Documentation of Blunt Trauma in Europe

Survey of the Current Status of Documentation and Appraisal of the Value of Standardization

Hans-Christoph Pape[1], H. J. Oestern[2], L. Leenen[3], D. W. Yates[4], M. Stalp[1], K. Grimme[1], H. Tscherne[1], C. Krettek[1], and the German Polytrauma Study Group

Abstract

During the last decade, several European communities have begun to perform multicenter approaches to document trauma care and trauma care outcome. So far every country has begun to do this without communicating with each other and no coordination has been performed. The current manuscript compares these modes of documentation, their advantages and evaluates options for future standardization. Even though to date a wide variety of structures is available, the value and the opportunities of a European-wide standardized documentation process is highlighted.

Key Words

Trauma documentation · Trauma registries · Trauma outcome evaluation · German Trauma Registry · Quality control · Quality management

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Introduction

Trauma continues to represent the major cause of disability in individuals during their productive work life [1, 2]. In addition, trauma-related deaths have been shown to have a higher socioeconomic impact than other diseases, such as malignancies or cardiovascular diseases [3]. In the European community, the incidence of traffic injuries accounts for about 3.5 million victims per year, accounting for about 43,000 deaths [4].

In contrast with these continuously high and alarming numbers, the current modes of documenting the incidence of trauma and of its sequelae, e. g. for governmental purposes are crude. The classification of the severity of trauma is often done by non-medical personnel (police) and differentiates only between an acutely "life threatening condition", patients who are "severely injured" (defined as the necessity of admission to the hospital), or patients who have "no severe injuries" (no hospital admission required). Official reports do not use the established trauma scoring systems, or other parameters closely related with the severity of trauma, such as the duration of hospitalization, the requirement or duration of intensive care therapy. The countrywide information on trauma only lists the numbers of injured and dead per 100,000 inhabitants. Sophisticated information about the duration and extent of disability in the survivors is not available [5, 6].

The inconsistencies of documentation become even more surprising in view of the extraordinary efforts undertaken within the last decades to improve the infrastructure for trauma patients. A classification of hospitals according to the degree of specialization has been

[1] Department of Trauma Surgery, Hannover Medical School, Hannover, Germany,
[2] President of the German Trauma Registry, Allgemeines Krankenhaus Celle, Germany,
[3] Dutch Trauma Registry, University Hospital Utrecht, Netherlands,
[4] The Trauma Audit and Research Network, Manchester, UK.

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undertaken and reported to be effective [7, 8]. In Germany, in the 1970s the combination of air-based and ground transportation rescue systems has led to a substantial reduction of rescue times [9]. This has prompted the initiation of similar rescue systems in neighboring countries. For example, a variety of new trauma units with air transportation are currently being established in the Netherlands. Further improvements in the clinical management of these patients will lead to even greater reductions in the mortality of these patients. When compared with the decades before, the incidence of lethal outcomes has dropped from about 40% to less than 20% [10]. In summary, the countless numbers of studies dealing with the changes in the clinical management of these patients prove that trauma care is a highly active and ongoing process.

In contrast, the shortcomings in documentation have medical, but also economic drawbacks. Official cost analyses show that the socioeconomic impact of trauma is highly underestimated. Clinical studies have attempted to investigate the costs of the initial clinical course for polytrauma patients in university hospitals. By meticulous documentation, efforts have been undertaken to calculate all necessary costs, including the overhead costs [11, 12]. Other groups have focused on the reduction of ICU charges [13], or investigated whether the amount of clinical tests can be reduced [14]. Despite the value of these studies, a complete overview on the costs cannot be made. In particular, the expenses for rehabilitation and repeated hospitalization for reconstructive procedures, and for lost work days cannot be fully accounted for. The drawbacks associated with inadequate documentation may be summarized as follows:

1. Information on the true profile of patients admitted for trauma is limited.
2. There is a lack of data regarding clinical complications and outcome, including the status of reintegration into work.
3. It is difficult to demonstrate whether or not changes in the management of trauma patients or in the configuration of the trauma system have been beneficial.
4. The options to perform quality management of the primary care and of the in-hospital care of trauma patients are therefore limited.
5. It follows that there is no clear evidence base upon which to develop effective pre-hospital and hospital care.

One step forward in this regard can be achieved by a complete medical documentation to characterize the patient's injuries, management, progress and outcome. In Germany, a group of trauma surgeons began in 1992 to develop a selected set of data for this purpose. Similar efforts have been undertaken in other countries, e. g. the UK Trauma Network and the Dutch trauma registry.

At the beginning of a new European era, it may be useful to consider standardization and optimization of the treatment of trauma patients in Europe. This requires a reliable data base to describe the current status of care. As a first step in this direction, the following report compares current standards of documentation for trauma in several European countries.

Methods

Aims and Organizational Prerequisites

All 3 trauma documentation systems document trauma patients who are primarily and secondarily admitted. All aim at fulfilling the file during the patient's hospital stay. The Trauma Network in England and Wales is supported by the Department of Health, the Dutch and the German Trauma Registry are regarded as studies, the latter is supported by the Deutsche Forschungsgemeinschaft. Further details can be obtained via website or e-mail. Addresses for correspondence are:
uktrauma@fs.ho.man.ac.uk, Lleenen@chir.azu.NL
dguoestern@t-online.de

