



Recommendations for uniform reporting of data following major trauma — the Utstein style

A report of a Working Party of the International Trauma Anaesthesia and Critical Care Society (ITACCS)

W.F. Dick ^{a,*}, P.J.F. Baskett ^{b,1}

^a *Klinik für Anaesthesiologie, Johannes Gutenberg Universität, Langenbeckstrasse 1, D-6500 Mainz, Germany*

^b *Department of Anaesthesia, Frenchay Hospital, Bristol, UK*

Accepted 21 July 1999

Members: W.F. Dick (Co-Chairman) (Germany); P.J.F. Baskett (Co-Chairman) (UK); C.M. Grande (USA); H. Deloos (Belgium); W. Kloeck (South Africa); C. Lackner (Austria); M. Lipp (Germany); W. Mauritz (Austria); M. Nerlich (Germany); J. Nicholl (UK); J.P. Nolan (UK); P. Oakley (UK); M.J.A. Parr (UK); A. Seekamp (Belgium); E. Soreide (Norway); P.A. Steen (Norway); Luc van Camp (Belgium); B. Wolcke (Germany); D. Yates (UK).

Keywords: Emergency medicine; Utstein style; Trauma data reporting

1. Introduction and background

Basic and advanced care of trauma patients always has been an important aspect of prehospital and immediate in-hospital emergency medicine. These involve a broad spectrum of disciplines, specialties and skills, generally delivered through Emergency Medical Services Systems which, however, may differ significantly in structure, resources and operation. This complex background at least in part, has hindered the development of a uniform pattern or set of criteria and definitions. This has, hitherto, often rendered data incompatible, with the consequence that differing systems or protocols of care cannot be readily evaluated or compared with acceptable validity; nor can they be incorporated into large-scale studies of epidemiological significance.

A similar situation has existed for other areas of emergency medicine, and resuscitation from cardiac arrest is a particularly important example. To address that particular problem, the European

Resuscitation Council (ERC), the American Heart Association (AHA), the Australian Resuscitation Council, the Resuscitation Council of Southern Africa and comparable organisations in other continents, have after intensive discussion and a series of consensus processes, issued ‘Guidelines for Uniform Reporting of Data following Out-of-Hospital and In-Hospital Cardiac Arrest — the Utstein Style’ [1,2]. Since then, studies from different centers have been published that facilitate valid comparison of data and systems on the basis of this uniform terminology and template.

In 1995, Spaite and his colleagues [3] in the United States published a report from the Uniform Prehospital Emergency Medical Services Data Conference that defined the principles of data collection and setting out, among others, proposals that data be stratified into ‘core’ (essential) and ‘optional’ (supplemental) information in an effort to provide useful information for improvement of quality of both care and research specifically in the prehospital arena.

In 1994, at its 7th Annual Symposium in Paris, a working group from the International Trauma Anaesthesia and Critical Care Society (ITACCS)

* Corresponding author.

¹ Also corresponding author.

agreed to design a system, based on the Utstein-concept and template, but specifically targeted at uniform reporting of data following trauma [4]. The project was not to be confined to capture of data in the prehospital phase only but would also attempt to include early in-hospital management and, significantly, would incorporate data from outcome studies. In 1996, during the 9th ITACCS Symposium in London, the working group met again and agreed that there was now an urgent need for a common terminology and reporting template to be developed to facilitate the acquisition, processing, audit and analysis of data which would be both compatible and comparable.

Such a system should have the following features:

- A structured reporting system based on an ‘Utstein-style-template’ which would permit data and statistics on major trauma care to be compiled, and to facilitate and validate independent or comparative audit of performance and quality of care [1–3];
- The recommendations and template would encompass both out-of-hospital and in-hospital trauma care;
- The recommendations and template should further permit intra- and inter-system evaluation to improve the quality of delivered care and identification of the relative benefits of different systems and innovative initiatives and
- The template should further facilitate studies setting out to improve epidemiological understanding of trauma; for example such studies might focus on the factors that determine survival.

In February 1998, the main ITACCS consensus project committee met in Mainz, Germany to produce a definitive draft of the document. Six initial

small group (each five strong) meetings were followed by plenary debate. The six groups then prepared a component draft that was debated, developed and refined within the group, following which the secretary of each group submitted their component draft to a small writing committee, charged with the preparation of a pre-final composite draft document. This was finalised in May 1998, during the 11th ITACCS Annual Symposium in Vienna. Prior to and since that meeting the document has received substantial input from additional researchers and clinicians from complementary disciplines and support from scientific organisations worldwide.

2. Trauma data structure development using object-orientated modelling

The data to be collected for trauma care inherently is complex. Different personnel who take part at different stages of trauma care often have different requirements for data collection, yet there are inherent similarities that allow the development of a single unifying model.

In the object orientated approach, the patient can be regarded as an object with a unique identification number ‘travelling’ through time (from the accident occurring) and space (location) with other generic object links such as attendants (personnel involved at different stages), observations (sensors) and interventions (effectors), as shown in Fig. 1.

The advantage of this approach, used by software engineers, is that it may be employed analytically to develop the model. A flexible structure is developed not only for recording and analysing data but also for shaping the way in which trauma care is conceptualised and the language used to describe it. Object-orientated concepts such as ‘object inheritance’ can be incorporated to define and refine individual objects within the overall model.

