



## ORIGINAL

# Epidemiology of severe trauma in Spain. Registry of trauma in the ICU (RETRAUCI). Pilot phase<sup>☆,☆☆</sup>



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## KEYWORDS

RETRAUCI;  
Trauma registries;  
Severe trauma;  
Intensive care unit

## Abstract

**Objective:** To describe the characteristics and management of severe trauma disease in Spanish Intensive Care Units (ICUs). Registry of trauma in the ICU (RETRAUCI). Pilot phase.

**Design:** A prospective, multicenter registry.

**Setting:** Thirteen Spanish ICUs.

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**Patients:** Patients with trauma disease admitted to the ICU.

**Interventions:** None.

**Main variables of interest:** Epidemiology, out-of-hospital attention, registry of injuries, resources utilization, complications and outcome were evaluated.

**Results:** Patients, n = 2242. Mean age  $47.1 \pm 19.02$  years. Males 79%. Blunt trauma 93.9%. *Injury Severity Score*  $22.2 \pm 12.1$ , *Revised Trauma Score*  $6.7 \pm 1.6$ . Non-intentional in 84.4% of the cases. The most common causes of trauma were traffic accidents followed by pedestrian and high-energy falls. Up to 12.4% were taking antiplatelet medication or anticoagulants. Almost 28% had a suspected or confirmed toxic influence in trauma. Up to 31.5% required an out-of-hospital artificial airway. The time from trauma to ICU admission was  $4.7 \pm 5.3$  h. At ICU admission, 68.5% were hemodynamically stable. Brain and chest injuries predominated. A large number of complications were documented. Mechanical ventilation was used in 69.5% of the patients (mean  $8.2 \pm 9.9$  days), of which 24.9% finally required a tracheostomy. The median duration of stay in the ICU and in hospital was 5 (range 3–13) and 9 (5–19) days, respectively. The ICU mortality rate was 12.3%, while the in-hospital mortality rate was 16.0%.

**Conclusions:** The pilot phase of the RETRAUCI offers a first impression of the epidemiology and management of trauma disease in Spanish ICUs.

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## PALABRAS CLAVE

RETRAUCI;  
Registros de trauma;  
Trauma grave;  
Unidad de Cuidados  
Intensivos

## Epidemiología del trauma grave en España. Registro de TRAuma en UCI (RETRAUCI). Fase piloto

### Resumen

**Objetivo:** Describir las características de la enfermedad traumática grave (ETG) y su atención en las unidades de cuidados intensivos (UCI) españolas.

**Diseño:** Registro multicéntrico y prospectivo.

**Ámbito:** Trece UCI españolas.

**Pacientes:** Pacientes con ETG ingresados en UCI participantes.

**Intervenciones:** Ninguna.

**Variables de interés principales:** Aspectos epidemiológicos, atención prehospitalaria, registro de lesiones, consumo de recursos, complicaciones y evolución final.

**Resultados:** Se incluyó a 2.242 pacientes con  $47,1 \pm 19,02$  años de edad media, 79% hombres. Fue trauma contuso en 93,9%. El *Injury Severity Score* fue de  $22,2 \pm 12,1$  y el *Revised Trauma Score* de  $6,7 \pm 1,6$ . Fue no intencionado en el 84,4%. Las causas más frecuentes fueron accidentes de tráfico, caídas y precipitaciones. Un 12,4% tomaban antiagregantes o anticoagulantes y en casi un 28% se implicó el consumo de tóxicos. Un 31,5% precisaron una vía aérea artificial en medio prehospitalario. El tiempo medio hasta el ingreso en UCI fue de  $4,7 \pm 5,3$  h. Al ingreso en UCI un 68,5% se encontraba estable hemodinámicamente. Predominó el traumatismo craneal y torácico. Hubo un importante número de complicaciones y en el 69,5% de los casos necesidad de ventilación mecánica (media  $8,2 \pm 9,9$  días). De ellos, un 24,9% precisaron traqueotomía. Las estancias en UCI y hospitalarias fueron respectivamente de mediana 5 (3–13) días y 9 (5–19) días. La mortalidad en UCI fue del 12,3% y la hospitalaria del 16%.

**Conclusiones:** La fase piloto del RETRAUCI muestra una imagen inicial de la epidemiología y atención del paciente con ETG ingresado en las UCI de nuestro país.

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## Introduction

Severe trauma disease (STD) is a worldwide pandemic and one of the leading causes of death and disability, particularly in young adults.<sup>1</sup> The prognosis of STD depends on a number of factors, such as the severity and energy of trauma, the physiological reserve of the patient, and the quality and promptness of the provided care. The latter are

the modifiable factors.<sup>2</sup> However, modification is only feasible if the reality of healthcare is adequately monitored, and this inevitably implies the existence a trauma registry (TR).<sup>2,3</sup>

Trauma registries can fully monitor the STD care process, and among other aspects their advantages include the monitoring of epidemiological trends, the promotion of public health and scientific production, the designing of

individualized intervention plans, and the optimization of resources as functions related to the accreditation and elaboration of different scales related to trauma disease.<sup>4,5</sup> The methodology used in the different registries is by no means uniform, however.<sup>6,7</sup>

Despite the above, and although there have been different regional initiatives in Spain,<sup>8–12</sup> to date no registry has afforded national coverage of the patients admitted to Intensive Care Units (ICUs). The Trauma and Neurointensive Care Working Group (WG) of the Spanish Society of Intensive Care Medicine and Coronary Units (*Sociedad Española de Medicina Intensiva, Crítica y Unidades Coronarias* [SEMICYUC]) has dedicated effort to the development of a severe TR that may serve as a vehicle for improving the documentation, care and investigation of STD in Spain.<sup>2</sup> The *RETRAUCI* (Trauma Registry in the ICU [*Registry TRAUma en UCI*]) was started as a registry pilot initiative in a series of hospitals with a particular interest in severe trauma.

The aim of this study is to describe the characteristics of STD and its management in Spanish ICUs, based on the first results of the *RETRAUCI* pilot initiative.

## Material and methods

The registry was identified as a need in the course of the meetings of the Trauma and Neurointensive Care Working Group of the SEMICYUC. Finally, and after several preliminary meetings, data collection was started on 23 November 2012 in some selected centers. During this pilot phase, the data were entered by the supervising investigator in each center using a Microsoft Access spreadsheet. At the time of submission of this study, the online tool had already been activated ([www.retrauci.org](http://www.retrauci.org)).<sup>13</sup> Approval was obtained from the corresponding Ethics Committees.

## Inclusion criteria

The study included all patients admitted to an adult patients ICU due to STD during the study period, with a stay of over 24 h. Cases involving shorter stays with a fatal outcome were also included.

