The definition of polytrauma revisited: An international consensus process and proposal of the new 'Berlin definition'

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BACKGROUND: The nomenclature for patients with multiple injuries with high mortality rates is highly variable, and there is a lack of a uniform definition of the term *polytrauma*. A consensus process was therefore initiated by a panel of international experts with the goal of assessing an improved, database-supported definition for the polytraumatized patient.

METHODS: The consensus process involved the following:

1. Expert panel. Multiple meetings and consensus discussions (members: European Society for Trauma and Emergency Surgery [ESTES], American Association for the Surgery of Trauma [AAST], German Trauma Society [DGU], and British Trauma Society [BTS]).
2. Literature review (original articles before June 8, 2014).
3. A priori assumptions by the expert panel. The basis for a new definition should include the Injury Severity Score (ISS) based on the Abbreviated Injury Scale (AIS); "A patient classified as polytraumatized should have a mortality rate of approximately 30%, twice above the established mortality of ISS > 15."
4. Database-derived resources. Deductive calculation of parameters based on a nationwide trauma registry (TraumaRegister DGU) with the following inclusion criteria: multiple injuries and need for intensive care therapy.

RESULTS: A total of 28,211 patients in the trauma registry met the inclusion criteria. The mean (SD) age of the study cohort was 42.9 (20.2) years (72% males, 28% females). The mean (SD) ISS was 30.5 (12.2), with an overall mortality rate of 18.7% (n = 5,277) and an incidence of 3% of penetrating injuries (n = 886). Five independent physiologic variables were identified, and their individual cutoff values were calculated based on a set mortality rate of 30%: hypotension (systolic blood pressure ≤ 90 mm Hg), level of consciousness (Glasgow Coma Scale [GCS] score ≤ 8), acidosis (base excess ≤ −6.0), coagulopathy (international normalized ratio ≥ 1.4/partial thromboplastin time ≥ 40 seconds), and age (≥70 years).

CONCLUSION: Based on several consensus meetings and a database analysis, the expert panel proposes the following parameters for a definition of "polytrauma": significant injuries of three or more points in two or more different anatomic AIS regions in conjunction with one or more additional variables from the five physiologic parameters. Further validation of this proposal should occur, favorably by mutivariate analyses of these parameters in a separate data set. (*J Trauma Acute Care Surg*. 2014;77: 780–786. Copyright © 2014 by Lippincott Williams & Wilkins)

KEY WORDS: Definition of polytrauma; assessment of patients with multiple injuries; conventional parameters for assessment; biomarkers for polytrauma; grading of patients.

The terminology applied to quantifying injury severity has been vague and inconsistent.[1–6] Descriptions such as "critically injured," "severely injured," or "critically ill with multiple injuries" have been used interchangeably.[2,3]

To our knowledge, the term *polytrauma* was first used approximately half a century ago, when survival rates began to improve for these patients. Descriptive definitions were used, such as "at least two severe injuries of the head, chest or abdomen, one of them in association with an extremity injury,"[4] "any patient with two or more significant injuries,"[5] or "a patient with two or more injuries, one of them being potentially life threatening." Isolated life-threatening conditions were also separated and the term *barytrauma* was coined.[6]

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DOI: 10.1097/TA.0000000000000453

The Injury Severity Score (ISS)[7] is the basis for most assessments of trauma patients and continues to be recommended by the American College of Surgeons' Committee of Trauma (ACS COT), The Trauma Outcome Research Network (TARN, GB), the German Trauma Registry (GTR), and the Australasian Trauma Society (ATS). The Major Trauma Outcome Study (MTOS) provided the first large-scale data that helped develop specific objective parameters to assess the polytrauma patient.[1] Physiology-based scoring systems included the description of the "lethal triad" to differentiate stable from unstable and "in extremis" patients.[8] This terminology has been later expanded to describe patient subsets, such as the "borderline" polytrauma patient.[9,10]

Today, the most widely disseminated definitions continue to rely on the basic concept of a combination of injuries that cause a life-threatening condition.[4–6] However, this approach is characterized by a lack of objective quantitative measures and represents Level IV evidence only.

