months after discharge (90% versus 74.1%,  $P=0.018$ ) than in the low SEMTO group. Group differences for high and low SEMTO at 12 months after discharge are presented in Table 5. In the high SEMTO group, significantly more patients lived with a partner (75.6% versus 58.8%,  $P=0.055$ ). The medium ranking for the ISS suggested a higher injury severity in the high SEMTO group ( $P=0.031$ ). The mean physician empathy rating was significantly higher in the high SEMTO group (40.9) than in the low SEMTO group (35.5,  $P<0.001$ ). Psychosocial care and SEMTO 6 weeks

**Table 4** Patients with high versus patients with low SEMTO6W: means (two-sided *t*-test for independent samples), medium ranking (Mann–Whitney *U*-test), percentages (chi-square test), and *P*-values

Characteristics	High SEMTO (n=101) (%)	Low SEMTO (n=82) (%)	<i>P</i> -value
Age <sup>a</sup> , years	49.04	44.19	0.023
Sex <sup>c</sup>			
Female (n=87)	47 (46.5)	40 (48.8)	0.762
Male (n=96)	54 (53.5)	42 (51.2)	
Partner <sup>c</sup>			
Yes (n=119)	76 (75.2)	43 (52.4)	0.006
No (n=51)	20 (19.8)	31 (37.8)	
Unknown (n=13)	5 (5.0)	8 (9.8)	
High school <sup>c</sup>			
Yes (n=49)	25 (32.1)	24 (30.0)	0.181
No (n=100)	46 (59.0)	54 (67.5)	
Unknown (n=9)	7 (9.0)	2 (2.5)	
ISS <sup>2</sup>	89.1	84.3	0.495
Length of stay <sup>b</sup>	94.8	88.5	0.425
Extremity injury <sup>c</sup>			
No (n=39)	20 (20.6)	19 (25.0)	0.568
AIS ≤2 (n=110)	65 (67.0)	45 (59.2)	
AIS ≥3 (n=24)	12 (12.4)	12 (15.8)	
Empathy <sup>a</sup>	42.29	33.30	<0.001
CPQ-PSC <sup>b</sup>	115.1	63.5	<0.001
SEMTO12M <sup>b</sup>	89.53	52.4	<0.001
6 W SF-36 PSS <sup>a</sup>	36.10	35.74	0.750
6 W SF-36 MSS <sup>a</sup>	45.64	41.39	0.029
12 M SF-36 PSC <sup>a</sup>	45.87	43.91	0.202
12 M SF-36 MSC <sup>a</sup>	49.69	47.40	0.270
Mental disorder in hospital <sup>c,d</sup>			
Yes (n=33)	13 (13.7)	20 (27.0)	0.021
No (n=140)	86 (86.9)	54 (73.0)	
Mental disorder at 12 months <sup>c,e</sup>			
Yes (n=22)	7 (10.0)	15 (25.9)	0.018
No (n=106)	63 (90.0)	43 (74.1)	

**Notes:** <sup>a</sup>Independent samples *t*-test. <sup>b</sup>Mann–Whitney *U*-Test. <sup>c</sup>Chi-square test. <sup>d</sup>Measured with German Hospital Anxiety and Depression Scale and Impact of Event-Scale Revised at hospitalization. <sup>e</sup>Measured with German Hospital Anxiety and Depression Scale 12 months after discharge.

**Abbreviations:** 6 W SF-36, 6-week 36-Item Short Form Survey Instrument; 12 M SF-36, 12-month 36-Item Short Form Survey Instrument; CPQ, Cologne Patient Questionnaire; ISS, Injury Severity Score; MSS, Mental Summary Score; PSC, psychosocial care; PSS, Physical Summary Score; SEMTO, subjective evaluation of medical treatment outcome; SEMTO6W, subjective evaluation of medical treatment outcome 6 weeks after discharge; SEMTO12M, subjective evaluation of medical treatment outcome 12 months after discharge.

after discharge had higher medium rankings in the high SEMTO group ( $P < 0.001$ ). The high SEMTO group had a higher mean value on the SF-36 Physical Summary Scores 6 weeks and 12 months after discharge (0.009 and 0.005, respectively). The SEMTO mean differences for the three empathy groups were significant (Table 9) and showed rising gradients according to the physician empathy level. Mental disorders diagnosed during hospitalization were equally distributed over the high and low SEMTO group. Twelve months after discharge, more patients without anxiety or depression were in the high SEMTO group compared to the low SEMTO group, but this difference was not significant (87.1% versus 75.8%;  $P = 0.087$ ).