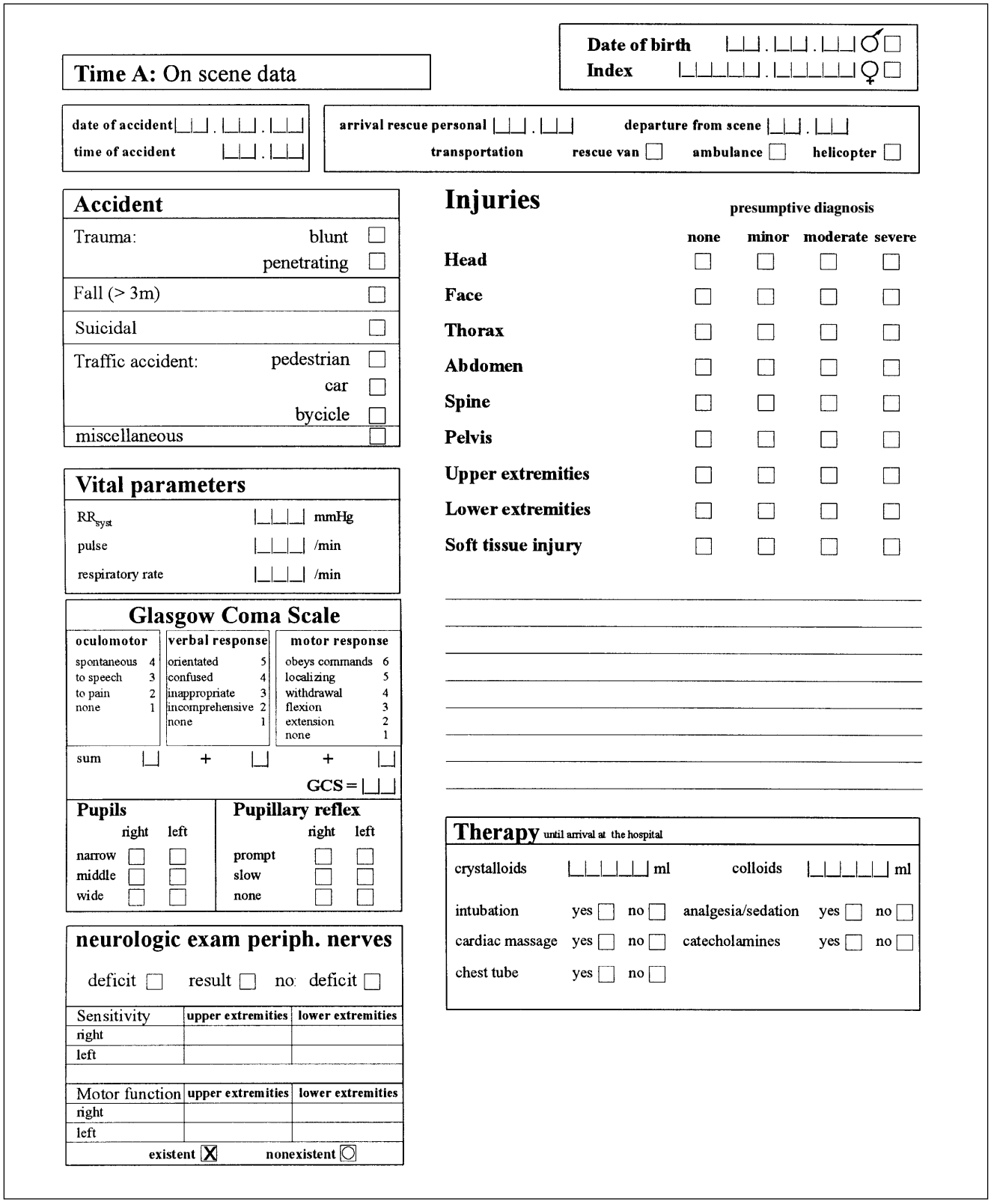
German Trauma Registry

The documentation sheet includes 4 different time points from admission to discharge (time a to d: admission, initial treatment, intensive care stay, and discharge). Moreover, a 90-day mortality was included for completion of the file.

Documentation Format of the German Trauma Registry

Sheet I: Relevant data of the time and mechanism of injury, the results of the first clinical examination are documented by the admitting physician. The data include those necessary for evaluation of the Glasgow Coma Scale, and the TRISS method. In addition, the therapy performed during rescue including artificial ventilation and chest tube placement is documented (Figure 1a).

Sheet II: After the primary treatment in the emergency room is completed, a reevaluation of the GCS, the



Time A: On scene data

Date of birth |_|_|.|_|_|.|_|_| ♂ ☐
Index |_|_|_|_|_|.|_|_|_|_|_| ♀ ☐

date of accident |_|_|.|_|_|.|_|_|
time of accident |_|_|.|_|_|

arrival rescue personal |_|_|.|_|_| departure from scene |_|_|.|_|_|
transportation rescue van ☐ ambulance ☐ helicopter ☐

Accident

Trauma:	blunt ☐
	penetrating ☐
Fall (> 3m)	☐
Suicidal	☐
Traffic accident:	pedestrian ☐
	car ☐
	bycicle ☐
miscellaneous	☐

Vital parameters

RR_{syst}	|_|_|_| mmHg
pulse	|_|_|_| /min
respiratory rate	|_|_|_| /min

Glasgow Coma Scale

oculomotor		verbal response		motor response	
spontaneous	4	orientated	5	obeys commands	6
to speech	3	confused	4	localizing	5
to pain	2	inappropriate	3	withdrawal	4
none	1	incomprehensive	2	flexion	3
		none	1	extension	2
				none	1

sum |_| + |_| + |_|
GCS = |_|_|

Pupils

	right	left
narrow	☐	☐
middle	☐	☐
wide	☐	☐

Pupillary reflex

	right	left
prompt	☐	☐
slow	☐	☐
none	☐	☐

neurologic exam periph. nerves

deficit ☐ result ☐ no: deficit ☐

Sensitivity	upper extremities	lower extremities
right		
left		

Motor function	upper extremities	lower extremities
right		
left		

existent ☒ nonexistent ◯

Injuries

	presumptive diagnosis			
	none	minor	moderate	severe
Head	☐	☐	☐	☐
Face	☐	☐	☐	☐
Thorax	☐	☐	☐	☐
Abdomen	☐	☐	☐	☐
Spine	☐	☐	☐	☐
Pelvis	☐	☐	☐	☐
Upper extremities	☐	☐	☐	☐
Lower extremities	☐	☐	☐	☐
Soft tissue injury	☐	☐	☐	☐

Therapy until arrival at the hospital

crystalloids |_|_|_|_|_| ml colloids |_|_|_|_|_| ml

intubation yes ☐ no ☐ analgesia/sedation yes ☐ no ☐
cardiac massage yes ☐ no ☐ catecholamines yes ☐ no ☐
chest tube yes ☐ no ☐