## Data collection

The following data were collected:

- Epidemiological information, including age, gender, date and time of trauma and of admission to the ICU, intentionality, mechanism and type of trauma, previous use of antiplatelet or anticoagulant medication, and potential implication of different drugs of abuse.
- Aspects related to out-hospital care, including the type of initial medical care and the need for lung isolation measures.
- Registry of trauma injuries according to the Abbreviated Injury Scale (AIS),<sup>14</sup> and calculation of different severity scores based on physiological (Revised Trauma Score [RTS])<sup>15</sup> and anatomical aspects (Injury Severity Score [ISS]).<sup>16</sup>
- Complications during admission to the ICU, including the hemodynamic condition upon admission, the existence

of coagulopathy, rhabdomyolysis, respiratory dysfunction, multiorgan failure syndrome, intracranial hypertension, renal failure and nosocomial infection. The definitions are described in [Annex 1](#).

- Resource utilization, including blood product transfusions, number of urgent surgeries in the first 24 h, and number of non-urgent surgeries, days on mechanical ventilation, pneumological monitoring, tracheotomy (percutaneous or surgical), arteriography for hemostasis and neuromonitoring techniques (ICP, S<sub>j</sub>O<sub>2</sub>, PtiO<sub>2</sub> and NIRS).
- Evolution and final destination of the patients in ICU.

## Coding of injuries

In 7 of the 13 centers that participated in the pilot phase ([Annex 2](#)), the injuries were coded with the 7 digits of the AIS in its updated version corresponding to the year 2008.<sup>17</sup> In those centers where no complete coding with the 7 digits was made, a customized abridged version was used ([Annex 3](#)) for calculating the ISS.

## Statistical analysis

The normal distribution of the variables was assessed using the Kolmogorov–Smirnov test. The quantitative variables followed a normal distribution, and were therefore reported as the mean ± standard deviation. Categorical variables were reported as number (percentage).

The bivariate analysis (differences between 2 groups) of the categorical variables was based on the chi-squared test, using the Fisher exact test if the expected frequency of a variable was less than 5 in 2 × 2 tables. The Student's *t*-test was used in the case of quantitative variables. Analysis of variance (ANOVA) was used when comparing more than two variables. The SPSS version 20 statistical package (IBM Corporation, 2011) was used throughout. Statistical significance was considered for  $p < 0.05$ .

## Results

Between 23 November 2012 and 31 January 2015 we included a total of 2242 patients admitted to the participating ICUs due to STD. The distribution of patients per participating center in the pilot phase is shown in [Annex A](#). The characteristics of the patients included in the registry are summarized in [Table 1](#). Of the included patients, 20.6% were over 65 years of age. Trauma was unintentional in 1890 cases (84.4%), intentional in 13.9% and unknown in 1.7%. Injury occurred in the context of a working accident in 154 patients (6.9%), a sports accident in 126 patients (5.6%), physical assault in 149 patients (6.7%), and attempted suicide in 162 patients (7.2%). Traffic accidents considered globally regardless of the type of vehicle, and falls, were the most frequent causes of trauma.

The percentage of patients with ISS > 15 and RTS < 6 was 72.7% and 26%, respectively.

A total of 12.4% of the subjects presented coagulopathy prior to trauma, 6.8% received antiplatelet medication, and 5.6% anticoagulant treatment. In 27.9% of the cases substance abuse was clinically suspected or confirmed by the laboratory tests.

**Table 1** Epidemiological characteristics.

Age (years)	47.1 ± 19.02
Gender (M/F) as %	79/21
Type (contusive/penetrating) as %	93.9/6.1
Injury Severity Score	22.2 ± 12.1
Revised Trauma Score	6.7 ± 1.6
<b>Origin n (%)</b>	
Out-hospital	816 (36.9)
Emergency care	784 (35.4)
Operating room	137 (6.2)
Other hospital	475 (21.5)
<b>Mechanism n (%)</b>	
Accidental fall	465 (20.8)
Fall from a height	358 (16.0)
Automobile	352 (15.3)
Motorcycle	321 (14.3)
Run over by vehicle	191 (8.5)
Bicycle	110 (4.9)
Struck with an object	96 (4.3)
Knife	73 (3.3)
Other vehicles	66 (3.0)
Crushing	29 (1.3)
Firearm	28 (1.3)
Explosion	16 (0.7)
Unknown	43 (1.9)
Others	99 (4.4)

The type of initial out-hospital care, the need for orotracheal intubation or *in situ* alternative airway, the hemodynamic situation upon admission to the ICU, and the evaluation of brain injury based on the radiological data are summarized in Table 2.

The mean time from trauma to admission to the ICU was 4.7 ± 5.3 h. There were significant differences in the time from trauma to admission to the ICU according to the type of first medical care provided: no pre-hospital care (7.3 ± 4.5 h), non-medicalized care (5.8 ± 3.4 h), mobile ICU (4.2 ± 5.6 h), helicopter (4.3 ± 3.4 h) and unknown (7.6 ± 4.8 h) ( $p < 0.0001$ ). The *post hoc* analysis found the mobile ICU to show significant differences *versus* no pre-hospital care, non-medicalized care and unknown care, while helicopter transfer showed significant differences in the *post hoc* analysis *versus* no pre-hospital care and unknown care. Regarding the time of admission, 24.2% of the patients were admitted in the course of the morning shift (08:01–15:00 h), 39.5% in the afternoon (15:01–22:00 h), and 36.2% during the night shift (22:01–08:00 h).

A total of 9890 injuries in 1665 patients were coded. The most commonly coded injuries according to the AIS are shown in Table 3, and the percentage injuries in each body region are indicated in Fig. 1. The percentage patients with each type of complication are shown in Table 4, while resource utilization on the part of the patients in the study sample is reported in Table 5.

The in-ICU mortality rate was 12.3%, while the in-hospital mortality rate was 16%. The days of ICU stay and of post-ICU hospital stay, together with in-ICU mortality and post-ICU hospital mortality are reported in Table 6. A significant

**Table 2** First care n (%).

<b>Pre-hospital care</b>	
None	192 (8.6)
Non-medicalized	229 (10.3)
Mobile ICU	1551 (69.7)
Helicopter	207 (9.3)
Unknown	46 (2.1)
<b>Pre-hospital OTI</b>	
No	1518 (68.5)
Yes	630 (28.4)
Alternative airway	68 (3.1)
<b>Hemodynamics upon admission to the ICU</b>	
Stable	1389 (64.4)
Unstable, recovers with volume replacement	326 (15.1)
Shock	323 (15.0)
Refractory shock	119 (5.5)
<b>TBI Marshall<sup>a</sup></b>	
DI type I	156 (19.7)
DI type II	351 (44.4)
DI type III	45 (5.7)
DI type IV	25 (3.2)
Evacuated mass	139 (17.6)
Non-evacuated mass	74 (9.4)

OTI: orotracheal intubation; DI: diffuse injury; TBI: traumatic brain injury; ICU: Intensive Care Unit.