## Logistic regression on subjective evaluation of medical treatment outcome 6 weeks and 12 months after discharge

The basic logistic regression model (Model 1A, Table 6) was calculated for SEMTO 6 weeks after discharge with the control variables age, sex, high school education, living with a partner, length of stay in hospital, ISS, and having at least one mental disorder at hospitalization (Nagelkerke's  $R^2 = 16.0\%$ ). Study patients who lived with their partner had a significant 2.4-fold increased chance to be in the high SEMTO group 6 weeks after discharge ( $P = 0.023$ , 95% confidence interval [CI]: 1.126–5.098). Age, sex, high school education, length of stay in hospital, ISS,



**Table 5** Patients with high versus patients with low SEMTO12M: means (two-sided *t*-test for independent samples), medium ranking (Mann–Whitney *U*-test), percentages (chi-square test), and *P*-values

Characteristics	High SEMTO (n=78) (%)	Low SEMTO (n=80) (%)	<i>P</i> -value
Age <sup>a</sup> , years	47.76	46.46	0.573
Sex <sup>c</sup>			
Female (n=74)	35 (44.9)	39 (48.8)	0.625
Male (n=84)	43 (55.1)	41 (51.3)	
Partner <sup>c</sup>			
Yes (n=106)	59 (75.6)	47 (58.8)	0.055
No (n=44)	15 (19.2)	29 (36.3)	
Unknown (n=8)	4 (5.1)	4 (5.0)	
High school <sup>c</sup>			
Yes (n=49)	25 (32.1)	24 (30.0)	0.181
No (n=100)	46 (59.0)	54 (67.5)	
Unknown (n=9)	7 (9.0)	2 (2.5)	
ISS <sup>b</sup>	81.4	67.6	0.031
Length of stay <sup>b</sup>	80.0	79.1	0.900
Extremity injury <sup>c</sup>			
No (n=35)	16 (21.6)	19 (25.7)	0.799
AIS ≤2 (n=91)	46 (62.2)	45 (60.8)	
AIS ≥3 (n=22)	12 (16.2)	10 (13.5)	
Empathy <sup>a</sup>	40.9	35.5	<0.001
PSC <sup>b</sup>	88.9	57.0	<0.001
SEMTO6W <sup>b</sup>	88.2	57.7	<0.001
6 W SF-36 PSS <sup>a</sup>	37.39	34.31	0.009
6 W SF-36 MSS <sup>a</sup>	44.59	42.42	0.316
12 M SF-36 PSC <sup>a</sup>	46.85	42.7	0.005
12 M SF-36 MSC <sup>a</sup>	50.21	46.71	0.077
Mental disorder in hospital <sup>c,d</sup>			
Yes (n=29)	13 (17.3)	16 (20.8)	0.589
No (n=123)	62 (82.7)	61 (79.2)	
Mental disorder at 12 months <sup>c,e</sup>			
Yes (n=25)	9 (12.9)	16 (24.2)	0.087
No (n=111)	61 (87.1)	50 (75.8)	

**Notes:** <sup>a</sup>Independent samples *t*-test. <sup>b</sup>Mann–Whitney *U*-test. <sup>c</sup>Chi-square test. <sup>d</sup>Measured with German Hospital Anxiety and Depression Scale and Impact of Event-Scale Revised at hospitalization. <sup>e</sup>Measured with German Hospital Anxiety and Depression Scale 12 months after discharge.

**Abbreviations:** 6 W SF-36, 6-week 36-Item Short Form Survey Instrument; 12 M SF-36, 12-month 36-Item Short Form Survey Instrument; CPQ, Cologne Patient Questionnaire; ISS, Injury Severity Score; MSS, Mental Summary Score; PSC, psychosocial care; PSS, Physical Summary Score; SEMTO, subjective evaluation of medical treatment outcome; SEMTO6W, subjective evaluation of medical treatment outcome 6 weeks after discharge; SEMTO12M, subjective evaluation of medical treatment outcome 12 months after discharge.