For these reasons, an international panel of physicians met multiple times to refine the existing descriptions. The objective was to discuss current descriptions and possibly describe parameters to define the critically injured patient (polytrauma) with the potential for unrestricted application.[11]

This article summarizes the results obtained during the process of four subsequent years of progressive meetings, scientific sessions, consensus discussions, and trauma registry analyses.

PATIENTS AND METHODS

Consensus Process

A series of scientific sessions and meetings were held under the auspices of several societies as follows: American Association for the Surgery of Trauma (AAST), European Society for Trauma and Emergency Surgery (ESTES), German Trauma Society (DGU), British Trauma Society (BTS), New Zealand Association for the Surgery of Trauma (ANZAST).

Following scientific sessions in conjunction with the Annual ESTES meeting in Brussels, (May 15, 2010) and Milan (April 27, 2011), the panel of authors decided upon a formal subsequent consensus conference to be held in Berlin, Germany.

In preparation for the Berlin meeting, numerous discussions and telephone conferences were held. A group of experts was then invited to participate in the process. The invitations were based on expertise in the field (assessed by number and quality of original publications), willingness to contribute to a longstanding process, response to the invitations by e-mail, and availability to join the meeting in Berlin.

The meeting was held on May 11 and 12, 2012, in Berlin, Germany, and resulted in a draft consensus definition. This was reconfirmed during several interactions and additional calculations of the database. Further recalculations of the database were performed to reach the final consensus as documented in Table 1.

Prerequisites

The panel decided on the following prerequisites for the data selection; availability and completeness of data in large data sets, worldwide applicability, sensitivity, and specificity to describe the severely injured. These were then used to differentiate a core analysis of data.

TABLE 1. Time Course "Definition of Polytrauma"

Premeeting Scientific Sessions
Kickoff session at ESTES 2010, Brussels
11th International Course on Polytrauma Management, Aachen, Germany
Scientific Session at the ESTES, 2011, Milan
In-Person Discussions, March 1 to October 15, 2012
Meeting to discuss composition of expert panel group (Berlin, German Congress of Orthopaedics/Trauma, DKOU 2012)
Precirculation of preliminary timeline before DKOU 2012
Empirical Evaluation of Draft Definition
Review of published data
Invitations and Information for Panelists, October 1 to December 12, 2011
Precirculation of definitive timeline
Precirculation of topics
Precirculation of background materials
TR-DGU Data Analysis I, Deductive Draft Definition
Assembling of clinical cohort, Cologne, March 8, 2012
Berlin Consensus Conference, May 10/11, 2012
Day I: influence of trauma systems, issues to include or exclude systemic inflammatory response syndrome, current concepts
Day II: presentation of calculations from a nationwide database, discussion of draft definition, consensus on the issue of further calculations in the database
Teleconference, June 15, 2012
Consensus on database use for later validation (NTDB, TARN, Australian Registry)
TR-DGU Data Analysis II, Deductive Draft Definition
Calculation of the final definition, Cologne, November 1 to December 7, 2012
In-Person Consensus Discussion at the 13th International Polytrauma Course, Aachen, December 8, 2012
Discussion on presentation of data
Discussion on involvement of other databases
Telephone Conference, March 8, 2013
Consensus on modality of manuscript publication
Permission to use all requested databases for validity assessment
Multiple Communications by E-mail, Telephone to Improve and Consent the Berlin Definition (following September 16, 2013)

Preparative Literature Review

A review of the literature was performed on the available definitions of polytrauma. The following MeSH headings were applied to the literature search: Abbreviated Injury Scale, Injury Severity Score, algorithms, clinical coding/methods, consensus, Germany/epidemiology, incidence, multiple trauma/diagnosis, Multiple Trauma/epidemiology, observer variation, prospective studies, registries, trauma centers/statistics & numerical data, United States/epidemiology, Injury Severity Score. All original articles were included if published within January 1, 1940, and May 8, 2012. No language restrictions were applied. This review served to determine pertinent parameters and cutoff values for the definition of the trauma patient "at risk."