The components of this model are incorporated into the various sections of the guidelines as listed:

- Factors relating to the circumstances of trauma
- System factors
- Patient factors
- Treatment and outcome
- Ethical issues
- Documentation/methodology

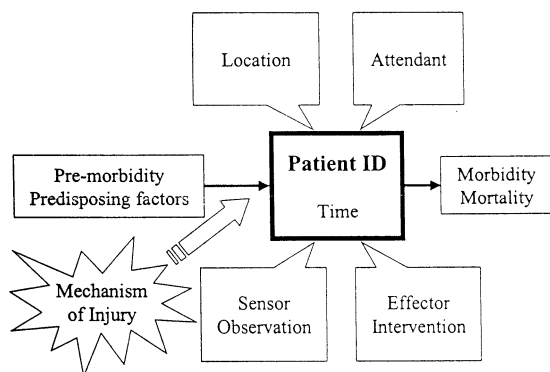


Fig. 1. Object-orientated model for trauma data structures.

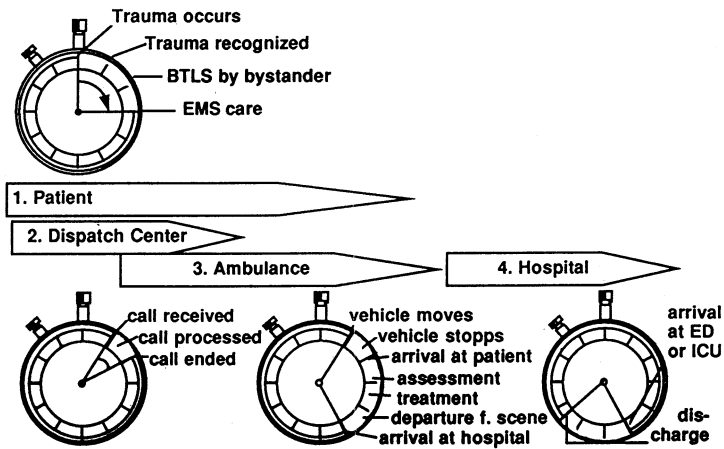


Fig. 2. Trauma time clocks. BTC, basic trauma care; EMS, emergency medical services; ED, emergency department; ICU, intensive care unit

The document is structured along the lines essentially similar to the original Utstein-style guidelines publication on 'prehospital cardiac arrest' [1]. It includes a glossary of terms used in the prehospital and early hospital phase, and definitions, time points, and intervals. The document uses an almost identical scheme (Fig. 2) for illustrating the different, overlapping time clocks — one for the patient, one for the dispatch centre, one for the ambulance, and finally one for the hospital. Guidelines and where appropriate, definitions, are provided for clinical inputs, interventions and outcomes which should be included in reports, and recommendations made for the description of emergency medical services systems, together with the variables for input, process and outcome. These variables may be stratified into core (essential) (prefixed with a 'c' or optional (supplemental) data (prefixed with an 'o').

Definitions such as bystander, emergency personnel, etc. used in the document are identical to those used in the original Utstein template for cardiac arrest documents and may be referred to in those publications [1,2].

In trauma, the terminology corresponding to Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS) should have been Basic Trauma Life Support (BTLS) and Advanced Trauma Life Support (ATLS). However, ATLS® is a trade mark held by the American College of Surgeons; therefore the working group elected to use the more generic terms Basic Care (BC) and Advanced Care (AC).

As in the previous Utstein-style documents, the term interval (event to event interval) replaces the term 'time' or 'down time'. Thus, the 'call-to-response interval' denotes the period from receipt of the call by the emergency dispatcher to the moment the emergency response vehicle stops moving at the scene; however, in this document, the 'call-to-patient-arrival' interval is utilised because it includes the period from 'vehicle stops moving at the scene' until arrival of the crew 'at patient side', a period which is not available for intervention but which may prove to be time-critical.

In the section on outcome, particular attention has been paid to data on morbidity and disability. They are developed to provide greater detail than do the corresponding cardiac arrest documents. Proposals are made for scalar indices that investigators may use to quantify disability, quality of life and other relevant parameters.

The structural and operational components of the Emergency Medical Services(EMS) are described in accordance with the original Utstein documents, i.e. the dispatch system and the first, second, and third tiers.

In contrast to the Utstein templates used for pre- or in-hospital cardiac arrest, the working group decided for the present time, to use a semantic rather than a graphic approach to the protocol for actually recording data. In the future, however, when the document has been promulgated and discussed widely, the group may come forward with a graphical report form for trauma patients which may facilitate collection or processing of data.

3. Terms and definitions

The terminology proposed for use in trauma care have been defined to ensure clarity in documentation and reporting. They are listed in Appendix A. The terms include the definitions or terms that are used frequently in blunt and penetrating trauma such as 'long bone', 'major', 'mixed', 'combined', 'multiple', 'poly' and 'pre-dominant' trauma in an effort to ensure consistency in future reporting.

Certain terms such as 'isolated trauma', 'single system trauma', and 'pattern of injury' may lead to confusion and are considered best to be avoided.

4. Factors relating to the circumstances of the injury

The factors relating to the circumstances of the injury include:

- The type of injury
- The severity of the injury
- The mechanism of the injury
- The location of the injury

The details of each factor are listed in Appendix B.