**Table 6** Results of logistic regression models with the dichotomized variable SEMTO6W after discharge as the dependent variable

Dependent variable: SEMTO6W dichotomized	Model 1A odds ratios (P-values) N=169	Model 2A odds ratios (P-values) N=169
Age (per year)	1.022 (0.092)	1.017 (0.239)
Sex (female)	0.805 (0.545)	1.337 (0.486)
High school (yes)	1.124 (0.758)	1.188 (0.686)
Partner (yes)	2.396 (0.023)	3.176 (0.010)
Length of stay in hospital (days)	1.010 (0.525)	1.018 (0.300)
ISS (per point on scale)	1.013 (0.721)	1.047 (0.273)
Mental Disorder hospitalization (yes)	0.436 (0.061)	0.515 (0.176)
Physician empathy low (10–30 points)		(<0.001)
Physician empathy middle (31–40 points)		4.720 (0.008)
Physician empathy high (41–50 points)		18.188 (<0.001)
Constant	0.255 (0.081)	0.021 (<0.001)
R <sup>2</sup>	0.160	0.375

**Notes:** Model 1A: basic model. Model 2A: physician empathy.

**Abbreviations:** ISS, Injury Severity Score; SEMTO6W, subjective evaluation of medical treatment outcome 6 weeks after discharge.

**Table 7** Results of logistic regression models with the dichotomized variable SEMTO12M as the dependent variable

Dependent variable: SEMTO12M dichotomized	Model 1B odds ratios (P-values) N=136	Model 2B odds ratios (P-values) N=136	Model 3B odds ratios (P-values) N=136
Age (per year)	1.009 (0.508)	1.010 (0.505)	1.005 (0.745)
Sex (female)	0.835 (0.647)	1.010 (0.981)	1.329 (0.534)
High school (yes)	1.715 (0.186)	1.304 (0.540)	1.311 (0.556)
Partner (yes)	2.479 (0.039)	3.175 (0.015)	3.696 (0.011)
Length of stay in hospital (days)	0.999 (0.943)	1.003 (0.871)	1.006 (0.753)
ISS (per point on scale)	1.021 (0.611)	1.036 (0.419)	1.048 (0.291)
6 W SF-36 PSS (per point)		1.087 (0.007)	1.088 (0.008)
6 W SF-36 MSS (per point)		1.018 (0.261)	1.016 (0.327)
Physician empathy low (10–30 points)			(0.002)
Physician empathy middle (31–40 points)			0.987 (0.982)
Physician empathy high (41–50 points)			4.265 (0.009)
Constant	0.262 (0.127)	0.005 (0.003)	0.001 (0.002)
R <sup>2</sup>	0.161	0.230	0.335

**Notes:** Model 1B: basic model. Model 2B: quality of life. Model 3B: quality of life and physician empathy.

**Abbreviations:** 6 W SF-36, 6-week 36-Item Short Form Survey Instrument; ISS, Injury Severity Score; MSS, Mental Summary Score; PSS, Physical Summary Score; SEMTO12M, subjective evaluation of medical treatment outcome 12 months after discharge.