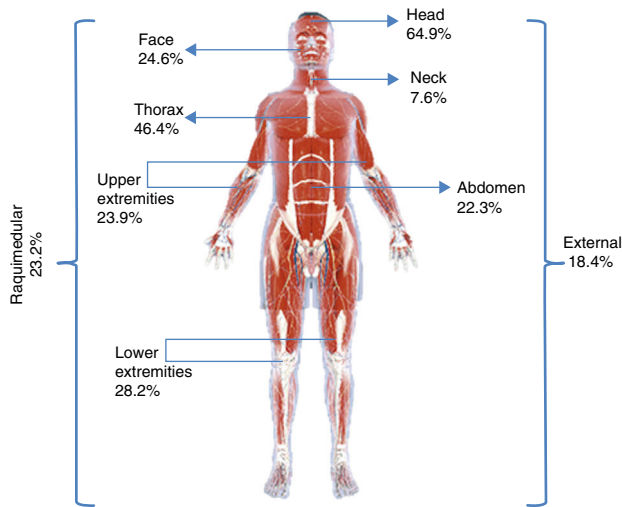
<sup>a</sup> Only in patients with injuries in coded head areas.<sup>25</sup>

**Table 3** Most frequent coded injuries in 1665 patients (%).

<b>450203.3:</b> Fracture ≥ 3 ribs without flail chest (17.1)
<b>650620.2:</b> Lumbar transverse process (14.9)
<b>140695.3:</b> Subarachnoid hemorrhage with coma >6 h (13.7)
<b>150202.3:</b> Fracture of the skull base without cerebrospinal fluid loss (12.1)
<b>150402.2:</b> Uncomplicated fracture of the skull dome (11.5)
<b>442202.2:</b> Pneumothorax (10.7)
<b>140694.2:</b> Subarachnoid hemorrhage without coma >6 h (10.4)
<b>140651.3:</b> Small subdural hematoma <6 mm in thickness (8.6)
<b>650420.2:</b> Dorsal transverse process (8.4)
<b>441407.2:</b> Minor unilateral pulmonary contusion (7.7)

association was observed between the ISS score and mortality ( $p < 0.0001$ ) (Fig. 2). Of the survivors, 11.6% were transferred to another ICU after discharge, while 21.1% were moved to another hospital center.

Limitation of life support measures was applied to one degree or other in 6.9% of the overall patient sample. Specifically, limitation of life support was implemented in 55.1% of the 273 patients that died (156 patients). A total of 27.5% of those who died became organ donors.



**Figure 1** Percentage of injuries coded according to the different areas contemplated by the Abbreviated Injury Scale.

**Discussion**

The data presented in this study offer a first impression of the epidemiology and management of patients with STD admitted to the ICUs in Spain. The findings suggest that the introduction of a national TR is feasible, and may result in improved knowledge of STD in our setting and better patient care in the future.

The standard patient with STD in our setting is a middle-aged male with unintentional contusion injuries caused by a traffic accident or fall, and initially attended by a mobile ICU in the out-hospital setting, without the need for *in situ* orotracheal intubation in 70% of the cases. The

**Table 4** Complications associated to trauma, n (%).

Coagulopathy trauma	497 (23.1)
Rhabdomyolysis	237 (11.1)
Intracranial hypertension <sup>a</sup>	
No	145 (34.2)
First-level measures required	144 (34)
Second-level measures required	135 (31.8)
MOFS	
Early	231 (10.9)
Late <sup>b</sup>	234 (15.7)
ARDS	501 (23.4)
Renal failure	312 (14.7)
Nosocomial infection <sup>c</sup>	455 (32.3)

MOFS: multiorgan failure syndrome; ARDS: acute respiratory distress syndrome.

<sup>a</sup> Considering only the patients in which intracranial pressure has been measured (n = 424).

<sup>b</sup> Considering only the patients with ICU stay >3 days (n = 1407).

<sup>c</sup> Considering only the patients with ICU stay ≥3 days (n = 1804).

**Table 5** Utilization of resources, n (%).

Transfused patients 6 h	596 (26.6)
Volume RCC transfused	
0-600 ml	1868 (83.3)
601-2000 ml	289 (12.9)
>2000 ml	85 (3.8)
Arteriography bleeding	88 (3.9)
Urgent surgery patients	833 (37.2)
Non-urgent surgery patients	407 (24.1)
Monitoring of ICP	424 (21)
Days of monitoring of ICP <sup>a</sup>	6.6 ± 4.8
Other neuromonitoring	
SjO <sub>2</sub>	20 (1)
PtiO <sub>2</sub>	84 (4.2)
NIRS	23 (1.1)
Patients on mechanical ventilation	1363 (69.5)
Days of mechanical ventilation <sup>b</sup>	8.2 ± 9.9
Tracheotomized patients <sup>b</sup>	340 (24.9)
Percutaneous	248 (73)
Surgical	92 (27)

RCC: red cell concentrates; NIRS: near-infrared spectroscopy; ICP: intracranial pressure; PtiO<sub>2</sub>: tissue oxygen pressure; SjO<sub>2</sub>: jugular bulb oxygen saturation.

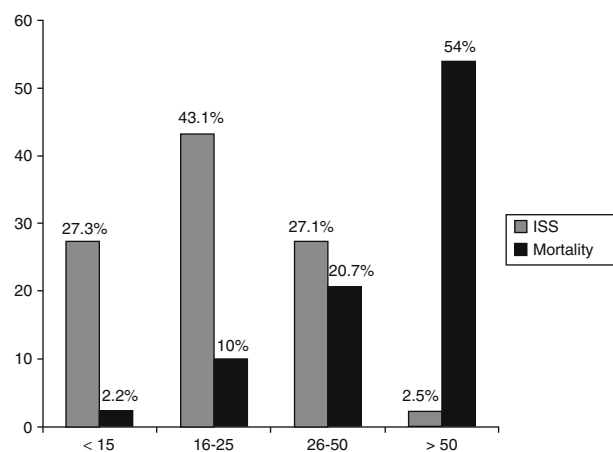
<sup>a</sup> Considering only the patients with intracranial pressure monitoring (n = 424).

<sup>b</sup> Considering only the patients with mechanical ventilation (n = 1363).

**Table 6** Clinical outcome of the trauma patients admitted to ICU.

ICY stay (days) <sup>a</sup>	5 (3-13)
Post-ICU hospital stay (days) <sup>a</sup>	9 (5-19)
ICU mortality	273 (12.3%)
Post-ICU hospital mortality	53 (3.7%)

<sup>a</sup> Median and interquartile range.