Data Acquisition

A National Trauma Registry (TR-DGU, version 2012) was used. In this registry, severely injured patients are documented prospectively by hospitals included in the German Trauma Network (www.traumaregister.de). Data from the registry was assessed at four different time points (Table 1): (1) before the

Berlin meeting to analyze the raw data set and feasibility of the selected parameters; (2) during the Berlin meeting (May 2012) to address the individual cutoff values; and (3) before and after the 13th International Polytrauma Course (Aachen, December 2012) to calculate the final score values.

During the inclusion period, a change in documentation occurred for parameters indicative of hemostasis. Therefore, in patients with missing international normalized ratio (INR) data, a relative measure of thromboplastin time ("Quick value" [*Q*] was used, expressed as percentage of normal activity) was used as follows: the value was approximated by the formula $0.4 + (58 / Q)$.

Inclusion Criteria

Patients from the TR-DGU were extracted if they fulfilled the following criteria: admission to an intensive care facility and multiple injuries

Definitions

Mortality was defined as in-hospital mortality.

Complications

Clinical complications included those documented in the registry, such as organ failure and sepsis. The information obtained through this process served as a basis for the discussions during the consensus meeting held in Berlin, Germany, on May 11/12, 2012.

Cohort Assembly

Based on the literature review, multiple studies from the Australian group,[11] preparative in-person meetings (C.J., I.M., H.-C.P.), and the expert session in Berlin, the following eligibility criteria were selected for suitability of the database to be used: (1) large multicenter cohort, (2) availability of data known to be relevant for outcome (namely indicators of hemorrhagic shock, resuscitation data, laboratory results) and mortality, and (3) inclusion of basic trauma scoring values.

The panel identified several data sets to be generally acceptable: the National Trauma Data Bank (NTDB, United States), the German Trauma Registry (TR-DGU), the Dutch Trauma Registry, the New South Wales Trauma Registry (Australia).

Empirical considerations lead to preliminary draft definitions: pilot data based on single institutions showed the potential feasibility of Abbreviated Injury Scale (AIS) score greater than 2 in two body regions, the potential hurdles with inclusion of systemic inflammatory response syndrome data, and the low interrater and intrarater agreement of the expert opinion-based subjective definition.[12] The resulting information was used to perform further calculations on the variables deemed to be available worldwide.

General Considerations and Prerequisites Addressed During the Berlin Meeting

During the meeting, the initial questions addressed by the expert group were as follows:

When is the best time to define a patient as a multiply injured/polytraumatized?
Who is the best trained expert to do this?
How can feasibility be maintained while accuracy is improved?

Timing of the Diagnosis of Polytrauma

On-scene assessment might be useful to initiate trauma team call and triage; however, the panel agreed that it is not useful for defining polytrauma. In-hospital diagnosis should be made before ICU admission because it is affected by treatment and includes the systemic patient response.[13] Therefore, the diagnosis of polytrauma should be made on the first day of the hospital stay after completion of initial diagnostic procedures.

Description of the Best Expert to Diagnose Polytrauma

The panel considered the assessment by police or other nonmedical personnel of little use for medical definition because of a lack of specificity.[14] It was agreed upon that ideally, the diagnosis is made by an expert that has completed his or her trauma fellowship and has fulfilled specific courses, such as Advanced Trauma Life Support (ATLS), www.atls.com), or the Polytrauma Course, www.polytraumacourse.com).

Clinical Scores

The panel agreed that any practicable definition of polytrauma should be applicable prospectively, that is, early after patient admission. Anatomic scoring was selected as the basis for assessment and for optimal standardization. Because the precise ISS is difficult to calculate during the patient management in the emergency department, it was favored unequivocally that AIS score greater than 2 in two body regions can be reliably recognized by a clinical expert shortly after admission. It has previously been discussed that the parameters providing the most stable sensitivity and specificity in terms of mortality are documented soon after admission.[15]

Parameters: Pathologic Conditions and Ancillary Variables

The selection of variables was assessed in preparation for the Berlin consensus meeting during a database evaluation for the TR-DGU in Cologne, on September 12, 2012. The lead author and the second author of this article met to assess the feasibility of variables selected in a previous literature search. The search included criteria used by the ACS COT, data from the Major Trauma Outcome Study, certain parameters suggested previously to define polytrauma,[1,16] and additional parameters previously used to assess these patients. Among these are the GCS score and certain physiologic criteria.[16,17] It lists certain valuable combinations of parameters, such as an ISS of 16 points or greater, two body regions with an ISS of 3 or greater, the use of an ISS of 16, and one or more additional altered physiologic parameters.[18] On the basis of this information, the panel present at the Berlin meeting decided on the threshold levels, as described in the following section.