4.1. Type of injury

When more than one injury type is present, the predominant type, i.e. the type most responsible for mortality/morbidity will be assessed in the hospital at a time considered appropriate.

Core data mandatorily must include data as to whether the trauma is blunt or penetrating.

In general, all trauma is classified as blunt, including amputation, crush, laceration, and asphyxia with the exception of stab, spike, or missile injuries, which are classed as penetrating trauma.

4.2. Severity of injury

4.2.1. Abbreviated injury score [5]

The abbreviated injury score (AIS) attempts to combine anatomical injury with physiological disability (see Appendix B). Anatomical regions of the body are listed by number in an agreed

numbered sequence of 1–9. The degree of physiological disability also is listed by the numbers 0–6 indicating an increasing severity in relation to each anatomical area. This is core data. More than one score may apply, for example a patient may have a chest injury that is severe, but not life-threatening (4.3) plus a head injury which is moderate (1.2) plus a lower limb injury which is severe, but not life threatening (8.3).

4.3. Mechanism of injury

Core data includes the basic mechanism of injury differentiating between transport, fall, interpersonal violence, deliberate self harm, thermal contact, asphyxia, etc.

Optional data include details within each of these major groups.

For convenience, explosion, chemical, and radiation injuries may be included under thermal injury if that is the major mechanism of injury, or they may be included under asphyxia, if that is more appropriate.

4.4. Location of injury

The place of injury is classed as optional data, but may be especially relevant in certain studies. Only the common places are listed; other places, e.g. on-board ship should be specified.

'Remote' indicates a place not easily accessible by road or more than 100 km from any EMS base. (Distance is not the criterion, but time spent to overcome distance in relation to the golden hour.)

5. System factors [6,7]

The EMS and Hospital System factors closely mirror those listed in the Utstein guidelines for reporting cardiac arrest. These are listed in Appendix C.

The factors relate to features of the health-care system in the prehospital phase, during inter-hospital transfer, and at the receiving hospital. They include the basic features of each phase, the time points and time intervals, details of the personnel involved, and the level of care provided.

6. Patient factors

The basic factors will have been recorded under factors relating to the circumstances of injury.

There are a number of factors that have been shown to influence trauma patient outcome. These include severity of injury, time-to-definitive care, the quality of the care provided, and patient factors. Patient factors that influence outcome (morbidity and mortality) are those factors that compromise physiological reserve. These include age, gender and co-morbidity (also referred to as pre-existing disease). Details of the suggested data to be recorded are listed in Appendix D.

6.1. Age

The patient's age or best approximation should be recorded in all cases. Age is a predictor of outcome from trauma [8–14]. Mortality increases between the ages of 45–55 years for the same injury severity and is doubled above 75 years relative to 45 years. Trauma in the elderly population also is associated with an increased risk of complications, intensive care, and hospital stay.

Ages are grouped as shown:

1. 0–12 months
2. 1–4 years
3. 5–14 years
4. 15–24 years
5. 25–34 years
6. 35–44 years
7. 45–54 years
8. 55–64 years
9. 65–74 years
10. 75–84 years
11. 85 years and older

6.2. Gender

Gender should be recorded for all cases. The overall death rates from trauma for males is more than twice that of females [15,16]. This ratio is increased further in intentional trauma and particularly in penetrating trauma. These higher rates reflect the greater involvement of males in trauma-associated with work, domestic and recreational activities.

6.3. Dimensions

Height and weight have often to be estimated

initially and are reported in metres and kilograms.

6.4. Other

Where appropriate, the population should be defined, for example by ethnic groups, socio-economic classification or subgroups (e.g. driver, passenger, cyclist, pedestrian, interpersonal, etc.).

6.5. Co-morbidity

Co-morbidity is an important predictor of outcome from trauma, but until recently has received little attention [17–23]. Previous assessments of co-morbidity in trauma patients have used retrospective discharge diagnoses according to the International Classification of Disease (ICD 9 or 10) codes, a limited list of disease states as part of a trauma registry, or a severity of disease classification system [24]. The functional/physiological limitations of the co-morbidity assessment have not, as yet, been clearly defined. An accurate description of all co-morbidity should ideally be included, but is likely to be difficult. In the absence of a reliable, simple assessment of co-morbidity, the four grading scales shown below should be used. It will allow an assessment of the impact of pre-existing disease on physiological reserve.

6.6. Co-morbidity gradings

(Ascribed to the American Society of Anesthesiologists (ASA))

1. Healthy (normal)
2. Systemic illness: non-limiting
3. Systemic illness: limiting normal activity
4. Systemic illness: constant threat to life
5. Intercurrent medication

6.7. Assessment

It is recognised that resuscitation is the first priority and that full assessment will not be performed before life-saving manoeuvres. Consequently, certain elements of assessment and resuscitation may be done simultaneously. It also is recognised that, at any instant, the physiological status is a summed expression of a dynamic process that is influenced by both inherent response and interventions. The documentation of the relation of these interventions to the assessment is

crucial therefore, if the impact of various interventions is to be evaluated.

To allow meaningful interpretation and comparison, both anatomical and physiological assessments must be documented. The most commonly used scoring systems in current use are the AIS [25,28], from which the injury severity score (ISS) [26,27] is derived, and the revised trauma score (RTS) [29] which is composed of the Glasgow coma scale [29,30], the systolic blood pressure, and the respiratory rate. The ISS and RTS allow TRISS methodology [31] and comparison with the Major Trauma Outcome Study (MTOS) [32,33].