**Figure 2** Distribution of cases according to the Injury Severity Score and associated mortality in each group.



patient is hemodynamically stable at the time of first care and mainly suffers brain (type II diffuse injury) and chest trauma. Three out of every four patients are admitted to the ICU in the course of the afternoon or night shift, and are therefore attended by less experienced personnel on duty. One out of every three patients require urgent intervention, while a similar proportion receive deferred care. These typical patients are associated to important resource utilization, and most of them receive mechanical ventilation during admission to intensive care, and suffer different complications. Intracranial hypertension is frequent in patients with brain injuries. Other neuromonitoring techniques are very little used. One out of every four patients on mechanical ventilation require a tracheotomy (preferentially percutaneous). The mortality rate is relatively low, though the stay in the ICU and in hospital is long.

The keeping of a TR is associated to improved knowledge of the epidemiology, processes and outcomes of the management of patients with STD,<sup>2-7</sup> and over time the documentation of such information is associated to lesser mortality and disability in patients with STD.<sup>18</sup> At this point it is still too early to assess this latter aspect in our registry. A controversial issue in relation to TRs is what parameters should be recorded and how optimum data collection can be ensured. In this regard, a recent Scandinavian study involving 783 patients from different geographical areas<sup>19</sup> has found that certain physiological and time-related variables pose compilation difficulties.

In our case, this pilot phase has allowed us to modify the way in which certain variables are collected and to add some others that may be of interest. Such flexibility is necessary, since a TR must be adaptable to the setting in which it is kept and modifiable according to the results obtained and the variations in scientific evidence over time.<sup>7</sup> Accordingly, and in comparison with the pilot phase presented herein, the latest version of the online access base contemplates among other modifications the time elapsed from the moment of trauma to hospital admission and from hospital admission to admission to the ICU; intoxication due to drugs and psychotropic agents of chronic use; the administration of new antiplatelet agents and anticoagulant drugs; pupil status and the performing of decompressive craniotomy; documentation of the patients admitted to the ICU as potential organ donors; the total red cell concentrate units transfused in the first 24 h instead of the number of milliliters transfused in the first 6 h; the number of fresh plasma bags and massive transfusions; the use of continuous renal replacement therapies; the introduction of a new definition of acute respiratory distress syndrome based on the Berlin criterion; and neurological assessment at discharge from the ICU. Furthermore, we will be able to gain more complete information referred to different trauma severity scores, with automatic calculation of the ISS and the New ISS, and of survival probability.<sup>20</sup>

The pilot phase of the RETRAUCI has allowed us to detect errors and opportunities for improvement in the documentation and follow-up of trauma patients in Spain, and has shown that starting the initiative is feasible. On the other hand, it has given us an initial impression of

the epidemiology and management of patients with STD admitted to the ICUs in our country.

In future, and ideally, an analysis of the quality of life of patients with STD also should be contemplated,<sup>21</sup> though the optimum timing of such an analysis is not clear,<sup>22</sup> and moreover it will require a great effort on the part of the investigators – particularly on considering the usual structure of Spanish ICUs.

The RETRAUCI was created as a project of the Trauma and Neurointensive Care Working Group of the SEMICYUC, with the intention of continuing over time and of having an impact upon the evolution of patients with STD, in the same way as with other Working Groups of the SEMICYUC in patients with ischemic heart disease or sepsis, through the ARIAM and ENVIN registries. At the time of drafting of this article, and with the online tool already active, several additional centers have announced their participation. From this article we wish to invite all Spanish ICUs that attend trauma cases to participate in the RETRAUCI through the mentioned online tool, since doing so will undoubtedly contribute to improve survival, increase volume and quality, and positively affect the health of these patients. The data obtained by means of the RETRAUCI can afford reliable information for public and political institutions with legislative intent, as well as optimize the use of resources and social awareness.<sup>7,23</sup>

We must take note of the limitations of this study in particular, and of registries in general. Firstly, the information presented herein arises from a voluntary TR in which the participating centers have expressed interest in joining the initiative. Coverage is therefore limited, and this may lead to bias in evaluating the results, since the registry documents information from particularly motivated centers.<sup>2</sup> Furthermore, this TR only contemplates those patients that are effectively admitted to the ICU. As such, it is not representative of STD in general, since it does not contemplate patients who die before reaching hospital, and which represent most of the fatalities due to severe trauma (mainly as a result of bleeding),<sup>1,24</sup> or minor traumatismos that do not require admission to the ICU.

In sum, the pilot phase of the RETRAUCI offers a first impression of patients with STD admitted to ICUs in Spain, and represents the first initiative of this kind. The consolidation of a national TR is feasible and in future may contribute to reduce mortality and disability among such patients.

### Authorship/collaborators

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## Conflict of interest

The authors declare that they have no conflict of interest.

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## Annex A. Distribution of patients in the centers participating in the pilot phase

Center	Patients n	Patients (%)
Hospital Universitario 12 de Octubre, Madrid <sup>a</sup>	549	24.5
Hospital Universitario de Donostia, San Sebastián <sup>a</sup>	310	13.8
Hospital Universitari Son Espases, Palma de Mallorca <sup>a</sup>	261	11.6
Hospital Universitario Virgen de las Nieves, Granada <sup>a</sup>	223	9.9
Hospital Torrecárdenas, Almería	200	8.9
Hospital Universitario Virgen del Rocío, Sevilla	153	6.8
Hospital Universitario Carlos Haya, Málaga	128	5.7
Hospital General Universitario de Ciudad Real, Ciudad Real <sup>a</sup>	122	5.4
Complejo Asistencial Universitario de Salamanca, Salamanca <sup>a</sup>	96	4.3
Hospital Universitari Arnau de Vilanova, Lérida <sup>a</sup>	94	4.2
Complejo Hospitalario de Navarra, Pamplona	60	2.7
Hospital Universitario Marqués de Valdecilla, Santander	24	1.1
Hospital Universitario de Getafe, Madrid	22	1.0

<sup>a</sup> Centers in which the injuries are coded with all the digits of the Abbreviated Injury Scale.