Threshold Levels of Mortality

Currently, the ISS is used as a standard anatomic classification of injury severity in major trauma centers across the United States, many European countries, and Australia. The threshold level to determine a severely injured patient is usually an ISS of greater than 15 points. The mortality rate for the patient population used to be 20% or greater.[1,6] Today, it is

considered to be considerably lower and ranges between 9% and 15%.[19] Based on this information, the panel unanimously agreed that an expected mortality rate of approximately 15% should be used as threshold level.

Criteria Used to Define a ''Relevant Change'' in the Clinical Condition

The assessment of the set mortality rates had been confirmed in the preliminary calculations of the registry. It was decided that the mortality rate to determine polytrauma should be double the value from the mortality rate of patients with an ISS of 16 points.

Therefore, after accounting for different variations of sensitivity, the panel decided that a mortality rate is most relevant when it accounts for approximately 30% for any of the parameters.

Relevant Physiologic Parameters: Pathologic Conditions and Ancillary Variables

- Coma was defined as a GCS score of 8 points or lower.[20]
- Hypotension was defined as a systolic blood pressure of 90 mm Hg or lower.[7]
- Metabolic acidosis was defined as a base excess of 6 or lower.
- Coagulopathy was defined as a partial thromboplastin time (PTT) of 50 or greater or an INR value of 1.4 or greater.

The panel agreed that ancillary parameters should be minimized mostly because of the intention of global use of the definition and the availability in databases. Before the Berlin meeting, an assessment of old age was performed as ancillary parameter for the three variants, namely, 60 years, 65 years, and 70 years of age. This demonstrated that mortality rates justified the inclusion of older than 70 years as an ancillary parameter. The panel reconfirmed the cutoff value of old age to be 70 years or older during the Berlin meeting.

Draft Consensus Definition

As part of the Berlin meeting, the prerequisites for the definition were selected as follows:

Based on several presentations during the meeting and a discussion on the requirements of the definition, all panel members agree on the following prerequisites:

1. A combination of injury severity, physiologic changes, and/or a relevant physiologic change (as defined earlier) in the clinical condition seem to be useful and should be applied.
2. The initial workup should be performed in the German Registry, followed by a reassessment in any large registry.
3. At least two body regions should be injured, thus requiring an AIS score of 2 points or greater in two or more body regions.
4. The panel unanimously decided that additional parameters are required to allow for a definition of polytrauma.
5. The weight of any selected parameter should be clinically relevant in terms of contributing to increased mortality.

Final Consensus on the Data

The results were presented to the panel during the 13th International Polytrauma Course in Aachen, Germany, on November 30 and December 1, 2012. It was agreed upon that the registry data should be used for the Berlin definition of polytrauma and that the results should be assessed by other databases, such as NTDB, the Dutch Trauma Registry, and the Registry from New South Wales. The consensus process included further telephone conferences and e-mail communication.

TABLE 2. Demographic Data of Patients Included in the Study With an ISS of 16 or Greater in Two or More Body Regions

Variable	Unit	Data
No. cases	Patients	28,211
Age, mean (SD)	Years	42.9 (20.2)
Sex	Male	72% (n = 20,433)
Mechanism of injury	Penetrating	3% (n = 886)
Incidence of intensive care treatment	—	93% (n = 26,130)
ISS, mean (SD)	Points	30.5 (12.2)
Maximum AIS score (MAIS)	3 points	29% (n = 8,212)
	4 points	40% (n = 11,362)
	5 points	29% (n = 8,207)
	6 points	2% (n = 430)
AIS	Points	
Head injuries	AIS score ≥ 3	54% (n = 15,279)
Thoracic injuries	AIS score ≥ 3	67% (n = 18,824)
Abdominal injuries	AIS score ≥ 3	25% (n = 7,005)
Extremity injuries	AIS score ≥ 3	44% (n = 12,290)
Mortality rate		18.7% (n = 5,277)

Mean (SD) for metric variables and n (%) for counts.