Figure 1a to 1d
Documentation sheet of the German Trauma Registry

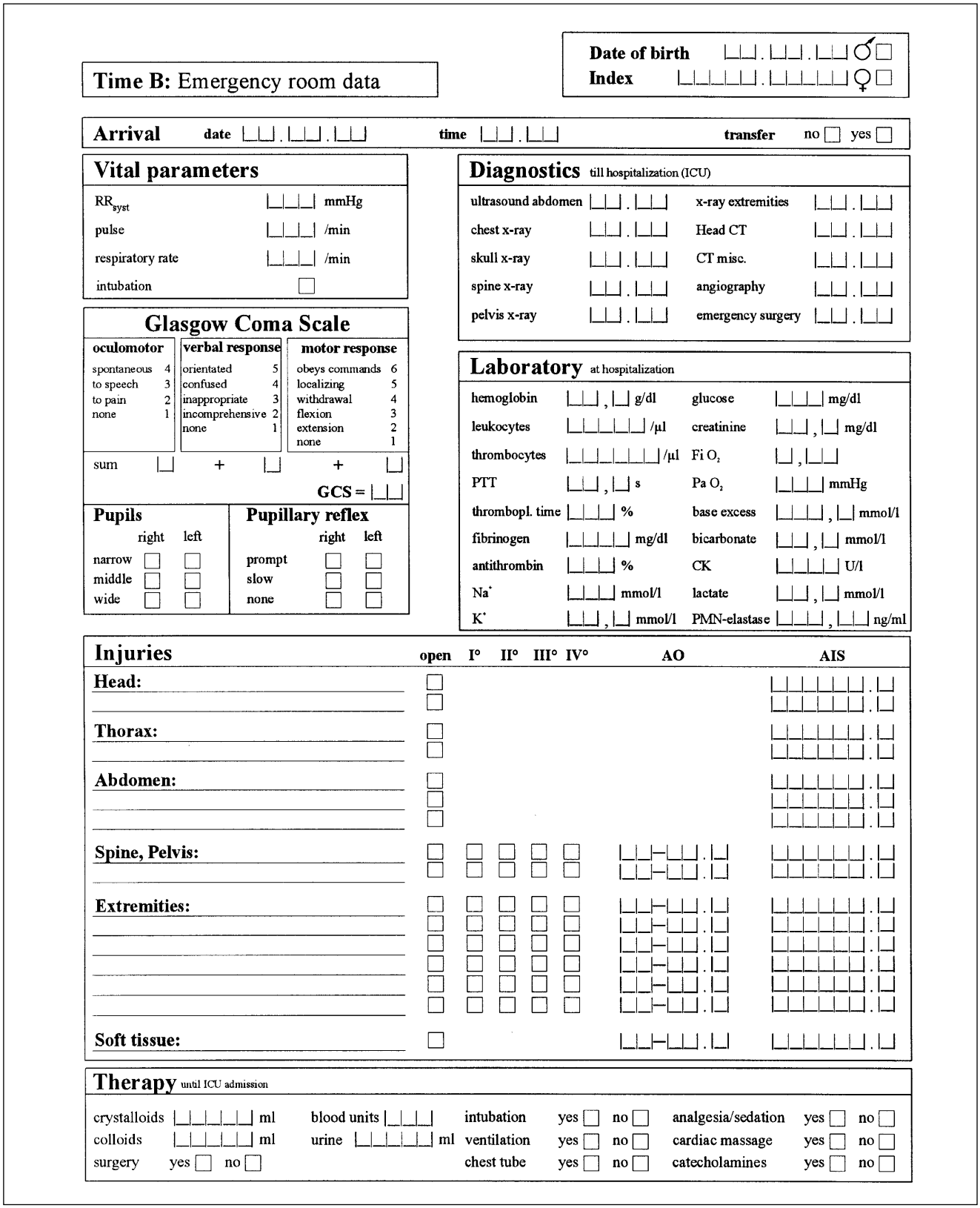

Time B: Emergency room data
Date of birth
Index
Arrival
date
time
transfer
no
yes
Vital parameters
RR syst
mmHg
pulse
/min
respiratory rate
/min
intubation
Glasgow Coma Scale
oculomotor
spontaneous 4
to speech 3
to pain 2
none 1
verbal response
orientated 5
confused 4
inappropriate 3
incomprehensive 2
none 1
motor response
obeys commands 6
localizing 5
withdrawal 4
flexion 3
extension 2
none 1
sum
GCS =
Pupils
right
left
narrow
middle
wide
Pupillary reflex
prompt
slow
none
Diagnostics till hospitalization (ICU)
ultrasound abdomen
chest x-ray
skull x-ray
spine x-ray
pelvis x-ray
x-ray extremities
Head CT
CT misc.
angiography
emergency surgery
Laboratory at hospitalization
hemoglobin
g/dl
glucose
mg/dl
leukocytes
/µl
creatinine
mg/dl
thrombocytes
/µl
Fi O2
PTT
s
Pa O2
mmHg
thrombopl. time
%
base excess
mmol/l
fibrinogen
mg/dl
bicarbonate
mmol/l
antithrombin
%
CK
U/l
Na+
mmol/l
lactate
mmol/l
K+
mmol/l
PMN-elastase
ng/ml
Injuries
open
I°
II°
III°
IV°
AO
AIS
Head:
Thorax:
Abdomen:
Spine, Pelvis:
Extremities:
Soft tissue:
Therapy until ICU admission
crystalloids
ml
colloids
ml
surgery
yes
no
blood units
urine
ml
intubation
ventilation
chest tube
analgesia/sedation
cardiac massage
catecholamines