## Annex B.

### B.1. Head–neck–cervical spine

	1	2	3	4	5	6
<b>Cranium</b>						
<i>Whole area</i>	Erosion/ contusion/ superficial laceration <sup>a</sup>	Laceration >10 cm <sup>a</sup> Avulsion >100 cm <sup>2a</sup>	Laceration/avulsion bleeding >20% Superficial penetrating injury ≤2 cm		Deep penetrating injury >2 cm	Crush with massive destruction

	1	2	3	4	5	6
<i>Vessels</i>			Thrombosis vertebral art./ant./post. cerebral art./other distal art. Aneurysm int. carotid art./cerebral art./vertebral/ other distal art. Venous thrombosis	Laceration other distal art. Thrombosis int. carotid art./middle cerebral art. Thrombosis (bilateral) vertebral art./ant./post. cerebral art. Laceration of venous sinus Thrombosis of venous sinus Carotid-cavernous fistula Venous laceration	Laceration int. carotid art./cerebral art./vertebral/ basilar art. Thrombosis (bilateral) int. carotid art./middle cerebral art. Traumatic aneurysm basilar art. Laceration with ext. bleeding of venous sinus Thrombosis (bilateral) of sinuses	Laceration (bilateral) vertebral art./int. carotid art. Laceration with ext. bleeding of sigmoid/transverse sinuses (bilateral)
<i>Nerves</i>		Contusion/ laceration of cranial nerve	Laceration (bilateral) of cranial nerve VII/VIII			
<i>Internal organs</i> Brainstem and cerebellum		Epidural/ subdural $\leq 0.6$ cm SAH	Contusion $\leq 15$ cc Superficial penetrating injury $< 2$ cm Swelling/ infarction	Hematoma $\leq 15$ cc Contusion/ epidural/subdural $\leq 30$ cc	Contusion/ infarction of brainstem Contusion/ hematoma/epidural/ subdural extensive $> 30$ cc, $> 1$ cm Deep penetrating injury $> 2$ cm	Crush/laceration of brainstem
Brain	<i>Mild contusion/ amnesia/GCS 9-14</i>	Petechiae $< 1$ cm diameter Epidural small $< 0.6$ cm thickness Intraventricular hemorrhage/SAH without coma Loss of consciousness $< 1$ h	Superficial penetrating laceration $\leq 2$ cm Contusions small $\leq 30$ cc Subdural small $< 0.6$ cm thickness Swelling/edema mild (ventric. compression) Infarction/ ischemia without coma SAH with coma. Pneumoencephalus Loss of consciousness 1-6 h	Contusions large 30-50 cc. Hematoma $\leq 30$ cc Confirmed white matter diffuse axonal injury Epidural/subdural moderate $\leq 50$ cc, 0.6-1 cm Swelling/edema moderate (ventricle/cistern compression) Intraventricular hemorrhage with coma $> 6$ h Loss of consciousness 6-24 h	Contusion/ infarction of brainstem Contusion/ hematoma/epidural/ subdural extensive $> 30$ cc, $> 1$ cm Deep penetrating laceration $> 2$ cm Extensive contusion $> 50$ cc. Hematoma $> 30$ cc Diffuse axonal injury with involvement of corpus callosum Epidural/subdural extensive $> 50$ cc, $> 1$ cm thickness Epidural moderate (bilateral), $\leq 50$ cc, 0.6-1 cm Swelling/edema severe (absent ventricle/cistern) Infarction/ischemia with coma	



	1	2	3	4	5	6
<i>Bones</i>		Linear simple dome fracture	Skull base fracture Dome fracture comminuted/depressed $\leq 2$ cm	Complex skull base or dome fracture with brain exposure Depressed dome fracture $> 2$ cm		
<b>Neck</b>						
<i>Whole area</i>	Mild penetrating injury Erosion/contusion/laceration superf. <sup>a</sup>	Penetrating injury $> 25$ cm <sup>2</sup> Laceration $> 10$ cm <sup>a</sup> Avulsion $> 25$ cm <sup>2a</sup>	Penetrating injury with hemorrhage $> 20\%$ Laceration/avulsion bleeding $> 20\%$			Decapitation
<i>Vessels</i>	Minor injury/laceration ext. jugular bleeding $< 20\%$	Laceration ext. carotid/vertebral bleeding $< 20\%$ Thrombosis ext. carotid Laceration int. jugular bleeding $< 20\%$	Minor laceration carotid/vertebral bleeding $< 20\%$ Thrombosis carotid/vertebral without neurological defect Laceration ext. carotid bleeding $> 20\%$ Laceration jugular bleeding $> 20\%$	Major laceration carotid bleeding $> 20\%$ Injury/laceration/thrombosis carotid/vertebral with neurological defect	Major laceration carotid with neurological defect Laceration/thrombosis vertebral art. (bilateral) with neurological defect	
<i>Nerves</i>	Vagus nerve damage	Phrenic nerve damage		Phrenic nerve damage (bilateral)		
<i>Internal organs</i>	Contusion thyroid gland	Contusion/hematoma of esophagus/larynx/pharynx/trachea Incomplete perforation of larynx/trachea Laceration thyroid/cord	Incomplete perforation of esophagus/pharynx Perforation of entire wall of larynx/trachea. Tracheal fracture Contusion/hematoma $> 75\%$ of lumen Vocal cord damage (bilateral) Salivary gland duct transection	Complete perforation of wall of esophagus/pharynx Perforation of entire wall of larynx with involvement of vocal cords Avulsion/massive damage to trachea Laryngo-tracheal separation	Avulsion/massive injury of esophagus/larynx/pharynx	
<i>Bones</i>		Hyoid fracture				

	1	2	3	4	5	6
<b>Cervical spine</b>						
<i>Nerves</i>		Contusion/ laceration/ incomplete avulsion brachial plexus	Contusion/ laceration/ complete avulsion brachial plexus	Complete injury (bilateral) brachial plexus		
<i>Spinal cord</i>		Contusion/ laceration/ nerve root	Laceration/ avulsion multiple roots Spinal cord damage with transient symptoms	Incomplete cervical spinal cord damage	Complete spinal cord damage between C7 and C4	Complete spinal cord damage at level C3 or higher
<i>Bones</i>		Disk herniation without radiculopathy Joint luxa- tion (unilateral) Simple/multiple vertebral fracture	Disk herniation with radiculopathy Luxation occipito- C1/C1-C2/art. (bilateral) Vertebral collapse >20% height Odontoid fracture			

<sup>a</sup> Code in skin.

## B.2. Face

	1	2	3	4	5	6
<b>Face</b>						
<i>Whole area</i>		Abrasion/contusion/ minor laceration <sup>a</sup>	Penetrating trauma damage >25 cm <sup>2</sup> Major laceration >10 cm <sup>a</sup> Major avulsion >25 cm <sup>2a</sup>	Penetrating trauma with bleeding >20% Laceration/ avulsion with bleeding >20%	Penetrating trauma with massive facial destruction (including both eyes)	
<i>Vessels</i>		Minor laceration of external carotid		Major laceration of external carotid with bleeding >20%		
<i>Nerves</i>			Contusion (uni-/bilateral) optic nerve Laceration/avulsion of optic nerve	Laceration/avulsion (bilateral) of optic nerve		
<i>Internal organs</i>						
<i>Ear</i>		Middle/inner ear damage (unilateral) Bone chain luxation (unilateral) Eardrum rupture. Vestibular damage	Bone chain luxation (bilateral) Laceration middle/inner ear (bilateral)			

1	2	3	4	5	6
Eye	Laceration lacrimal canal Conjunctival damage Abrasion/contusion/laceration cornea Foreign body in ant./post. chamber Uveal/vitreous damage	Avulsion/enucleation (unilateral)	Avulsion/enucleation (unilateral)		
Mouth	Laceration of mouth/palate/gums				
Tongue	Minor, superficial laceration	Major, deep laceration			
Osteoarticular	Simple mandibular fracture Simple nasal fracture Luxation/fracture/avulsion tooth/teeth Zygomatic arch fracture	Temporo-mandibular luxation Dental alveolar fracture Open/displaced/comminuted mandibular fracture Maxillary fracture: sinus/ LeFort I/LeFort II Open/displaced/comminuted nasal fracture Orbital fracture Complex zygomatic arch fracture	LeFort III Panfacial fracture	LeFort III with bleeding >20% Panfacial fracture with bleeding >20%	

<sup>a</sup> Code in skin.