6.8. Treatment

At present there is controversy as to whether outcome for trauma patients is influenced for the better by the type of prehospital provider or even by the procedures performed.

Available studies have produced conflicting results [6,7,34–41]. Some studies have suggested that advanced life support (ALS) procedures improve physiological variables but not outcome [40].

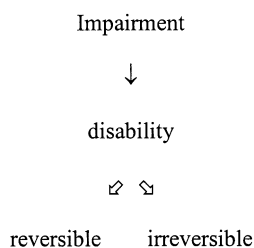
Of greater concern would be if prehospital ALS procedures actually may be detrimental [42,43]. As a result, the traditional concept of trauma management in the prehospital setting is increasingly questioned [44]. These uncertainties underline the importance of accurate documentation of treatment and outcome. This will provide evidence for or against the efficacy of management systems and treatment interventions and regimes [3,45].

7. Outcome

Details of outcome are essential to any study (Appendix E).

Whilst mortality rates are more easily collected, every effort should be made to collect information on morbidity.

Morbidity is defined as "all non-fatal" problems"



It should also be stated if prevention of adverse factors was relevant: this prevention should be graded as: probably;possibly;definitely.

The following factors may be considered as a surrogate measure of outcome

- time in ICU
- time in hospital
- costs

8. Ethical issues

Recommendations for reviewing, reporting, and conducting studies on trauma would be inappropriate without attention to the many ethical issues involved. These recommendations are not intended as new guidelines for managing trauma patients, although many of the issues are relevant to that activity. Many of the factors also pertain to patients with cardiac arrest, and these are described in the In-hospital resuscitation, Utstein-style paper [2]. Quality trauma research must be conducted, because only scientific evaluation of trauma care can unequivocally benefit future patients. This research must be conducted, however, within an ethical framework, which may vary between countries and cultures, but the treatment of the individual patient always must have priority.

In trauma research it particularly is important to depersonalise all data as it generally is easier to connect a specific person to a trauma incident than to a disease process, especially in case reports.

8.1. Patient consent for trauma research

All studies should follow the Declaration of Helsinki, and must not be initiated until approved by the appropriate ethics committee. This usually implies that informed consent must be obtained from the patient if possible. This is problematic and presents a unique ethical challenge in trauma research.

Some patients will be unconscious, and so cannot consent at the time needed for inclusion in many studies. Surrogate permission from family members or legal guardian, is unacceptable in some countries, [46,47] and rarely is available in the acute care situation in countries in which it is accepted.

Even in conscious patients, informed consent is problematic in the acute care setting [47,48]. Informed consent implies that a competent patient must, to the best of a competent researcher's knowledge, have received and understood all the appropriate information. As the treatment of the patient has first priority, there frequently is not sufficient time to ensure quality informed consent in the management of patients with severe trauma.

Any study must comply with ethical principles. These can vary between nations, states, or local communities. In the United States, as an example, Federal regulations concerning informed consent resulted in a virtual halt in resuscitation research in the early 1990s. In response, the 1995 Coalition Conference of Acute Resuscitation and Critical Care researchers stated that research can and should be done in clinical circumstances where it was not feasible to obtain informed, prospective, or proxy consent for enrolment in a study protocol [49]. The Coalition endorsed a new term — 'appropriate incremental risk', which is defined as any potential risk associated specifically with participation in the research compared with risk of the natural consequences of the medical condition itself. Although patients indeed are vulnerable to research risks, they also are at risk of being denied potential beneficial therapy when no effective therapy currently exists. Therefore, recently the US Food and Drug Administration has published a 'final rule' allowing research to be performed in certain emergency situations without informed consent. It is not one of the requirements that the patient has to be unconscious, but that it is not feasible to obtain informed consent from the patient or a legal representative.

There are certain studies in which the act of asking for informed consent causes a bias in itself. This is covered in the Helsinki Declaration Section 11.5; thus if the physician thinks it is essential not to obtain informed consent, the specific reasons for this should be stated in the experimental protocol submission to the independent ethical committee.

8.2. *Medical futility*

There is no commonly accepted definition of medical futility. Hidden value judgements may be made by clinicians who declare futility. Some cases such as decapitation, incineration, drowning with

bloating, hemicorporectomy, or rigor mortis will be considered futile by all. Other situations, such as prolonged submersion or exsanguination with asystole will require a statement of the time element required for defining futility in the specific study.

Qualitative futility is a term being used by some researchers implying survival with a quality of life well below the threshold considered minimal by general professional judgement. This is problematic without obtaining the wish of the patient, as it has been reported recently that there is relatively poor correlation between the evaluation of quality of life between physicians and the patients [50–53]. Seckler et al. [54] and Suhl et al. [55] have also found poor or no correlation between patients and physicians or family members/surrogates concerning their wish for resuscitation.

8.3. *Do not attempt resuscitation (DNAR), do not resuscitate (DNR)*

The term DNAR/DNR is more difficult to apply in the trauma patient than in victims of cardiac arrest of cardiac origin. Resuscitation can involve more factors in trauma management such as fluid resuscitation, etc. In studies of trauma in which these terms are applied, it therefore is essential that they are defined, together with other possible codes for withholding or withdrawing treatment.