Figure 1b

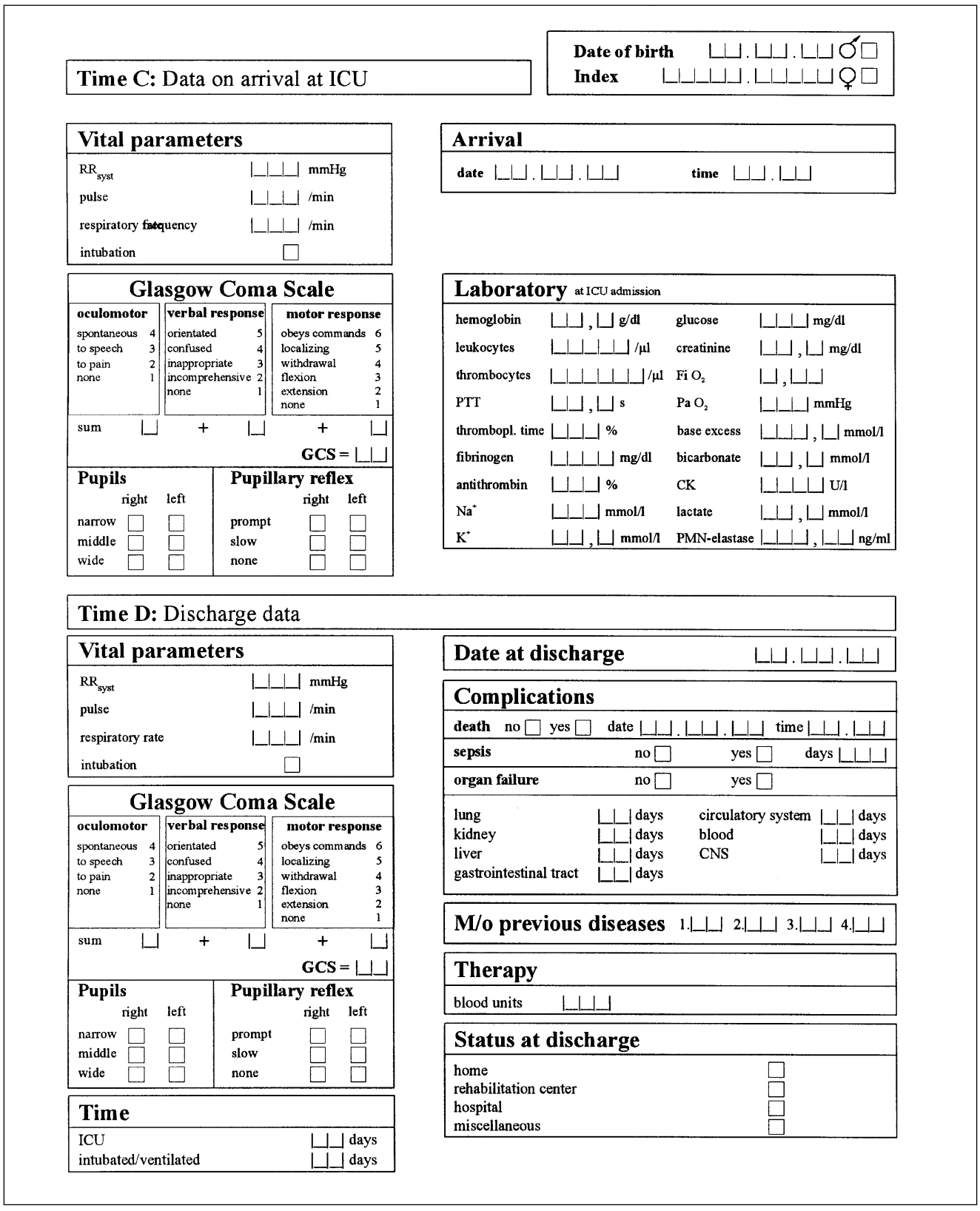

Date of birth |_|_|.|_|_|.|_|_| ♂ ☐
Index |_|_|_|_|_|.|_|_|_|_|_| ♀ ☐
Time C: Data on arrival at ICU
Vital parameters
RR syst |_|_|_| mmHg
pulse |_|_|_| /min
respiratory frequency |_|_|_| /min
intubation ☐
Arrival
date |_|_|.|_|_|.|_|_| time |_|_|.|_|_|
Glasgow Coma Scale
oculomotor
spontaneous 4
to speech 3
to pain 2
none 1
verbal response
orientated 5
confused 4
inappropriate 3
incomprehensive 2
none 1
motor response
obeys commands 6
localizing 5
withdrawal 4
flexion 3
extension 2
none 1
sum |_| + |_| + |_|
GCS = |_|_|
Laboratory at ICU admission
hemoglobin |_|_|,|_| g/dl
glucose |_|_|_| mg/dl
leukocytes |_|_|_|_| /µl
creatinine |_|_|,|_| mg/dl
thrombocytes |_|_|_|_|_| /µl
Fi O2 |_|,|_|_|
PTT |_|_|,|_| s
Pa O2 |_|_|_| mmHg
thrombopl. time |_|_|_| %
base excess |_|_|_|,|_| mmol/l
fibrinogen |_|_|_|_| mg/dl
bicarbonate |_|_|,|_| mmol/l
antithrombin |_|_|_| %
CK |_|_|_|_| U/l
Na+ |_|_|_| mmol/l
lactate |_|_|,|_| mmol/l
K+ |_|_|,|_| mmol/l
PMN-elastase |_|_|_|,|_|_| ng/ml
Pupils
right left
narrow ☐ ☐
middle ☐ ☐
wide ☐ ☐
Pupillary reflex
right left
prompt ☐ ☐
slow ☐ ☐
none ☐ ☐
Time D: Discharge data
Vital parameters
RR syst |_|_|_| mmHg
pulse |_|_|_| /min
respiratory rate |_|_|_| /min
intubation ☐
Date at discharge |_|_|.|_|_|.|_|_|
Complications
death no ☐ yes ☐ date |_|_|.|_|_|.|_|_| time |_|_|.|_|_|
sepsis no ☐ yes ☐ days |_|_|_|
organ failure no ☐ yes ☐
lung |_|_| days
kidney |_|_| days
liver |_|_| days
gastrointestinal tract |_|_| days
circulatory system |_|_| days
blood |_|_| days
CNS |_|_| days
M/o previous diseases 1.|_|_| 2.|_|_| 3.|_|_| 4.|_|_|
Therapy
blood units |_|_|_|
Status at discharge
home ☐
rehabilitation center ☐
hospital ☐
miscellaneous ☐
Glasgow Coma Scale
oculomotor
spontaneous 4
to speech 3
to pain 2
none 1
verbal response
orientated 5
confused 4
inappropriate 3
incomprehensive 2
none 1
motor response
obeys commands 6
localizing 5
withdrawal 4
flexion 3
extension 2
none 1
sum |_| + |_| + |_|
GCS = |_|_|
Pupils
right left
narrow ☐ ☐
middle ☐ ☐
wide ☐ ☐
Pupillary reflex
right left
prompt ☐ ☐
slow ☐ ☐
none ☐ ☐
Time
ICU |_|_| days
intubated/ventilated |_|_| days

Figure 1c

Time D: Data at discharge

Date of birth ☐☐.☐☐.☐☐ ♂☐
Index ☐☐☐☐☐.☐☐☐☐☐ ♀☐

Injuries	open	I°	II°	III°	IV°	AO	AIS
Head: ____	☐						☐☐☐☐☐☐.☐
____	☐						☐☐☐☐☐☐.☐
Thorax: ____	☐						☐☐☐☐☐☐.☐
____	☐						☐☐☐☐☐☐.☐
Abdomen: ____	☐						☐☐☐☐☐☐.☐
____	☐						☐☐☐☐☐☐.☐
____	☐						☐☐☐☐☐☐.☐
Spine, Pelvis: ____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
Extremities: ____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
____	☐	☐	☐	☐	☐	☐☐-☐☐.☐	☐☐☐☐☐☐.☐
Soft tissue: ____	☐					☐☐-☐☐.☐	☐☐☐☐☐☐.☐

Operations

Operation	ICPM - code 1.1	Date	Time
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐
____: ____	☐-☐☐☐☐.☐☐	☐☐.☐☐.☐☐	from ☐☐.☐☐ till ☐☐.☐☐

Mortality at 90 - days after injury **(important!)**

Survival at 90 - days after injury yes ☐ no ☐ time of death ☐☐.☐☐.☐☐ unknown ☐

Figure 1d

severity of injury, and especially the diagnoses are undertaken. The information of the time and the type of X-ray diagnostic procedures performed can now be added. At this time point, all injuries are classified. All injuries are categorized by the AIS/ISS [16], fractures are listed on the basis of the AO-classification [15] (Figure 1b).

Sheet III: The clinical status on admission to the intensive care unit summarized, including GCS and laboratory data that can now be compared with those achieved on admission. The second part of sheet III summarizes the scoring systems of MOF [17] and sepsis. Other complications determine the relevant data to be collected for the period of intensive care. Finally, the further course of the patient, i. e. whether discharge to a rehabilitation center, to another hospital etc. is also documented (Figure 1c).

Sheet IV: When the patient is discharged, all information regarding the operative procedures performed is made available. The sheet also includes the documentation of any medical conditions prior to the accident and the evaluation of the 90-days mortality (Figure 1d).

Structure and Organization of the German Trauma Registry

The participating hospitals send their documentation sheets to 3 different documentation centers. There, all files are controlled for completeness and for reliability of the data. There is a certain set of mandatory data that are required to allow participation in the study. These data imply basic information on the vital signs, the injury severity, and further data such as those to allow for TRISS evaluation. Further details can be provided, if a hospital is interested to participate in the registry. If these data are not included, the documentation centers return the file to the participating clinic for correction. This work is done by specially trained personnel. A second test of data reliability is performed after they have been entered into the computer. All data are anonymized for the participating clinic and for the patient identification.

An annual list of data is then returned to the participating clinics. This summarizes and compares the relevant parameters outcome of injury severity, injury distribution, specifics of rescue, duration of primary in-hospital care. Thereby, the director of a given department can anonymously compare his or her situation with the mean values of the other documenting hospitals. This allows one to evaluate the weaknesses and strengths of trauma care, or to explain why certain differences may have been expected beforehand (e. g. increased number of patients arriving in shock in rural areas with prolonged rescue times).

Presentation of the Documentation Format in the Netherlands and in the United Kingdom

In the Netherlands, a documentation form has been selected, that focuses on the pertinent data of the type of injury, the injury severity, the modes of transportation and the requirements to allow for the TRISS method (Figure 2).

In England and Wales, 2 documentation sheets are used for patients that are either primarily admitted or referred from other hospitals. Figures 3a to 3c demonstrate the parameters necessary for completion of primarily admitted patients. They consist of 3 parts that focus on the anatomic injuries, the rescue condition, initial resuscitation and operative care. Pre-accident diseases are assessed in outline but there is only a limited amount of data on physiological parameters and none on biochemical tests. Long-term disability of survivors is not determined currently.

Discussion

The advantages of multicenter trauma system documentation were first reported by the Major Trauma Outcome Study (MTOS). It provided the scientific basis for quality management in the USA by means of a standardized database [18]. Subsequently, authors were able to perform studies by including patients that met the MTOS criteria. One of the major conclusions from such comparisons was that a further reduction of provider-related morbidity has to be achieved by education and by adjustment of protocols for standard care delivery [19].

It may be argued that a European comparison of trauma documentation should be based on, or rely on, the major trauma outcome study. However, important differences between the trauma care in Europe and the US have to be considered:

1. The enormous differences in geography imply that a comparable net of rescue transportation – supplied with physicians – as organized in several European countries may not be feasible in the USA.