and having at least one mental disorder at hospitalization were not significant predictors for the dependent variable SEMTO 6 weeks after discharge. “Physician empathy” was added in Model 2A. In this model, living together with a partner led to an about 3.2-fold higher chance to be in the high SEMTO group ( $P=0.010$ , 95% CI: 1.325–7.612). Compared to the lowest empathy group, the group with a rating of 31 to 40 points had a 4.7-fold increased chance ( $P=0.008$ , 95% CI: 1.509–14.759), and the group with a rating of 41 points and above had an 18-fold increased chance ( $P<0.001$ , 95% CI: 5.756–57.470) to be in the high SEMTO group 6 weeks after discharge (Nagelkerke's  $R^2=37.5\%$ ). Compared to Model 1A, the logistic regression on SEMTO at 12 months after discharge showed similar results in Model 1B (Table 7): Living together with a partner was significantly correlated with a 2.5-fold higher chance to be in the high SEMTO group 12 months after discharge ( $P=0.039$ , 95% CI: 1.048–5.863; Nagelkerke's  $R^2=16.1\%$ ). The SF-36 Mental Summary Score at 6 weeks after discharge was not significantly correlated with the dependent variable (Model 2B; Table 7). Instead, a positive correlation occurred between the SF-36 Physical Summary Score and SEMTO 12 months after discharge ( $P=0.007$ , 95% CI: 1.023–1.154), which also remained in Model 3B (Table 7;  $P=0.008$ , 95% CI: 1.022–1.159). A one point rise in the SF-36 Physical Summary Score was associated with an 8.8% higher probability to be in the high SEMTO group. In Model 3B, the group of patients with physician empathy ratings of 41 points and above had a 4.3-fold higher chance to be in the high SEMTO group ( $P=0.009$ ,

95% CI: 1.440–12.629). The middle empathy group did not correlate with the dependent variable. The introduction of “physician empathy” into the logistic regression model led to a more than 10% increase of the explained variance of SEMTO 12 months after discharge, as Nagelkerke's  $R^2$  rose from 23.0% (Model 2B) to 33.5% (Model 3B). The variable “physician empathy” contributed – with a rise in Nagelkerke's  $R^2$  from 16.9% in Model 1A to 37.5% in Model 2A – explained over 20% of the variance of the SEMTO 6 weeks after discharge. In all of the presented models, “physician empathy” was the strongest predictor for having a SEMTO rating of 3.5 and higher. Age, sex,

**Table 8** Comparison of the study population with dropout patients: means (*t*-test), percentages (chi-square test), and *P*-values

	Participants	Dropouts	P-value
<b>6-weeks follow-up</b>			
Age <sup>a</sup> , years	46.6	39.7	0.021
Sex <sup>b</sup>			
Female, n (%)	88 (46.3)	3 (11.1)	0.001
Male, n (%)	102 (53.7)	24 (88.9)	
ISS <sup>a</sup> , mean	6.2	7.73	0.493
Length of stay <sup>a</sup> (days), mean	13.8	13.5	0.915
<b>12-months follow-up</b>			
Age <sup>a</sup> , years	47.5	40.2	0.002
Sex <sup>b</sup>			
Female, n (%)	78 (47.3)	13 (25.0)	0.005
Male, n (%)	87 (52.7)	39 (75.0)	
ISS <sup>a</sup> , mean	6.6	5.5	0.236
Length of stay <sup>a</sup> (days), mean	13.8	13.7	0.926

**Notes:** <sup>a</sup>Independent samples *t*-test. <sup>b</sup>Chi-square test.

**Abbreviation:** ISS, Injury Severity Score.

**Table 9** Mean differences of SEMTO6W and SEMTO12M by physician empathy groups

	SEMTO6W <sup>a</sup> (n=183)	SEMTO12M <sup>a</sup> (n=144)
	Mean (SD)	Mean (SD)
<b>Physician empathy</b>		
10 to 30 points	2.86 (0.57)	2.77 (0.82)
31 to 40 points	3.28 (0.57)	3.13 (0.62)
41 to 50 points	3.63 (0.49)	3.55 (0.51)
P-value <sup>b</sup>	<0.005	<0.05

**Notes:** <sup>a</sup>Possible values between 1 and 4. <sup>b</sup>For ANOVA post-hoc tests: Scheffé, Bonferroni, and Gabriel.

**Abbreviations:** SD, standard deviation; SEMTO6W, subjective evaluation of medical treatment outcome 6 weeks after discharge; SEMTO12M, subjective evaluation of medical treatment outcome 12 months after discharge.

high school education, length of stay, and ISS did not show any significant correlation within all models.