8.4. *Deliberate self-inflicted harm*

In studies involving patients, the information must be depersonalised and informed consent must be obtained. If the patient also refuses standard treatment, that should be noted. The rules for declaring the patient incompetent, and so allowing treatment, vary between countries, and also should be noted. This does not automatically permit the inclusion of the patient in a study without consent.

8.5. *Information to police*

Information to police is mainly a patient management problem, but also can pertain to study data. Informed consent generally is required, but national or state rules for divulging information to the police without consent can apply. In some

countries the duty to protect the public from potential further damage weighs more heavily than does the patient's right to privacy, with national variations in the degree of damage potential required. In other circumstances the police may acquire information by legal enforcement.

Information such as alcohol or drug blood levels obtained strictly as part of a study should not be divulged to the treatment team without informed consent. If reported in a study, the process for obtaining such information should be described, as the routine testing in all motor vehicle accident patients in some countries may in itself give a different result from that taken for a specific indication.

8.6. Information to media

This is an important patient management problem, with no specific research aspects. It should be noted that in some countries the media are being actively used by researchers to inform the public that a certain acute care study is going on, in an attempt to pre-inform patients as part of the informed consent procedure.

8.7. Care of relatives

Caring for relatives is an important part of trauma care. If this is to be studied, the rules of informed consent and depersonalised data apply.

8.8. Advance directives

In a patient who is incompetent because of injuries, the researcher should take due note of any advance directive. However, it is important to evaluate how likely it is to cover the patient's present wishes. Has the directive been made recently and to what circumstances does it apply? Studies indicate that many patients change their opinion on what is an acceptable life situation when changes in their life situation actually occur [56,57].

A death wish letter in the case of self-inflicted trauma is not to be considered an advance directive. While the wish of a conscious, sane person normally is respected, the incompetent patient usually is given the benefit of the doubt, and is treated in the absence of an adequate information process. There is a tendency in some cases to

comply with patient wishes 'to the edge of the cliff' or until unconsciousness supervenes, and then treat. While it can be argued that as soon as a patient becomes unconscious, the doctor no longer can be sure of the patient's will because of the short period of contact in an acute care situation, this strategy, in most circumstances reduces the potential for a good outcome. In the end, it always comes down to the sound clinical judgement of senior and experienced doctors.

8.9. Pregnancy

Generally, it is accepted that the pregnant woman takes priority over the fetus. If treating the mother is considered futile and the fetus is still potentially viable (i.e. witnessed traumatic cardiac arrest), caesarean section becomes an option. In other circumstances, any heroic action is considered unethical.

9. Documentation/methodology

9.1. Planning for data collection

Plans for collecting data on trauma patients should be drawn up prospectively. Full co-operation between prehospital and in-hospital personnel will minimise the possibility of omitting or duplicating relevant data. If the pre-hospital and in-hospital data can be linked with police, EMS or population studies, they may provide a means for data verification and validation.

9.2. Data collection

Data collection can be done manually or it can be automated. Some manual techniques are partly automated by using some form of hand-held computer with which to record data. In the future, physiological telemetry is likely to become more widely available, and will allow continuous, automated collection of data in both the pre-hospital and in-hospital areas.

9.3. Manual collection

Real-time data collection is the ideal, but this will require the continual presence of a dedicated data collector. With the exception of well-funded

research studies, this is unlikely to be practical in the prehospital phase.

A single data collection form for both prehospital and in-hospital phases may be seen as ideal, but most trauma systems will utilise two or more forms. These need to be linked by a unique identifier, preferably a number. This will be supported by secondary identifiers, comprising name and time. Links are required between the pre-hospital, in-hospital forms, audit forms and forms at any secondary or tertiary hospital to which the patient has been transferred.

Data may be derived from audio and/or video tape, but this will often be too labour intensive to use for routine audit. This technique, however, may be a valuable research tool.

Personnel in the control/dispatch centre may well be able to collect and record some of the relevant pre-hospital data.

9.4. Data collection forms

With developing technology, in the future, the principle should be to avoid cumbersome forms. Data collection forms should be of simple digital, analogue and 'tick box' design where possible. The best format is to ask closed questions with 'yes', 'no', 'don't know', and 'other' options. Multiple, colour coded copies will allow the data to be distributed to appropriate personnel.

9.5. Data entry

The entry of data into a database may be performed manually or with optical readers. There should be regular quality checks to ensure data reliability and accuracy, and to eliminate bias. The gold standard for data entry is a validated, primary electronic system.

9.6. Electronic data collection

Electronic notepads will record the time and location (using GPS) automatically and continually. In addition, they have a manual capability and in the future are likely to include voice recognition software. Bar code readers already are in use in hospitals. They may contribute to more efficient and accurate data collection. Data can be downloaded on- or off-line from monitors and variety of other patient care devices.

9.7. Training in data collection and entry

All data collectors and enterers should receive appropriate training. These personnel may be EMS staff, nurses, and/or doctors. Data validation is important. Intra- and inter-rater variation may be minimised with appropriate training.

9.8. Common database

If data collection is standardised, the data may be downloaded in a common database. This could be a national database, such as the Major Trauma Outcome Study (MTOS) [32,33], or an international database that could be termed 'the International Trauma Audit (ITA)'.

Appropriate steps should be taken to ensure patient confidentiality; patient and hospital identifiers should be removed before data are downloaded into a common database outside hospital.