Trauma documentation sheet

patient:

patient number:		**hospital number:**	**documenting physician:**
family name:			
first name index:		**date of birth:**	**Sex:**
cause of accident:			**code:**
date of accident:		**time of accident:**	
ambulance ID:		**time of alarm (ambulance):**	**on scene arrival time:**
prim.admission/referal:	**traumateam:**	**helicopter team:**	**type of injury:**
arrival date:	**arrival time at hospital:**		**departure time from hospital:**

	on scene data	**arrivel at hospital**	**discharge from hospital**
Glasgow Coma Scale: (3 modalities)			
GCS total:			
GCS (l/m/s)			
blood pressure:			
respiratory rate:			
heart rate:			
O_2-saturation:			
intubation (yes/no):			
O_2-concentration (FiO_2):			
O_2-application mode:			
hemoglobin:			
volume therapy:			
additional information:		Lactate: mmol/l	Ethanol: g/l

Astrup

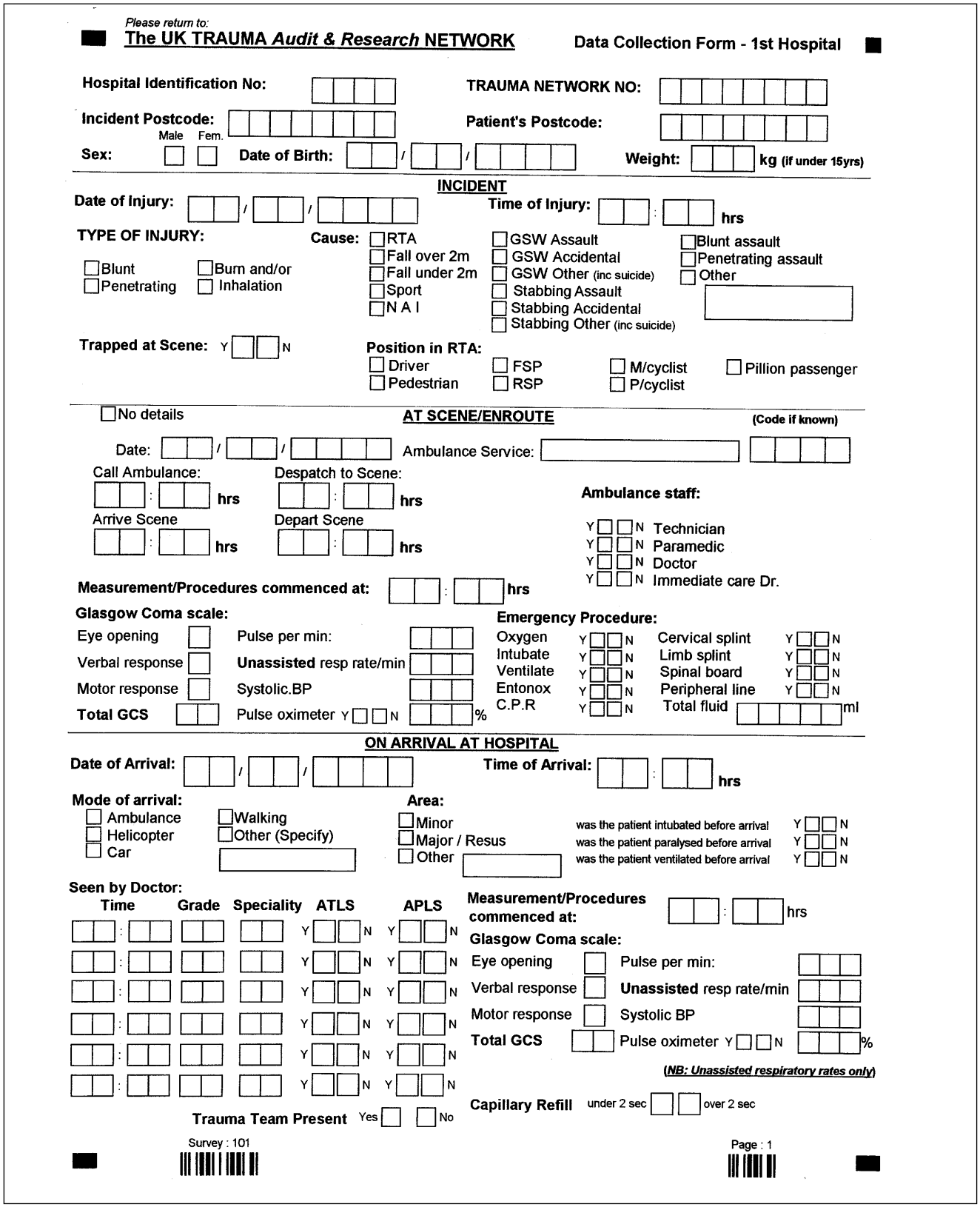
time point	pCO_2	pO_2	SaO_2	pH	BE	Bic	hospital number

Diagnoses

body area: AIS/ISS-coding:

therapy: admission specialty:

Figure 2
Documentation sheet of the Dutch Trauma Registry.



Please return to:
The UK TRAUMA *Audit & Research* NETWORK

Data Collection Form - 1st Hospital

Hospital Identification No:

TRAUMA NETWORK NO:

Incident Postcode:

Patient's Postcode:

Sex: Male ☐ Fem. ☐

Date of Birth: / /

Weight: kg (if under 15yrs)

INCIDENT

Date of Injury: / /

Time of Injury: : hrs

TYPE OF INJURY:
☐ Blunt ☐ Penetrating ☐ Burn and/or ☐ Inhalation

Cause:
☐ RTA ☐ Fall over 2m ☐ Fall under 2m ☐ Sport ☐ N A I
☐ GSW Assault ☐ GSW Accidental ☐ GSW Other (inc suicide) ☐ Stabbing Assault ☐ Stabbing Accidental ☐ Stabbing Other (inc suicide)
☐ Blunt assault ☐ Penetrating assault ☐ Other

Trapped at Scene: Y ☐ ☐ N

Position in RTA:
☐ Driver ☐ Pedestrian ☐ FSP ☐ RSP ☐ M/cyclist ☐ P/cyclist ☐ Pillion passenger

☐ No details

AT SCENE/ENROUTE

(Code if known)

Date: / /

Ambulance Service:

Call Ambulance: : hrs

Despatch to Scene: : hrs

Arrive Scene : hrs

Depart Scene : hrs

Ambulance staff:
Y ☐ ☐ N Technician
Y ☐ ☐ N Paramedic
Y ☐ ☐ N Doctor
Y ☐ ☐ N Immediate care Dr.

Measurement/Procedures commenced at: : hrs

Glasgow Coma scale:
Eye opening ☐ Pulse per min:
Verbal response ☐ Unassisted resp rate/min
Motor response ☐ Systolic.BP
Total GCS ☐ ☐ Pulse oximeter Y ☐ ☐ N %

Emergency Procedure:
Oxygen Y ☐ ☐ N
Intubate Y ☐ ☐ N
Ventilate Y ☐ ☐ N
Entonox Y ☐ ☐ N
C.P.R Y ☐ ☐ N
Cervical splint Y ☐ ☐ N
Limb splint Y ☐ ☐ N
Spinal board Y ☐ ☐ N
Peripheral line Y ☐ ☐ N
Total fluid ml

ON ARRIVAL AT HOSPITAL

Date of Arrival: / /

Time of Arrival: : hrs

Mode of arrival:
☐ Ambulance ☐ Helicopter ☐ Car ☐ Walking ☐ Other (Specify)

Area:
☐ Minor ☐ Major / Resus ☐ Other

was the patient intubated before arrival Y ☐ ☐ N
was the patient paralysed before arrival Y ☐ ☐ N
was the patient ventilated before arrival Y ☐ ☐ N

Seen by Doctor:

Time	Grade	Speciality	ATLS	APLS
:			Y ☐ ☐ N	Y ☐ ☐ N
:			Y ☐ ☐ N	Y ☐ ☐ N
:			Y ☐ ☐ N	Y ☐ ☐ N
:			Y ☐ ☐ N	Y ☐ ☐ N
:			Y ☐ ☐ N	Y ☐ ☐ N
:			Y ☐ ☐ N	Y ☐ ☐ N