## Discussion

The association of 136 patients' subjective evaluations of the medical treatment outcome 12 months after discharge with inpatient physician empathy was investigated, controlling for patient and disease characteristics and health-related quality of life at 6 weeks after discharge. The same analysis was carried out for the 6-week follow-up subjective evaluation of medical treatment outcome, and results were compared. The level of the subjectively evaluated treatment outcome for both follow-up dates is comparable to the results from the pre-phase study group of the previous analysis and those by Janssen et al.<sup>22,28</sup> Physician empathy ratings during the injured patients' hospitalization were identified as a significant predictor for a higher subjective evaluation of medical treatment outcome 12 months after discharge. Compared to patients who rated the empathy of the surgeons in hospital up to 30 points on the CARE Measure, patients with a rating of 41 points and above had a significantly higher chance of a high subjective evaluation of medical treatment outcome. In comparison with the results of the short-term evaluation 6 weeks after discharge from hospital, the effect size of physician empathy was much smaller 12 months after discharge. Additionally, in the analysis of the long-term subjective treatment outcome, no association was found for patients with middle range empathy ratings 12 months after discharge. Though the effect size of physician empathy was smaller in the long-term, there was still an obvious correlation of physician empathy with the patients' perception of the treatment efficacy, treatment satisfaction, and treatment effect on quality of life. Regarding the lack of correlation between the middle empathic group and subjective treatment outcomes, it seems that a certain empathy level in trauma surgery is needed

to produce a change in the patients' outcome. Our results underline that not only short-term, but also higher long-term patient outcomes in trauma surgery, go along with better emotional clinician care in a setting where technical and medical skills seem to dominate the treatment.<sup>28</sup> As already discussed and concluded within a previous analysis, the level of physician empathy perceived within this sample of trauma patients is increasable, and ideas for a positive development in this surgical specialty were suggested.<sup>28</sup> The replicability of the results for patients' long-term subjective evaluation of medical treatment outcome underlines these conclusions. The survey of patients' evaluation of the medical treatment outcome after 12 months adds helpful information to the 12-month health-related quality of life data. The SF-36 Summary Scores increased over time and can show the health development of injured patients toward an improvement of physical and mental status. Outcomes research on injured patients has shown that health-related quality of life increases in the long run.<sup>1,2,5,6,8,18,52-55</sup> Compared to the healthy population, the level of our study patients' health-related quality of life 12 months after discharge from the hospital was still low, which is characteristic of accident victims at this date.<sup>1,6,8,56</sup> Although health-related quality of life, as surveyed with the SF-36, gives fundamental information on patients' physical, pain, or mental status, it does not include a direct link between the received treatment and the patients' perceived benefit of their outcome. This gap might be closed by the additional assessment of subjective treatment outcomes, as assessed with the SEMTO CPQ scale. Compared to the 6-week follow-up, patients rated their subjective treatment outcome lower at the time of 12 months after discharge. The difference is relatively small but still significant. While the health-related quality of life increased from 6 weeks to 12 months after discharge, patients' perception of the treatment benefits seems to be relatively robust over time, with a slight decrease. Goldstein et al assumed that in the long run "selective forgetting" causes differences in perceiving interventions and thus differences in evaluations of patient satisfaction.<sup>57</sup> Janssen et al found that within the group of patients with negative results for subjective evaluation of treatment outcome, the medium ranking of "time after discharge" was higher than within the group of patients with positive subjective evaluation of treatment outcome, but the difference was not significant.<sup>22</sup> Ferreira found lower patient satisfaction scores 5 months after discharge compared to 1 month after discharge from the hospital.<sup>58</sup> Patient satisfaction was shown to be time sensitive, as it depends on the development of outcomes.<sup>59,60</sup> In the long-term and short-term