10. Summary

Basic and advanced care of trauma patients has always been an important aspect of prehospital and immediate in-hospital emergency medicine, involving a broad spectrum of disciplines, specialities and skills delivered through EMS systems which, however, may differ significantly in structure, resources and operation.

This complex background has, at least in part, hindered the development of a uniform pattern or set of criteria and definitions. This in turn has hitherto rendered data incompatible, with the consequence that such differing systems or protocols of care cannot be readily evaluated or compared with acceptable validity.

Guided by previous consensus processes evolved by the ERC, the AHA and other International Organisations, represented in ILCOR, on 'Uniform Reporting of Data following Out-of-Hospital and In-Hospital Cardiac Arrest — the Utstein Style' an international working group of ITACCS has drafted a document, 'Recommendations for Uniform Reporting of Data following Major Trauma — the Utstein Style'.

The reporting system is based on the following considerations.

(1) A structured reporting system based on an 'Utstein-style-template' which would permit the

compilation of data and statistics on major trauma care, facilitating and validating independent or comparative audit of performance and quality of care (and enable groups to challenge performance statistics which did not take account of all relevant information).

(2) The recommendations and template should encompass both out-of-hospital and in-hospital trauma care.

(3) The recommendations and template should further permit intra- and intersystem evaluation to improve the quality of delivered care and identification of the relative benefits of different systems and innovative initiatives.

(4) The template should facilitate studies setting out to improve epidemiological understanding of trauma; for example such studies might focus on the factors that determine survival.

The document is structured along the lines of the original Utstein-style guidelines publication on 'prehospital cardiac arrest'. It includes a glossary of terms used in the prehospital and early hospital phase and definitions, time points and intervals. The document uses an almost identical scheme for illustrating the different process time clocks—one for the patient, one for the dispatch centre, one for the ambulance and, finally, one for the hospital.

For clarity, data should be reported as core data (i.e. always obtained) and optional data (obtained under specific circumstances). In contrast to the graphic approach used for the Utstein template for pre- or in-hospital cardiac arrest, respectively, the present template introduces, for the time being at least, a number of terms and definitions and a semantic rather than a graphic report form.

The document includes the following sections.

(1) The section 'Introduction and background'

(2) The section on 'Trauma data structure development' presents a general outline of the development of structured data using object-orientated modelling (which will be discussed in due course) and includes a set of explanatory illustrations.

(3) The section on 'Terms and definitions' outlines terms and definitions in trauma care, describing different types of trauma (blunt, penetrating, long bone, major/combined, multiple/polytrauma and predominant trauma).

(4) The section on 'Factors relating to the circumstances of the injury' describes the following items: (a) cause of injury (e.g. type of injury (blunt or penetrating), burns, cold, crush, laceration, am-

putation, radiation, multiple, etc.); (b) severity of injury, e.g. prehospital basic abbreviated injury score developed by the working group. The score contains anatomical and physiological disability data, with the anatomical scale ranging ordinally from 1, head to 9, external; the physiological disability scale ranging ordinally from 0, unsurvivable; (c) mechanism of injury, recording for transportation incidents, etc., e.g. the type of impact, possible restraining devices, and deliberate self-harm; (d) demographics of injury, e.g. presentation of data, concerning the location and other social information pertaining to the injury.

(5) The section on 'System factors' defines the factors which may be structured, subdivided into pre-hospital, inter-hospital transfer and trauma centre/receiving hospital factors or temporal consisting of dates, time points and time intervals, which are defined in accordance with the previous Utstein template on cardiac arrest. Trauma centre details focus on the trauma team, its membership and their respective experience, the facilities available during the 24-h period and arrival data at different transit/treatment locations such as the operating room, PACU, ICU, discharge, etc.

(6) The section on 'Patient factors' defines demographics such as age, gender, dimensions, and co-morbidity factors that may be most important for survival. Co-morbidity is graded ordinally from 1, healthy to 4, systemic illness: constant threat to life.

Scores and scales for consistent quality assessment of trauma are then addressed, concentrating in particular on respiratory and cardiovascular function, temperature, blood gases, the anatomic assessment of injury and treatment modalities and details.

The chapter concludes with a look at the present situation where conflicting results either confirm or refute not only the efficacy and effectiveness of prehospital ALS procedures but also any influence which such measures may exhibit as a rationale for evidence based medicine. These latter phenomena require further scientific evaluation, where possible in randomized controlled studies.

(7) The section on 'Outcome' addresses mortality (time, date, location of death, place, confirmation, cause of death and adverse factors) and morbidity, defined as all non-fatal problems leading from impairment to disability and reversible

and irreversible disability. A number of widely used outcome scales are discussed.

(8) The section on ‘Ethical issues’ dedicates special emphasis on patient consent to trauma research, on medical futility, DNAR and DNR directives, deliberate self-inflicted harm, care of relatives and advanced directives.

(9) The section on ‘Documentation’ addresses methodology and technology, underlining the need

for data collection to be planned. Details such as manual, automatic and electronic data collection and entry, and data collection forms are outlined. It is particularly emphasised that all data collectors and enterers should receive appropriate training before being involved in the data collection process. It is further pointed out that the standardisation of data collection will allow down-loading to a valid common database.