### B.3. Thorax

	1	2	3	4	5	6
<b>Thorax</b>						
<i>Whole area</i>	Abrasion/contusion/minor laceration <sup>a</sup>	Penetrating trauma damage >100 cm <sup>2</sup> Major laceration >20 cm <sup>a</sup> Major avulsion >100 cm <sup>2a</sup>	Penetrating trauma with bleeding >20% Laceration/avulsion with bleeding >20%	Sucking chest wound		Thoracic crush with massive destruction

	1	2	3	4	5	6
<i>Vessels</i>		Minor laceration <sup>a</sup> of other minor art./veins (bronchial, esophageal, intercostal, int. mammary, etc.)	Minor laceration <sup>a</sup> of pulmonary art./brachio-cephalic trunk/subclavian art./innominate vein/pulmonary cava/Subclavian vein Major laceration <sup>c</sup> of other minor art./veins (bronchial, esophageal, intercostal, int. mammary, etc.)	Minor laceration Aortic damage Major laceration 2 brachio-cephalic trunk/subclavian art./innominate vein/vena cava/subclavian vein	Major laceration <sup>b</sup> of aorta/pulmonary art./pulmonary vein Intimal laceration with aortic valve involvement Laceration of coronary artery Major laceration <sup>c</sup> superior vena cava/innominate vein with air embolism	Major laceration <sup>b</sup> Aortic damage with bleeding confined to mediastinum Major laceration <sup>c</sup> Pulmonary art./vein (bilateral)
<i>Nerves</i>	Vagus nerve damage					
<i>Internal organs</i>						
Bronchi	Contusion/hematoma	Contusion/hematoma of distal bronchus Laceration without perforation of distal bronchus	Laceration without perforation of principal bronchus Laceration with perforation of distal bronchus	Laceration with complete perforation of principal bronchus Complex laceration, transection, avulsion of distal bronchus	Complex laceration, transection, avulsion of principal bronchus	
Diaphragm		Contusion/hematoma of diaphragm	Ruptured diaphragm ≤10 cm	Ruptured diaphragm with herniation Ruptured diaphragm >10 cm		
Esophagus		Contusion/hematoma of esophagus	Partial laceration <50% circumference Ingestion of caustic agents with partial necrosis	Laceration with perforation >50% circumference of esophagus Ingestion of caustic agents with complete necrosis	Complex laceration, transection, avulsion of esophagus	
Heart	Minor contusion (without acute dysfunction)	Laceration/puncture of pericardium	Laceration without perforation of chambers Laceration of pericardium with hemopericardium (without tamponade or heart damage)	Major contusion (acute dysfunction) Laceration of pericardium with tamponade (without heart damage)	Atrial rupture/burst Ventricular/atrial perforation Valve/septal/chord rupture Laceration of pericardium with herniation	Cardiac avulsion Laceration with Ventricular burst

	1	2	3	4	5	6
Lungs		Minor pulmonary contusion (unilateral) <sup>d</sup> Inhalation damage without erythema, edema, bronchorrhea or obstruction	Mild pulmonary blast Minor pulmonary laceration (unilateral) <sup>d</sup> Minor pulmonary contusion (bilateral) <sup>d</sup> Major pulmonary contusion (unilateral) <sup>e</sup> Inhalation damage with mild erythema	Blast (uni-/bilateral) with alveolar hemorrhage Minor pulmonary laceration (bilateral) <sup>d</sup> Major pulmonary laceration (unilateral) <sup>e</sup> Major pulmonary contusion (bilateral) <sup>d</sup> Inhalation damage, erythema, bronchorrhea	Severe pulmonary blast injury (bilateral) Major pulmonary laceration <sup>d</sup> (bilateral) Inhalation damage with severe inflammation, obstruction and hypoxemia	Inhalation damage with necrosis, detachment and obliteration at bronchial level
Thoracic cavity		Pneumothorax Hemo-/pneumo-mediastinum Laceration of the thoracic duct	Hemothorax/ hemo-pneumothorax Pneumome diastinum with tamponade	Pneumothorax >50% or persistent leakage Hemothorax >1000 cc	Tension pneumothorax Air embolism	
Trachea			Tracheal contusion/hematoma Laceration without tracheal perforation	Laceration with complete tracheal perforation	Complex laceration, transection, avulsion of trachea	
Osteoarticular	Costal/sternal contusion. Rib fracture	Fracture of 2 ribs Sternal fracture	Unstable thorax (unilateral) 3-5 ribs Fracture of $\geq 3$ ribs	Unstable thorax (unilateral) >5 ribs	Unstable thorax (bilateral)	
Dorsal spine						
Nerves	Contusion/avulsion of a nerve	Laceration/avulsion of multiple nerve roots				
Spinal cord			Spinal cord damage with transient symptoms	Incomplete spinal cord damage	Complete spinal cord damage	
Bones		Disk herniation without radiculopathy Joint luxation (unilateral) Simple/multiple vertebral fracture	Disk herniation with radiculopathy Joint luxation (bilateral) Vertebral collapse >20% height			

<sup>a</sup> Code in skin.

<sup>b</sup> Minor vascular laceration: superficial/intimal, without affecting entire circumference and with bleeding <20%.

<sup>c</sup> Major vascular laceration: rupture of entire circumference, complete transection and with bleeding >20%.

<sup>d</sup> Minor lung contusion/laceration: involvement of less than one lobe, without increase in O<sub>2</sub> (A-a) gradient.

<sup>e</sup> Major lung contusion/laceration: involvement of one or more lobes, or hypoxemia, or increase in increase in O<sub>2</sub> (A-a) gradient.