Trauma Team Present Yes ☐ ☐ No

Measurement/Procedures commenced at: : hrs

Glasgow Coma scale:
Eye opening ☐ Pulse per min:
Verbal response ☐ Unassisted resp rate/min
Motor response ☐ Systolic BP
Total GCS ☐ ☐ Pulse oximeter Y ☐ ☐ N %

(NB: Unassisted respiratory rates only)

Capillary Refill under 2 sec ☐ ☐ over 2 sec

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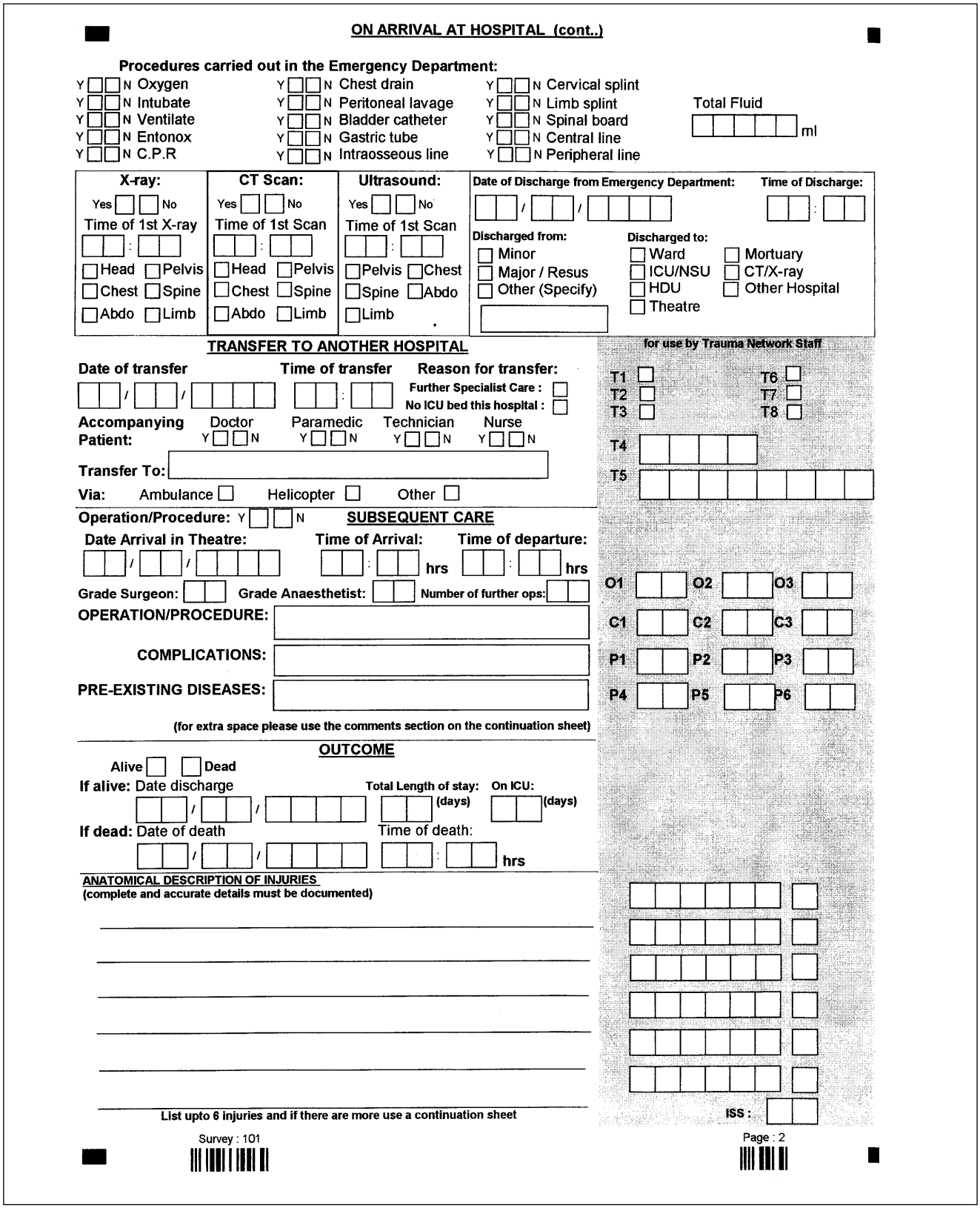
Figure 3a to 3c
Documentation sheet of the British Trauma Registry.



ON ARRIVAL AT HOSPITAL (cont..)

Procedures carried out in the Emergency Department:

Y ☐☐ N Oxygen
Y ☐☐ N Intubate
Y ☐☐ N Ventilate
Y ☐☐ N Entonox
Y ☐☐ N C.P.R
Y ☐☐ N Chest drain
Y ☐☐ N Peritoneal lavage
Y ☐☐ N Bladder catheter
Y ☐☐ N Gastric tube
Y ☐☐ N Intraosseous line
Y ☐☐ N Cervical splint
Y ☐☐ N Limb splint
Y ☐☐ N Spinal board
Y ☐☐ N Central line
Y ☐☐ N Peripheral line

Total Fluid ☐☐☐☐☐ ml

X-ray: Yes ☐ ☐ No
Time of 1st X-ray ☐☐ : ☐☐
☐ Head ☐ Pelvis
☐ Chest ☐ Spine
☐ Abdo ☐ Limb

CT Scan: Yes ☐ ☐ No
Time of 1st Scan ☐☐ : ☐☐
☐ Head ☐ Pelvis
☐ Chest ☐ Spine
☐ Abdo ☐ Limb

Ultrasound: Yes ☐ ☐ No
Time of 1st Scan ☐☐ : ☐☐
☐ Pelvis ☐ Chest
☐ Spine ☐ Abdo
☐ Limb

Date of Discharge from Emergency Department: ☐☐ / ☐☐ / ☐☐☐☐
Time of Discharge: ☐☐ : ☐☐

Discharged from:
☐ Minor
☐ Major / Resus
☐ Other (Specify)

Discharged to:
☐ Ward ☐ Mortuary
☐ ICU/NSU ☐ CT/X-ray
☐ HDU ☐ Other Hospital
☐ Theatre

TRANSFER TO ANOTHER HOSPITAL

Date of transfer ☐☐ / ☐☐ / ☐☐☐☐
Time of transfer ☐☐ : ☐☐
Reason for transfer:
Further Specialist Care : ☐
No ICU bed this hospital : ☐

Accompanying Patient:
Doctor Y ☐ ☐ N
Paramedic Y ☐ ☐ N
Technician Y ☐ ☐ N
Nurse Y ☐ ☐ N

Transfer To:

Via: Ambulance ☐ Helicopter ☐ Other ☐

Operation/Procedure: Y ☐ ☐ N

SUBSEQUENT CARE

Date Arrival in Theatre: ☐☐ / ☐☐ / ☐☐☐☐
Time of Arrival: ☐☐ : ☐☐ hrs
Time of departure: ☐☐ : ☐☐ hrs

Grade Surgeon: ☐☐ **Grade Anaesthetist:** ☐☐ **Number of further ops:** ☐☐

OPERATION/PROCEDURE:

COMPLICATIONS:

PRE-EXISTING DISEASES:

(for extra space please use the comments section on the continuation sheet)

OUTCOME

Alive ☐ ☐ Dead

If alive: Date discharge ☐☐ / ☐☐ / ☐☐☐☐
Total Length of stay: ☐☐ (days)
On ICU: ☐☐ (days)