Appendix A. Terms and definitions: injuries related to trauma

Term	Definition	Comments
Blunt injury	Non-penetrating, but including crush, laceration, amputation and asphyxia	
Penetrating injury	Bullet, knife or spike	
Long bone	Fracture/dislocation of femur, tibia, humerus, ulna, radius, fibula	
Major injury, ISS > 15	Comprising At least one severe life-threatening regional injury Or at least two severe non-life-threatening regional injuries Or at least one severe non-life-threatening plus at least two injuries of moderate severity	Note, these are based on nine regions of the body (see Appendix B)
Mixed/combined trauma	Trauma with more than one mechanism of injury	
Multiple trauma/	Injury to one body cavity (head, thorax, abdomen)	
Polytrauma plus	Two long bone and/or pelvic fractures Or injury to two body cavities	
Predominant trauma	Injury to one body part of severity > 2	(can include up to one other injury with severity < 2)

A.1. Terms to be avoided

‘Isolated trauma’/‘pattern of injury’/‘single system trauma’.

A.1.1. Triage

The comparative assessment of the individual patient, i.e. their needs and priorities in relation to:

1. Vital functions
2. Concomitant injuries
3. Age + co-morbidity
4. Circumstances of the event

Appendix B. Factors relating to the circumstances of the injury

B.1. Type of injury

- c Blunt []
- c Penetrating []
- o Crush []
- o Radiation []
- o Burn []
- o Asphyxia []
- o Laceration []
- o Multiple []
- o Cold []
- o Amputation []
- Other (specify).....

B.2. Severity of injury — the abbreviated injury score

Anatomical	Physiological disability
1. Head	0. None
2. Face	1. Minor
3. Neck	2. Moderate
4. Chest	3. Severe not life-threatening
5. Abdomen	4. Severe life-threatening
6. Spine	5. Critical
7. Upper limb	6. Unsurvivable
8. Lower limb (inc. pelvis)	
9. External	

B.3. Mechanism of injury

- c Transport**
- o Motor vehicle (car or truck) []
- Train []
- Other (specify).....
- o Occupant or rider []
- o Position of occupant in vehicle
- Passenger []
- Driver/rider/pilot []
- Position in train/plane/boat
(Seat number (specify).....)
- o Type of impact
- Head on []
- Roll over []
- Entrapment []
- Other specify.....
- o Vehicle deformity
- Front []
- Side []
- Other (specify).....
- Cycle []
- Boat []
- Pedestrian []
- Rear end []
- Ejection []
- Side []
- Rear []
- Roof []

- c EMS-response (data collected for each unit separately)
- c Crew
 - Technician (BLS (e.g. EMT, life guard), ALS (e.g. Paramedic))
 - Nurse (special trauma training → Y/N)
 - Physician (special trauma training → Y/N)
 - No. of crew members.....
- c Vehicle
 - Ground/air/sea
 - Patient's own transport Y/N
- c Type of Care
 - Basic care = noninvasive
 - Advanced care = invasive
- o Distance (kilometres between vehicle: base → incident [] and incident → hospital [])

C.2. *c Date/time-points/time-intervals (record time after each heading)*

- c Incident (Incident occurs/recognised/care by bystander/EMS care)
- c Call for assistance initiated.....
- c Call for assistance received (Pick-up-moment).....
- c Call processed.....
- c Dispatch achieved.....
- c Vehicle moves.....
- c Vehicle stops.....
- c Arrival at patient.....
- c Scene interval (assessment/treatment).....
- c Vehicle-departure from scene (vehicle moves).....
- c Arrival at trauma (or emergency treatment) facility.....
- Diversion from destination hospital.....

C.3. *Interhospital transfer factors*

- c Indications (tick box)
 - Usual facilities not available []
 - Special facilities not available []
 - Others (specify)
- c Date/time-points/time-intervals (record time after each heading)
 - o Referral call received (optional)
 - o Transfer accepted.....
 - o Departing from fixed-monitoring-environment (bed → stretcher)
 - o Initiation of transfer (vehicle moves)
 - o Arrival at fixed-monitoring-environment (stretcher → bed)
- c Emergency Y/N
 - EMS response
- c Crew (tick box)
 - Technician (BLS (e.g. EMT), ALS (e.g. Paramedic)) []
 - Nurse (special trauma training → Y/N) []
 - Physician (Special Trauma Training → Y/N) []
- c Vehicle (tick box)
 - Ground/air/sea []
 - Referral/retrieval/independent []
- c Type of care (tick box)
 - Basic care = noninvasive []
 - Advanced care = invasive []
 - Intensive []

- o Distances
 - Kilometres base → hospital []
 - Hospital (1)–hospital (2) []

C.4. Trauma centre/receiving hospital (in-hospital) — factors

Trauma team

- c Designated trauma team Y/N Prehospital/in-hospital/home
- c Designated trauma protocol Y/N
- c Advance warning Y/N
- c Trauma alert — One tier (i.e. whole team responds) []
- Multiple tier (only certain members present at a time) []
- o Trauma team members (no.) []

	Special trauma training	Trauma team coordinator
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Emergency physician	[] o	[]
Trauma surgeon	[] o	[]
Anaesthetist	[] o	[]
Neuro surgeon	[] o	[]
Radiologist	[] o	[]
Other physician	[]	[]
Nurse	[] o	[]
Technician	[] o	[]
Paramedic	[]	[]

o Facilities available (24 h)

Bloodbank	[]
CT	[]
Cardio-thoracic surgery	[]
Neurosurgery	[]
Lab.	[]
Designated audit system	[]

Date/time-points/time-intervals (record time after each heading)

- c Arrival at facility.....
- c Arrival of first (responsible) doctor/MD.....
- c First X-ray (time of initiation)
- o First ultrasound (time of initiation)
- o First CT (time of initiation)
- Specify
- o Leaving ED.....
- c Arrival operating room.....
- o Skin incision.....
- o Skin closure.....
- o Arrival Post-Anaesthesia Care Unit.....
- c Arrival ICU.....
- c Discharge ICU.....
- c Discharge hospital.....
- o Discharge in-hospital rehabilitation.....
- o Return to work.....