Statistical Analysis

Panel Decisions

Data from the TR-DGU were used to allow subjective decision making regarding the severity of injuries. Continuous variables are presented as means and SDs. Frequencies are presented as percentages with numbers of records available in the database.

Database Calculations

Data were tested for normal distribution. Nominally scaled variables were tested using χ^2 analysis. Proportions were evaluated using the Yates-corrected statistics. The relative risks of death of the conventional parameters tested were calculated individually and expressed in odds ratios. The association between conventional parameters and death was evaluated using univariate analysis. Statistical significance was assumed at $p < 0.05$. All calculations were performed using a statistical software package (SPSS, version 20, IBM Inc., Armonk, NY). The number of candidate criteria fulfilled per patient record was also used to build subgroups of patients and to calculate mortality rates.

RESULTS

Table 1 describes the time course of the consensus process.

The first scientific session was held during the ESTES meeting in Brussels (May 15, 2010), followed by multiple meetings, telephone conferences, and group discussions.

TABLE 3. Prevalence of Five Selected Pathologic Conditions/ Ancillary Parameters Associated With Increased Postinjury Mortality

Ancillary Variable/ Parameter	Criteria	Incidence	No. Patients	Mortality	Odds Ratio
Age	≥70 y	13·0%	3,661 of 28,071	38.0	2.99
Unconsciousness	GCS score ≤ 8	34.6%	9,232 of 26,657	38.3	4.17
Hypotension	Systolic blood pressure ≤ 90 mm Hg, preclinical or on admission	29.5%	7,955 of 26,923	35.3	4.90
Acidosis	Base excess ≤ −6.0	24.9%	3,764 of 15,117	38.3	3.32
Coagulopathy	PTT ≥ 40 s or INR ≥ 1.4	26.2%	6,316 of 24,143	38.4	5.81

From January 1, 1993, to December 31, 2010, 67,782 patients were documented in the registry. Among these, 43,175 had experienced multiple injuries. The exclusion of all transferred patients left 34,547 patients for further evaluation. Following exclusion of patients with injuries with an AIS score of 2 points or less (n = 6,336), 28,211 patients were included in the present study.

Table 2 lists the study population and basic demographic data from the patients. Within the study population, the following distribution of mortality rates associated with incidences of injured body regions was found: 11.8% when at least 2 AIS injuries with 3 points or more[16] in two body regions were affected, 28.3% for three body regions, 37.4% for four body regions, and 58.0% for five body regions.

Table 3 documents the prevalence of the five physiologic parameters identified to be associated with increased mortality rates and the odds ratios for death. Univariate mortality analysis revealed threshold levels for the five parameters as follows: age of 70 years or greater, 38.0%; acidosis, 38.8%; coagulopathy, 48.3%; GCS score of 8 points or less, 38.3%; and hypotension, 35.3%.

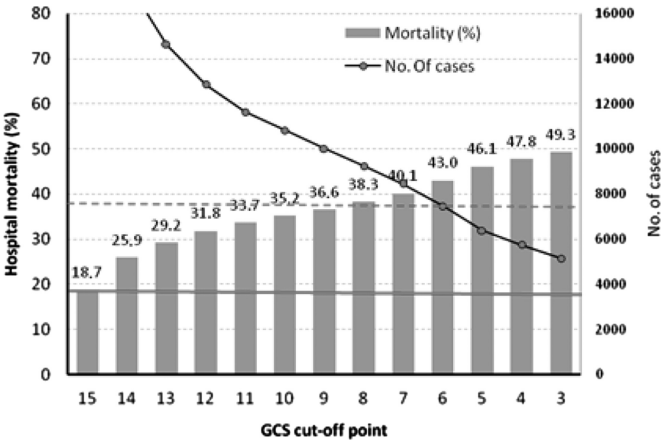

Figure 1. Cutoff points for in-hospital mortality rates based on various values for the GCS.