If dead: Date of death ☐☐ / ☐☐ / ☐☐☐☐
Time of death: ☐☐ : ☐☐ hrs

ANATOMICAL DESCRIPTION OF INJURIES
(complete and accurate details must be documented)

List upto 6 injuries and if there are more use a continuation sheet

for use by Trauma Network Staff

T1 ☐ T6 ☐
T2 ☐ T7 ☐
T3 ☐ T8 ☐
T4 ☐☐☐☐
T5 ☐☐☐☐☐☐☐☐

O1 ☐☐ O2 ☐☐ O3 ☐☐
C1 ☐☐ C2 ☐☐ C3 ☐☐
P1 ☐☐ P2 ☐☐ P3 ☐☐
P4 ☐☐ P5 ☐☐ P6 ☐☐

☐☐☐☐☐☐ ☐
☐☐☐☐☐☐ ☐
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ISS : ☐☐

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Figure 3b

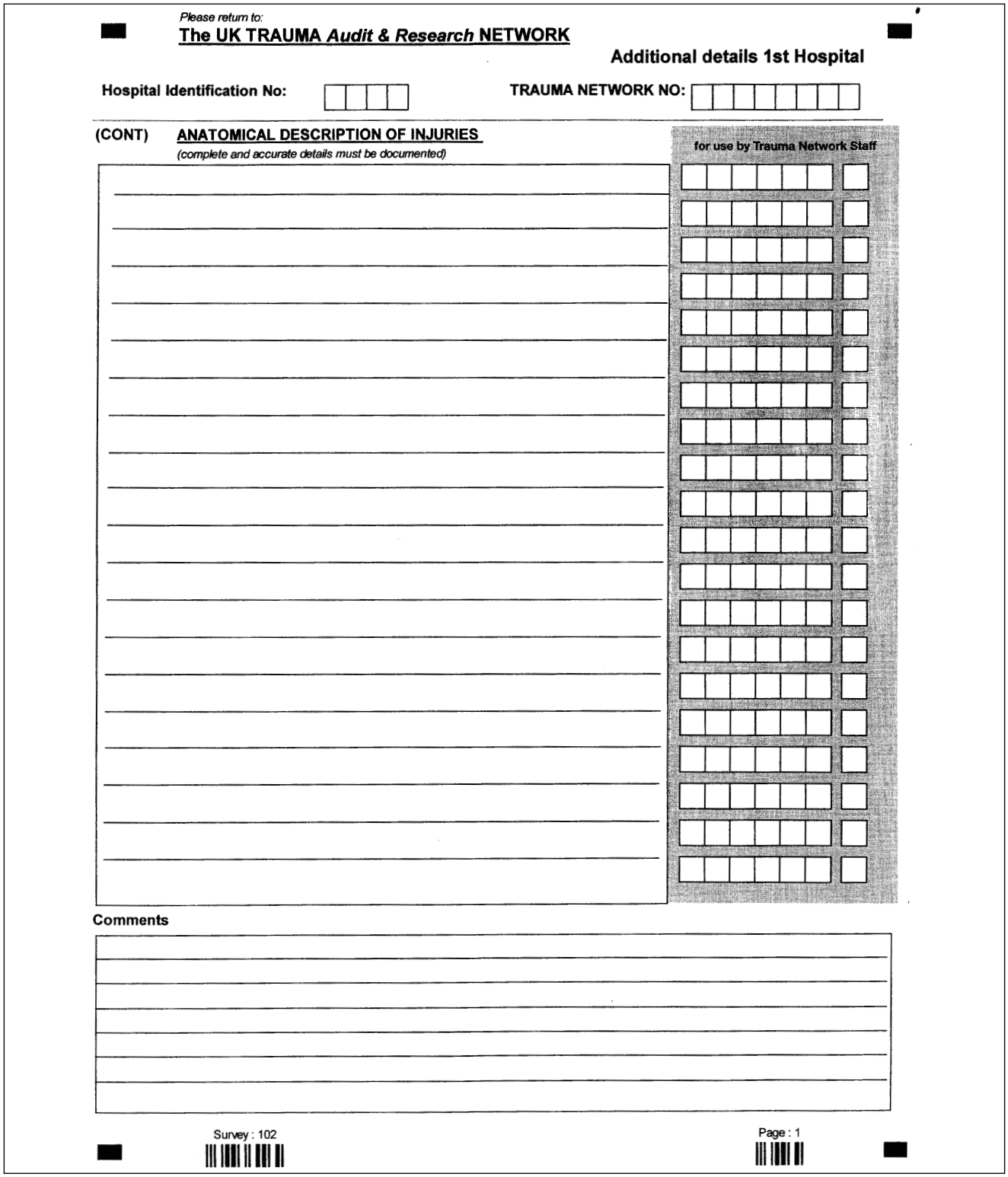
Please return to:
The UK TRAUMA Audit & Research NETWORK
Additional details 1st Hospital
Hospital Identification No:
TRAUMA NETWORK NO:
(CONT) ANATOMICAL DESCRIPTION OF INJURIES
(complete and accurate details must be documented)
for use by Trauma Network Staff
Comments
Survey : 102
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Figure 3c

2. There is a higher incidence of penetrating trauma in the USA than in Europe. In view of the well described differences in the pathophysiology and the outcome between blunt and penetrating trauma, we feel that these entities should be separately investigated.

Of course, the major achievements of the MTOS have been considered by those who have installed the data bases in the European countries. Likewise, the development of the documentation protocols in Europe have of course been influenced by the MTOS, and has led to the inclusion of the ISS, TRISS, and other parameters. Nevertheless, for the reasons discussed above, we have found it more wise to concentrate on the European data sheets.

In Europe, the efforts to perform quality management as a basis to improve trauma care are not new. Draaisma et al. [20] performed the first prospective multicenter study for quality control of trauma care in 1989 and investigated a 1-year period in 12 participating hospitals. The authors focused on the incidence of preventable management errors and at the incidence of the management error-related deaths in small, large, and university hospitals. They clearly demonstrated that 1. the highest incidence of management errors occurred in small hospitals and 2. the highest incidence of management errors in these small hospitals was associated with the highest rate of preventable deaths. Based on their results, the authors advocated mandatory admission of these patients to Level I trauma centers. Similar studies confirmed these findings in the United Kingdom [21], and in Australia [22]. In Germany, these concepts were followed as well, but until the mid 1990s, most reports dealing with blunt multiple trauma patients were based on the experience of single centers [10, 23, 24].

Comparison of Data Sheets

The comparison of the 3 documentation sheets reveals that all have aimed at standardizing the degree of injury, and the distribution of injuries. Different time points of the preclinical and clinical course are reflected in all sheets as well. Moreover, all consider the clinical status by means of vital parameters including the neurological status, or additional results of blood testing. Finally, the important therapeutic steps are documented as well as parameters of outcome. Some principal differences are 1. the use of 2 different documentation sheets for patients that are primarily or secondarily admitted in England and Wales, 2. the focus on the early preclinical period in the Dutch registry, and 3. the extent of information to be documented during the early documentation period, including various fracture classification systems in the German system. Other important differences can be inspected in detail in the figures.

The *Dutch Trauma Registry* has focused on the preclinical status and the time sensitivity of the rescue conditions. It was designed to gain rapid information about the principal patient condition. Out of this growing trauma documentation, scientific publications are to be expected in the near future.

The *German Trauma Registry* was designed to summarize all medical data to describe the specifics of injury, rescue and of the clinical course. These data 1. include the numbers to calculate currently used trauma scoring systems, 2. reflect changes in the diagnoses during the entire hospital stay, 3. imply the complications that are responsible for prolongations of the hospital stay, 4. summarize the clinical course, and 5. demonstrate the outcome of each patient.