Appendix D. Patient assessments and interventions

c Anatomic assessment by the abbreviated injury scale (AIS 90 is the version in most common use) which allows calculation of injury severity score.....

o Data from autopsy (also see outcome)

c Time intervals to be recorded as a minimum;	SceneEmergency room
	Operating room
	Intensive Care Unit
	Ward

The first available recording of:

c Glasgow coma scale (GCS)

GCS (recorded as the eye, ventilation, movement components)

(assessed prior to drug administration but note the influence of drugs in further assessment — see below)

c Respiratory function

Spontaneous/assisted — rate per minute — end tidal CO₂ (o).....

c Heart rate

Heart — rate per minute — ECG (o).....

c Blood pressure

Preferably automated (method should be described) Y/N

Reading —

Document if a reading cannot be recorded

c Pulse oximetry

SpO₂ (document if no reading obtainable) []

c Temperature []

Describe method

o Blood gases

ABG (pH, PCO₂, PO₂, BD, bicarbonate)

Electrolytes

c Haemoglobin []

c Blood sugar []

o Other optional investigations depending on status, and mechanism of injury.

e.g. lactate, HbCO, drug/alcohol

c Cardiac arrest	Y/N	Pre-hospital ()	In-hospital ()
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c Respiratory arrest	Y/N	Pre-hospital ()	In-hospital ()
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o Data from autopsy (also see outcome).....

c Treatment (with times recorded (o))

o Pre-hospital []

o ER []

o OR []

o ICU []

o etc. (specify)

c Oxygen therapy (describe method and concentration)**c Immobilisation —**

Cervical collar [] Vacuum mattress []
 Spine board [] Other []

c Airway adjuncts

OPA [] NPA [] COPA [] LMA [] Combitube []
 Oral tracheal tube [] Naso tracheal tube [] Surgical (needle/cricothyroidotomy/
 tracheostomy) []

c Ventilation

Spontaneous [] Manual [] Mechanical []
 Chest decompression (needle) [] (tube) []

c Haemorrhage control Y/N**c i.v. Access**

Attempts [] Success Y/N Number []

c i.o. Access

Attempts [] Success Y/N Number []

c i.v. Fluid

Type [] Volume infused [] Infusion time period []
 No. of i.v. lines [] Central access Y/N High flow sets used Y/N

c PASG/MAST []**c Surgical intervention**

Should be defined in terms of setting and procedure, e.g. amputation, thoracotomy, etc.

c Other interventions

DPL [] Pericardiocentesis [] Intercostal drain []

c Drug information

Anaesthesia, neuromuscular blocks, analgesia, sedation, vasopressors; others (specify)

Drug (name)	Dose	Time (o)
.....
.....
Etc.		

c Time to CT, X-ray, etc.**c CPR**

Closed chest/open chest/minimally invasive/open chest (ring as appropriate)

c Complications/adverse effects/side effects (documentation for each of the treatments headings on a yes/no basis. There should be an optional facility to describe details of the complication and its relation to outcome.)

- c Oxygen therapy Y/N
- c Immobilisation Y/N
- c Airway-management Y/N
- c Ventilation Y/N
- c Haemorrhage control Y/N
- c i.v. Access Y/N
- o i.o. Access Y/N
- c i.v. Fluid Y/N
- c Surgical intervention Y/N
- o Other intervention (specify) Y/N
- c Drugs (specify) Y/N
- c CPR Y/N

Appendix E. Outcome details

c Outcome (quality of life, morbidity, etc.)

- o at each stage of care
- o hospital
- o later (3, 6, 12 months)

Widely used outcome scales (record details and time point)

Glasgow outcome scales.....

back to work:

time.....

old job.....

reduced capacity.....

other scales (e.g. FIM, SF 36....).....

patients opinion.....

c Mortality (N.B. trauma death is defined as death within 30 days of incident)

c Time/date of death

c Location of death.....

Found dead []

Died at scene []

Dead on arrival at hospital []

Died in hospital []

Died after discharge []

c Confirmation of death

Time of clinical death.....

Time of declaration of death.....

Withheld CPR? Y/N

Withdrawal of CPR? Y/N

Withdrawal of treatment? Y/N

c Cause of death

Patient factors.....

Autopsy? Y/N

Details.....

c Adverse factors (possibly responsible for fatal outcome)

State time of problem

airway problems []

ventilatory problems []

circulatory problems []

other.....

infection/sepsis/MoSF (severity score?)

co-morbid conditions.....

age.....

other management.....

The following factors may be considered as a surrogate measure of outcome (record details)

time in ICU.....

time in hospital.....

costs.....

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