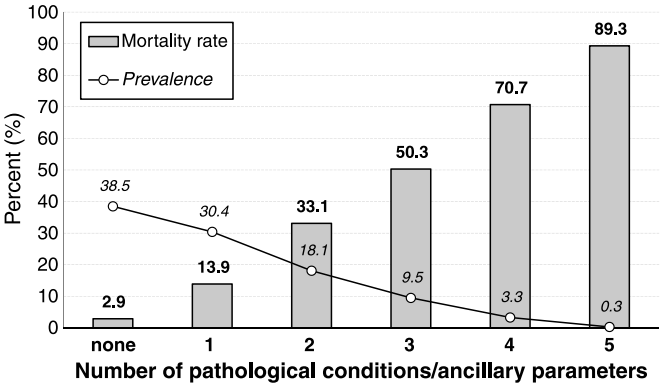

Figure 2. Documentation of mortality rates depending on the number of pathologic conditions/ancillary variables.

Figure 1 describes mortality rates for different thresholds of the GCS values. The optimal cutoff point that leads to a mortality rate twice as high as in the whole group was a value of 8 points or less. A similar approach was performed for each of the criteria listed in Table 3.

Figure 2 lists the prevalence of pathologic values and ancillary parameters. The highest prevalence was found when one parameter was involved (38.5%), and the lowest prevalence occurred when all five parameters were involved (0.3%).

The parameters deemed to be relevant for an improved definition of polytrauma are as follows: ISS of greater than 15 points, AIS score of 3 or greater in at least two body regions and at least one of five standardized pathologic conditions, (hypotension [systolic blood pressure ≤ 90 mm Hg], unconsciousness [GCS score ≤ 8], acidosis [BE ≤ −6.0], coagulopathy [PTT ≥ 40 seconds or INR ≥ 1.4], and age [≥70 years]).

DISCUSSION

Trauma continues to be the leading cause of death worldwide in young individuals younger than 40 years, associated with the highest socioeconomic impact on society. In blunt injuries, those leading to the biggest long-term impact on quality of life are traumatic extremity amputations and spinal cord injuries.[21,22]

The value of a reliable assessment of patients with polytrauma can be manifold. It may serve as a basis for scientific, socioeconomic, quality-control, and educational purposes. For clinicians, it may help facilitate adequate distribution of in-hospital resource allocations, such as availability of operating rooms and intensive care unit beds.[23]

The current article has both strengths and limitations.

1. The panel decision to use the ISS for practicability may be judged as a limitation. Some authors downplayed the importance of ISS and argue that mortality is better predicted by describing the patient's worst injuries.[9] Others used variations of the ISS to account for shortcomings in the representation of multiple injuries to the same body region. However, none of

these initiatives represented a breakthrough. Likewise, most international databases and many registries use the ISS rather than other coding systems (e.g., International Classification of Diseases [ICD]). It has therefore been suggested to use risk-adjusted levels of scores and/or parameters, as performed in the current consensus process of the Berlin definition. Among these, it is unclear whether anatomically derived general scoring systems such as ISSs outweigh those that purely describe local changes.[24]

With the addition of other physiologic variables on top of the injury scoring, a sustained increase in coverage of mortality occurred. This finding concurs with previous studies.[12,16]

Moreover, when using the ISS threshold of greater than 15 points, an 18.7% mortality rate was found, independent of any of the five additional parameters used. As soon as one other physiologic parameter was added, a reliable set of data revealed mortality rates of 35% to 38%, as deemed clinically relevant to the panel. Therefore, patient data seem to support the expert opinion.

2. One may also argue whether the selection of the additional parameters and ancillary variables was adequate. The "Inflammation and the Host Response to Injury Collaborative Research Program" gathered the most recent data on patients with severe injuries and stressed the importance of inflammation for the hospital course in severely injured patients.[25] However, none of the inflammatory parameters, such as interleukin 6 or other laboratory parameters indicative of inflammation values, are currently available in any large database. It was considered highly unlikely that any of these markers will be available for global application in the near future. Thus, it seemed to be justified not to consider them in the current analysis. This approach is supported by the fact that similar parameters as used in the current setup have been successful in predicting outcome[12,16] and by other groups that studied the risk of adverse effects during the hospital course.[9,19]

3. A priori selection of mortality rates to identify patients in a life-threatening condition should not have been performed. Yet, the panel that convened in Berlin was under the impression that clinically relevant thresholds for mortality levels are the missing link for database-confirmed values. The a priori use of certain values seems to be supported by previous empirical approaches.[25] Therefore, it was felt that the current approach was appropriate for the current status of documentation. Nevertheless, we anticipate that future clinical research using a model of definition development may rely on parameters of inflammation in the future.