## B.4. Abdomen

	1	2	3	4	5	6
<b>Abdomen</b>						
<i>Whole area</i>	Abrasion/ contusion/minor laceration <sup>a</sup>	Penetrating trauma damage >100 cm <sup>2</sup> Major laceration >20 cm <sup>a</sup> Major avulsion >100 cm <sup>2a</sup> Rupture of <i>rectus abdominalis</i> muscle	Penetrating trauma with bleeding >20% Laceration/avulsion with bleeding >20%			Transection of trunk
<i>Vessels</i>			Minor laceration <sup>b</sup> of iliac art. (common, internal or external)/sup. mesenteric art./common iliac vein/vena cava/other minor art. or veins (renal, hepatic, splenic) Celiac trunk intimal damage	Minor laceration <sup>b</sup> of aorta/celiac trunk Major laceration <sup>c</sup> iliac artery (common, internal or external)/sup. Mesenteric art./common iliac vein/vena cava/other minor art. or veins (renal, hepatic, splenic, etc.) Common iliac artery damage (bilateral)	Major laceration <sup>c</sup> of aorta/celiac trunk	
<i>Nerves</i>	Vagus nerve damage					
<i>Internal organs</i>						
<i>Adrenal glands</i>	Contusion/minor laceration	Contusion/major laceration >2 cm	Massive damage, destruction >50%			
<i>Anus</i>	Contusion/ hematoma	Partial laceration (without perforation)	Perforation of full thickness	Massive laceration, avulsion		
<i>Bladder, ureter, perineal region</i>	Bladder contusion Contusion/minor laceration of perineal region	Extraperitoneal laceration ≤2 cm Laceration without perforation bladder/ureter Major laceration perineal region. Ureteral contusion	Intra- /extraperitoneal rupture >2 cm Perforation, rupture of ureter Massive laceration, avulsion of perineal region	Massive bladder laceration, avulsion affecting trigone or neck		



	1	2	3	4	5	6
Colon, rectum		Contusion/laceration without perforation of the rectum/colon	Laceration with perforation <50% circumference, of the rectum, >50% circumference of the colon	Laceration with perforation >50% circumference, with extension to perineal region Laceration with transection of colon	Massive laceration, avulsion of rectum	
Duodenum		Disruption <50% circumference Contusion/laceration without perforation	Disruption 50–75% circumference of portion D2 Disruption >50% of portion D1, D3 or D4	Laceration with disruption >75% circumference D2 (affecting ampoule or distal portion of choledochus)	Massive laceration, avulsion, devascularization	
Gallbladder		Contusion/laceration without affecting cystic duct	Massive laceration + cystic duct	Massive laceration + cystic + (choledochus/hepatic)		
Small bowel		Contusion/laceration without perforation	Laceration with perforation of full thickness	Massive laceration, avulsion, devascularization		
Kidney		Laceration ≤1 cm of cortex Subcapsular contusion ≤50%	Laceration >1 cm of cortex (not collector system) Subcapsular contusion >50%	Laceration cortex + medulla + collector system + vessels Renal rupture	Total avulsion of renal hilum	
Mesenterium		Contusion/minor laceration	Major laceration with bleeding >20%	Massive laceration, avulsion of mesenterium		
Uterus, ovary	Contusion/laceration ≤5 cm of ovary	Contusion/laceration ≤1 cm of uterus Laceration >5 cm of ovary	Laceration >1 cm. <i>Abruptio placentae</i> ≤50%	Major laceration+uterine art. <i>Abruptio placentae</i> >50%	Rupture, avulsion. <i>Abruptio placentae</i>	
Urethra, testes, Prostate, penis,	Contusion/minor laceration penis/testes Prostate gland contusion	Laceration without perforation urethra/prostate Major laceration penis/testes/scrotum/perineal region. Urethral contusion	Laceration prostate without urethral involvement Laceration with transection of urethra >2 cm			

	1	2	3	4	5	6
Spleen		Superficial laceration $\leq 2$ cm Subcapsular contusion $\leq 50\%$ /parenchyma $\leq 5$ cm	Laceration $>3$ cm without vascular/segmental damage Subcapsular contusion $>50\%$ /parenchyma $>5$ cm	Major laceration with vascular involvement and devascularization $>25\%$	Massive laceration, avulsion, hilar destruction, devascularization	
Liver		Laceration $\leq 3$ cm depth/ $\leq 10$ cm length Subcapsular contusion $\leq 50\%$ /parenchyma $\leq 10$ cm	Laceration $>3$ cm depth/major duct involvement Subcapsular contusion $>50\%$ /parenchyma $>10$ cm	Parenchymal laceration $\leq 75\%$ of one/multiple lobes laceration $>3$ cm in depth/Hepatic rupture	Parenchymal laceration $>75\%$ of 1 lobe/ $>3$ segments ( <i>Couinaud</i> classification) of 1 lobe/ involvement of vena cava or hepatic veins	Hepatic avulsion
Stomach		Contusion/laceration without perforation	Laceration with perforation of full thickness	Massive laceration, avulsion, devascularization		
Vagina, vulva	Contusion/superficial laceration	Deep laceration extending to muscle	Massive laceration, avulsion of vagina/vulva			
<b>Lumbar spine</b>						
<i>Nerves</i>	Contusion/avulsion of a nerve	Laceration/avulsion multiple nerve roots				
<i>Spinal cord</i>			Spinal cord damage with transient symptoms	Incomplete spinal cord damage	Complete spinal cord damage	
<i>Bones</i>		Disk herniation without radiculopathy Joint luxation (unilateral) Simple/multiple vertebral fracture	Disk herniation with radiculopathy Joint luxation (bilateral) Vertebral collapse $>20\%$ height			

<sup>a</sup> Code in skin.

<sup>b</sup> Minor vascular laceration: superficial/intimal, without affecting entire circumference and with bleeding  $<20\%$ .

<sup>c</sup> Major vascular laceration: rupture of entire circumference, complete transection and with bleeding  $>20\%$ .