regression analyses, patients living with their partner had higher chances for a high medical treatment outcome. This result confirms the result of the previous analysis, where it was already discussed.<sup>28</sup> The authors assumed that health-related quality of life and patients' evaluation of medical treatment outcome at the 6-week follow-up would reveal a high statistical correlation due to a conceptual overlap. The results of the *t*-test for mean differences did not confirm this assumption to the predicted extent. Though the mean value of the mental summary score within the low short-term subjective treatment outcome group was significantly lower, no difference was found for physical-health-related quality of life. On the other hand, the mean value of the physical-health-related quality of life 12 months after discharge was significantly higher in the high long-term subjective treatment outcome group, but no significant difference was found for the mental summary score. In contrast to the 6-week SEMTO outcomes, no SEMTO group differences in frequency distribution were identified for mental disorders assessed at hospitalization in the 12-month follow-up. It is possible that these psychological disorders diagnosed at the time of hospitalization declined to a certain degree 1 year after discharge, whereas other mental problems are persistent or arise later, as the appearance of anxiety and depression showed for our study population 12 months after discharge.<sup>8</sup> As posttraumatic stress was not assessed at the 12 months follow-up, the validity of our results is limited to anxiety and depression symptoms. Age correlated positively with the short-term medical treatment outcome, which may be explained with a generally higher patient satisfaction in older patients.<sup>61–63</sup> Other studies showed that age may be associated with worsened outcomes or does not correlate with outcome measures.<sup>7,9,52,64</sup> In combination with physician empathy, the age effect disappears, which may be assumed to result from higher empathy ratings with advancing age.<sup>61–63,65</sup> Actually, no bivariate correlation between patient age and empathy rating was found within our study sample. The control variables sex, education, injury severity, and length of stay did not correlate with subjective evaluation of treatment outcome.

## Conclusion

Several limitations of our analyses and results should be considered. First, although longitudinal data are presented, causal inferences cannot be drawn as there might be hidden aspects that lead to correlations. Second, due to a small sample size and the study design, a generalization to other trauma patients should be considered with caution. Future studies should be conducted at diverse study sites. Third, all

data were gathered by the same survey method, which might lead to a common method variance.<sup>66</sup> Possible practical solutions for future studies were already presented.<sup>28,67</sup> Fourth, dropout patients differed significantly in age and sex. As age was positively correlated to a higher subjective treatment outcome, the effect within this study might be underestimated due to the dropout of younger study patients. Sex did not show any effect in our study. Results regarding the association of surgery patients' sex with outcome evaluation are inconsistent.<sup>22,68</sup> Fifth, posttraumatic stress was not measured 12 months after discharge. This reduces the significance of the depicted results on mental health outcomes. Finally, most of the variance in the dependent variable subjective evaluation of medical treatment outcome remains still unexplained and seems to hark back to aspects that are not yet identified. To explore those aspects and their controllability, further information has to be gathered by qualitative research and field studies. It is worthwhile to increase short-term and long-term treatment outcomes of patients, for the benefit of patients and society in general.<sup>69,70</sup> The findings from our 12-month follow-up confirm the results of the previous study.<sup>28</sup> As these and other study results show, long-term health-related quality of life in patients who suffered an accident may be at a very low level.<sup>2,5,6,71</sup> Nevertheless the measurement of subjective evaluation of the treatment and physician empathy may provide additional information regarding the options to help by means of emotional care and may serve to detect the limits of technical and medical skills. Additionally, the subjective evaluation of medical treatment outcome may give surgeons a motivating feedback, as the results may still be positive even if injured patients do not fully recover.<sup>72</sup> In many countries, such as Germany, medical care is performed at very high technical standards and medical skills. But medical care still is a human service – provided by humans. The authors assume the relational aspect is one of the most important key levers to improve treatment outcomes, and the results of our short-term and long-term considerations underline this assumption. Many studies have already shown the importance of the “human factor” in medical treatment.<sup>73–78</sup> These and the present results might be motivating for trauma surgeons not only to save lives but also to see the seemingly “invisible wounds” that trauma patients bring with them to the hospital that also need curing.<sup>73</sup> The time has come to transfer these and similar study results into clinical practice. Further research should figure out what helps trauma surgeons or clinicians generally to find the time and place to sympathize with their patients.<sup>79–83</sup> Health care providers, scientists, politicians, and other stakeholders should put greater efforts

into implementing psychosocial quality in medical care. A routine measurement of subjective evaluation of medical treatment outcome and physician empathy may give surgeons immediate feedback about their patients' perceptions. If those measurements serve to identify the need for an improvement of empathy, then communication training can offer surgeons a protected area to learn how to deal with patients' concerns and eventually enhance treatment outcomes.<sup>84,85</sup>

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## Disclosure

The authors report no conflicts of interest in this work.

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