4. During the consensus meeting in Berlin, the sensitivity issues of the selected parameters were considered as well. While using the ISS as the only parameter would have been easier, the panel felt that the addition of other physiologic parameters greatly increased the sensitivity and specificity. Similar effects had been described elsewhere.[26] Furthermore, the usability of physiologic parameters has been proven in previous databases. Kondo et al. examined the data sets from 35,732 patients of 115 hospitals from the Japanese national trauma database. They documented a good predictive power for GCS, age, and systolic blood pressure in terms of mortality.

5. The data set was not divided into a development and a validation group. Therefore, validation will have to be undertaken in a separate analysis using another database.

Among the strengths is the use of a database that summarizes data from institutions committed to perform optimal trauma care:

1. All information available in the database are documented prospectively.

2. The database uses homogenous inclusion criteria by including only patients admitted through the emergency department and requiring intensive care therapy. The coding expertise is assessed both by computerized plausibility assessments and by regular feedback to every center. It is part of the quality assurance program involved in the certification process of the National Trauma Network, and the quality of documentation is accepted to be high.[15,17] In this line, Kilgo et al.[27] reconfirm that a high quality of data may be an issue in studies gathered from databases. Likewise, Moore et al.[28] state that the most important issue to address in registries is high-quality coding practices along with homogenous inclusion criteria. It is implied that some variables from the current database—those that could not be used because of a lack of availability and feasibility—may become more useful with future assessments.

3. Another issue is the quality of the data collected. Kondo et al.[16] report a 76% complete data set 27,154 in patients from a nationwide database. The authors conclude that this number seems to be within the normal range. Across several registries—including the one used for the current study—missing values for physiologic data seem to be a similar concern. Some authors therefore advised to use a multiple imputation model.[26] Kondo et al.[16] decided to eliminate all patients with missing data to improve the quality of documentation. The same approach was applied in the current study.

Given these prerequisites, the panel laid special emphasis on availability and completeness of data in large data sets, sensitivity, and specificity. Both the literature review and the database assessment confirmed that this approach leads to a sound association with mortality rates. The current definition thus seems to fulfill all criteria listed earlier, thus allowing for global application. One may argue that a pure expert consensus may offer certain advantages over empirical estimation of injury severity.[29]

Instead, it seems that the combination of a priori expert consensus, review of the literature, and a database analysis provides a more solid basis for a refined assessment. Similar concepts have been successfully applied by previous groups. Despite being more time consuming, a consensus process seems to provide an exceedingly durable statement.[30]

In summary, a consensus and database-supported definition of the polytraumatized patient is presented. The definition was tested using empirical data on outcome, namely, a mortality rate of 30% or greater. The database served to predict the value of multiple parameters, to refine the draft definition, and to include multiple parameters including accepted scoring systems and ancillary variables. The definition implies the following parameters: two injuries that are greater or equal to 3 on the AIS and one or more additional diagnoses (pathologic condition), that is,

hypotension (systolic blood pressure ≤ 90 mm Hg,), unconsciousness (GCS score ≤ 8), acidosis (base deficit ≤ −6.0), coagulopathy (PTT ≥ 40 seconds or INR ≥ 1.4), and age (≥70 years). Based on current knowledge, worldwide use seems to be feasible. We anticipate that future evaluations will be required to use multivariate analyses in a separate database to evaluate the data presented in this article.

AUTHORSHIP

H.C.P. wrote the article. R.L. performed the statistical analysis. All other authors were involved in the consensus process, participated in the meetings and reviewed the manuscript.

DISCLOSURE

The Berlin meeting and all associated expenses were funded by the German Trauma Society.

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