## B.5. Extremities

	1	2	3	4	5
<i>Upper extremities</i>					
Whole area	Amputation/crush finger/s 2–5 Minor/superficial penetrating trauma Abrasion/erosion/minor laceration <sup>a</sup> Avulsion <25 cm <sup>2</sup> hand/<100 cm <sup>2</sup> rest of extremity <sup>a</sup>	Amputation/crush hand/finger 1. Compartmental syndrome Degloving of a part of the extremity Penetrating trauma injury >25 cm <sup>2</sup> , without bleeding >20% Laceration >10 cm in hand/>20 cm rest of extremity <sup>a</sup> Avulsion >25 cm <sup>2</sup> hand/>100 cm <sup>2</sup> rest of extremity <sup>a</sup>	Amputation/crush between wrist and elbow Degloving of the entire extremity Penetrating trauma above elbow and bleeding >20% Laceration/avulsion with bleeding >20%	Amputation/crush above elbow	
Vessels	Minor laceration <sup>b</sup> brachial vein/other art./veins with bleeding <20%	Minor laceration <sup>b</sup> axillary/brachial art./axillary vein bleeding <20%	Major laceration <sup>c</sup> art./vein with bleeding >20%		
Nerves	Contusion median/radial/cubital	Laceration/avulsion of median/radial/ulnar			
Muscles, tendons, ligaments	Damage of muscle/tendon/ligament				
Joints	Luxation carpal/metacarpophalangeal/interphalangeal Spraining/subluxations	Luxation sternoclavicular/acromioclavicular/shoulder/wrist/open head of radius			
Bones	Phalangeal fracture	Clavicular/scapular/humeral/ulnar/radial/carpal/metacarpal fracture	Open fracture + (comminuted/articular) of humerus/ulna/radius		

	1	2	3	4	5
<i>Lower extremities</i>					
Whole area	Minor/superficial penetrating trauma Abrasion/erosion/minor laceration <sup>a</sup> Avulsion <100 cm <sup>2a</sup>	Amputation/crush of foot (total or partial) Compartmental syndrome without muscle necrosis Degloving of a part of the extremity Penetrating trauma injury >25 cm <sup>2</sup> , bleeding <20% Laceration >20 cm/avulsion >100 cm <sup>2</sup> , bleeding <20% <sup>a</sup>	Amputation/crush between ankle and knee Degloving of the entire extremity Penetrating trauma above knee with bleeding >20% Laceration/avulsion with bleeding >20% Compartmental syndrome with muscle necrosis	Amputation/crush above knee	
Vessels	Minor laceration <sup>b</sup> of other art./veins distal to knee	Minor laceration <sup>b</sup> of popliteal art./popliteal/femoral vein	Major laceration <sup>c</sup> art./vein with bleeding >20% Minor laceration <sup>b</sup> of femoral art.	Major laceration <sup>c</sup> femoral art. with bleeding >20%	
Nerves	Contusion/laceration of digital nerve	Contusion sciatic/popliteal/tibial/fibular nerve Laceration popliteal/tibial/fibular nerve	Laceration of sciatic nerve (complete or incomplete)		
Muscles, tendons, ligaments	Partial muscle disruption	Laceration tendon/ligament Complete muscle disruption			
Joints	Luxations of the foot. Subluxations/spraining	Luxation of hip/knee/ankle			

	1	2	3	4	5
Bones	Phalangeal fracture	Pelvic fracture without posterior ring involvement Closed acetabular fracture. Closed tibial fracture Fibular fracture. Patel- lar/astragalar/ calcaneal/navicular/ wedge/cuboid/ metatarsal fracture	Open pelvic fracture (stable ring) Open acetabular fracture. Femoral fracture Open tibial fracture. Open, bi-malleolar fibular fracture	Pelvic ring fracture (complete or incomplete) with bleeding <20%	Pelvic ring fracture (complete or incomplete) with bleeding >20%

<sup>a</sup> Code in skin and soft tissues:

- Isolated skin damage (without underlying disease) is counted for calculation of the ISS in the region of the skin and soft tissues.  
- Skin damage occurring associated to other injuries is coded in the corresponding region, except open fractures, which are coded in the corresponding region and skin damage in the region of the skin and soft tissues.

<sup>b</sup> Minor vascular laceration: superficial/intimal, without affecting entire circumference and with bleeding <20%.

<sup>c</sup> Major vascular laceration: rupture of entire circumference, complete transection and with bleeding >20%.

## B.6. Skin and soft tissues

	1	2	3	4	5	6
Skin	Abrasion/ contusion/ laceration/ avulsion					
Freezing	1 st grade, superficial	Deep, full skin thickness	Deep, full skin thickness, multiple locations			
Burns	1st grade any affected body surface area 2nd grade <10% 3rd grade <100 cm <sup>2</sup> (face ≤25 cm <sup>2</sup> )	2nd or 3rd grade of 10–19% affected body surface area 3rd grade >100 cm <sup>2</sup> to ≤10% (face >25 cm <sup>2</sup> )	2nd or 3rd grade of 20–29% affected body surface area	2nd or 3rd grade of 30–39% affected body surface area	2nd or 3rd grade of 40–89% affected body surface area	2nd or 3rd grade ≥90% affected body surface area
Asphyxia			Without neurological defect	With neurological defect	With cardiac arrest documented by medical personnel	
Drowning			Near-drowning without neurological defect	Near-drowning with neurological defect	With cardiac arrest documented by medical personnel	
Electrical injury (high voltage)			With muscle necrosis		With cardiac arrest documented by medical personnel	

In addition to the injuries described here, code in skin and soft tissues:

- Isolated skin damage (without underlying disease) is counted for calculation of the ISS in the region of the skin and soft tissues.

- Skin damage occurring associated to other injuries is coded in the corresponding region, except open fractures, which are coded in the corresponding region and skin damage in the region of the skin and soft tissues.

## Annex C. Definition of complications upon admission and during stay in the Intensive Care Unit.

- *Hemodynamic situation upon admission*
- *Stable*: systolic blood pressure >90 mmHg during initial trauma care.
- *Unstable, restored with volume replacement*: presentation of systolic blood pressure <90 mmHg, requiring only volume replacement (crystalloids or colloids) for normalization.
- *Shock*: presentation of blood pressure <90 mmHg requiring volume replacement, blood products and vasoactive drug support for normalization.
- *Refractory shock*: presentation of hypotension refractory to volume replacement measures (crystalloids or colloids), blood products or vasoactive drug support. Activation of massive bleeding protocol at time of initial care.
- *Coagulopathy*: Prolongation of the prothrombin and activated partial thromboplastin times to over 1.5 times the control values, or fibrinogen <150 mg/dl or thrombocytopenia (<100,000) at determination in the first 24 h after admission.
- *Rhabdomyolysis*: laboratory test determination of CPK >5000 U/L.
- *Respiratory dysfunction*: presence of PO<sub>2</sub>/FiO<sub>2</sub> during admission <300.
- *Early multiorgan failure syndrome*: defined as involvement of two or more organs with score of ≥3 on the Sequential-related Organ Failure Assessment (SOFA) scale in the first 72 h after trauma.
- *Late multiorgan failure syndrome*: defined as involvement of two or more organs with score of ≥3 on the SOFA scale beyond the first 72 h after trauma.
- *Intracranial hypertension*: intracranial pressure increase of >20 mmHg, maintained for at least 5 min, and requiring guided management.
- *Renal failure*: creatinine elevation of ≥1.5 times the initial value, reduction of glomerular filtration rate by 25% or more, and lowering of urine flow to under 0.5 ml/kg/h during 6 h or more.
- *Nosocomial infection*: infection acquired in hospital, with the development of symptoms beyond 48 h of admission.

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