So far it has provided an overview of epidemiologic data of patients with blunt trauma in Germany. About 1/3 of patients have met the definition of polytrauma (ISS > 16). As expected, it emphasizes the fate of young male traffic victims. Interestingly, the incidence of severe thoracic trauma (AIS ≥ 3 points, 44.5%) exceeded the one of severe head injury (39.2%) [25], which had not been found in previous investigations [10]. The data have also been used for quality management purposes. The authors compared the means of injury severities, the Z-statistics and the mortality between different hospitals. Other factors included the preclinical treatment, the time to completion of diagnostic procedures, and the time to primary surgery. The best outcome was achieved in the hospital where short preclinical times with a high intubation rate were present and where the diagnostic procedures and the time to initial surgery was short [26]. In recent years, the indications for primary surgical procedures in patients with blunt multiple injuries have been vividly discussed [27–29].

Therefore, another investigation looked at the influence of the degree of primary (within 24 hours after trauma) surgery on the further clinical course. To do this, comparably injured subgroups of polytrauma pa-

tients, in whom the pertinent difference was the duration of primary surgery, were evaluated. Those patients who had to undergo more than 6 hours of initial surgery had the worst outcome in terms of the incidence of multiple organ failure and death [30]. Moreover, a standardized follow-up examination is performed in the patients documented in this registry that is performed 2 years after the initial injury [31]. Based on the data of 254 patients, a new rehabilitation scoring system has been developed that includes objective and subjective outcome [32].

Similar evaluations were performed on the basis of the Trauma Registry in England and Wales. The first report from the UK Trauma Network presented a review on the care of injured patients from 33 British hospitals. The evaluation provided data on the inconsistencies and shortcomings of trauma care [33]. More recently, the numbers of this data base allowed to demonstrate that the combination of traumatic brain injury and extracranial injuries doubles the mortality rate when compared with the mortality rate of head injury alone [34]. Another survey showed a continuous reduction in the accident death rates of children and young adults between 1989 and 1995 [35]. Moreover, the UK trauma data base proved the ability of this system to perform interclinical comparisons for quality management purposes and allows to develop new statistical methods for comparison [36]. The most recent report shows an improvement in trauma survival over the last 9 years in England and Wales associated with the presence of more senior doctors in the resuscitation area and the operating theatres. However pre-hospital times were shown to have increased [37].

Problems of Documentation

One important problem in the exploitability of data lies in the quality of documentation. It is obvious that the completeness of data is closely related with the amount of data to be collected. Moreover, the education of the personnel involved in the documentation is crucial. Previous clinical studies relied on data that were provided by research nurses. These had undergone a 2-day course on documentation and on scoring systems for trauma [38]. This does not provide adequate accuracy of data and is clearly an inadequate approach, given the well described problem of interobserver reliability.

However, the documentation performed in the current registries also is less than ideal. In a preliminary analysis of the care of injured patients from the UK Trauma Registry, Yates et al. [33] draw attention to the incompleteness of records. In this analysis, it affected especially the respiratory rate. The authors report a variation between 43.1 and 100% completeness of data depending on the documentation center. In order to improve this situation, the authors advocate courses for injury scaling.

In this light, the German Trauma Registry should be at special risk of this problem. In comparison with other data collection sheets, it requires the largest number of documentation steps and also includes laboratory data. In contrast, the form used in the Netherlands appears to be advantageous since it focuses on elementary data of the pre-hospital and hospital stay. Moreover, it may be most adequate since it includes pertinent scoring systems that are accepted tools for the evaluation of blunt trauma patients. Completeness as well as the accuracy of data have also been a problem in the German documentation. A variety of laboratory data could not be used when the hospitals used their own units for blood tests, which were different from the standard required from the data sheet. In a laborious review process, all sheets are therefore reexamined by a team of documentation analysts. All documentation sheets are now sent back to a hospital if their data are incomplete and a set of minimally required data (vital signs, parameters to allow TRISS classification, and outcome) has been defined for this purpose. Moreover, a computer programmed work-up for data inconsistency has been added as a second shield. It is thought to guard against inadequacy of data that might have been overlooked by the documentation personnel.

Cost Calculations on the Basis of a Trauma Registry

In recent years, budget reductions have become an important issue. One has to keep in mind that adequate treatment and rehabilitation after trauma is an important economic factor which may outweigh the high costs necessary for rescue and all further treatment. O'Kelly et al. [39] investigated the efficiency of financial resources for trauma centers in terms of "quality-adjusted life years". The calculated costs were low compared with a variety of health care activities funded in the UK up to that date. In the United States, a higher effectiveness (determined by quality-

adjusted life years) of the care of trauma patients was found when compared with internal medicine patients [40].

In order to gain information on the costs of trauma patients, previous studies have meticulously documented the expenses of the initial clinical course for polytrauma patients in university hospitals [11, 12]. US studies complain that physicians who aim to reduce costs, cannot rely on meaningful data on the effectivity of their cost-containment activities. These studies differentiate between fixed costs (the hospital's overhead), variable costs (medications, length of stay), and marginal costs (incremental cost for additional patients/tests). If one aims at cost reduction, it must be considered that those costs that can be influenced by the physician (variable costs), represent the smallest sum. The influence of the physician regarding cost reduction in a hospital is extremely limited and may lie between 25 and 35% of variable direct costs. The best cost reductions in a 1-year survey were achieved in pharmacy (57%), nursing (24%), and emergency (36%) [41]. Other estimates of a hospital overhead of 84% [14] have been found to be way beyond the physician's immediate control [42]. It is of utmost importance that the high fixed costs of a hospital are unaffected by differing patient numbers. Therefore, the only promising way appears to be efficient capacity utilization. The authors demand that physicians are given access to sophisticated economic data to make adequate modifying decisions [42].

Although these calculations were meticulously performed, they only reflect an estimate of the true costs of trauma to the society. Among these are 1. the loss of productivity during prolonged hospital periods, 2. the costs for the interventions during hospitalization, and 3. especially the huge costs for rehabilitation and for reimbursement of insurances. A complete picture on the economical effect can only be achieved if additional information on the rehabilitative efforts and their long-term outcome is gathered. We have tried to collect data on this topic by performing a follow-up study [30]. It includes a standardized follow-up examination performed by a trauma surgeon at 2 years after the initial injury. The clinical status is then documented by a standardized scoring system [32]. So far, this follow-up has only been performed at the founding hospitals of the German Trauma Registry.

Future Perspectives

In the future, standardization of trauma documentation in Europe may be a valuable achievement. It would allow a direct comparison of the rescue situation, the standards of early in-hospital care, and possibly the outcome. While a complete cost documentation does not represent to be a feasible goal, at least more information on the expectable hospital stay appears to be realistic objective.

The adjustment of the data sheets is only one aspect in regards of a European trauma coordination initiative and could probably be achieved within a reasonable period of time. In contrast, the administration of the information represents a larger problem. To date, separate data bases are in use and the problems of data coordination are well known. A coordination of several trauma documentation systems would also imply an agreement about the software and the operating system to be used. Despite these shortcomings, we feel that a standardized documentation of trauma is a desirable goal for the European countries.

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Address for Correspondence:
Prof. Dr. Hans-Christoph Pape, Department of Trauma Surgery, Hannover Medical School, Carl-Neuberg-Straße 1, D-30625 Hannover, Germany,
Phone (+49/511) 532-2050, Fax -8673,
e-mail: Pape.Hans-Christoph@MH-Hannover.de