

APPLICABILITY OF THE ABBREVIATED INJURY SCALE IN FORENSIC MEDICAL PRACTICE IN BULGARIA

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ABSTRACT

INTRODUCTION: The present study offers a detailed analysis of the principles of the American system for trauma classification AIS (Abbreviated Injury Scale) and tests the possibility of its application in the field of forensic-medicine in Bulgaria, where currently traumas are classified according to the experts' subjective judgments.

MATERIALS AND METHODS: For the purposes of the study, expert reports have been used by 20 Bulgarian forensic doctors, written between 2009 and 2013, describing at least one temporarily life-threatening trauma. The severity of the traumas was evaluated according to AIS by the authors.

RESULTS: The comparison between the reports and the results of AIS indicates that the scale is applicable for forensic medical purposes and in determining life-threatening conditions. At the same time, differences have been discovered between the medico-biological qualifications of the Bulgarian experts regarding the same trauma; apparently as a result of the ambiguous wording of the Bulgarian Penal Code (unchanged since 1896).

CONCLUSION: These differences accentuate the need for accepting a unified method of evaluating trauma severity. Taking such a step would dramatically improve the quality of Bulgarian forensic-medical reports.

Keywords: *abbreviated injury scale, life threatening trauma, severity*

INTRODUCTION

It is crucial for forensic science to establish objective criteria for scaling the severity of health impairments. In Bulgaria there is a lack of official legal rules that clearly regulate the medico-biologi-

cal qualifications of injuries. Similarly, in European countries like France, Germany, Hungary etc. the process of determining the severity of traumas is entirely based on the doctors' subjective view. This may lead to conflicting conclusions on the same trauma by different experts.

Since European countries' traditions in forensic practice do not offer a solution to this problem, the methods of grading injury severity for medical or general healthcare purposes are analyzed. It is found that one of the most widespread systems of grading trauma severity is AIS (Abbreviated Injury Scale). It is developed in the USA and the 2008 update of AIS 2005 is used in the present paper (1).

AIS is a specific classification system based upon anatomic description of the tissue damages.

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Nowadays it is widely applied in trauma registries in numerous countries around the world.

Some of its basic principles are as follow:

- ❖ Trauma description is based on anatomic principles and not on physiological or functional principles;
- ❖ Each trauma gets an independent evaluation;
- ❖ Evaluating the severity of the trauma is independent of the time at which it has occurred;
- ❖ The evaluation reflects the severity of the trauma and not its long-lasting effects;
- ❖ The evaluation reflects the severity for a healthy individual;
- ❖ The evaluation reflects the effect of the trauma on the whole body.

The AIS code has two components: (1) a description of the trauma (often called the code “before the dot”) which is a unique digit code for each trauma in the system; (2) evaluation of severity (called the code “after the dot”). The severity varies between 1 and 6. AIS 1 is considered a minimal trauma, AIS 2 – moderate, AIS 3 – serious, AIS 4 - severe, AIS 5 – critical and AIS 6 – maximal (incurable to this time). The evaluation is determined mainly by the following:

- ❖ Threat for life;
- ❖ Risk of death – theoretical, expected, actual;
- ❖ Amount of the energy applied/taken in;
- ❖ Hospitalisation and need for intensive treatment;
- ❖ Duration of hospital treatment;
- ❖ Expenses for treatment;
- ❖ Complexity of treatment;
- ❖ Temporary or permanent disability;
- ❖ Permanent handicap;
- ❖ Quality of life.

An analysis of AIS was undertaken to determine the correlation between the AIS severity score and the rate of survival/death (1). The investigation included data of 474 025 patients, having undergone 1 291 191 traumas, from the American national database of traumas. Survival risk ratios were determined for each type of trauma and represent the number of patients who survived, divided by the number of patients who sustained the same trauma. One of the conclusions based on all the traumas is that there

is an excellent correlation between the AIS severity score and the survival rate (1):

- ❖ grade 1, survival rate 0.993
- ❖ grade 2, survival rate 0.992
- ❖ grade 3, survival rate 0.965
- ❖ grade 4, survival rate 0.854
- ❖ grade 5, survival rate 0.604
- ❖ grade 6, survival rate 0.210

At the moment AIS is the most widely used and accepted scale based on anatomic description of traumas, and its reliability and validity have been proven in numerous independent investigations.

PURPOSE

The purpose of this study is to evaluate the applicability of AIS in the forensic medical practice in Bulgaria in relation to life-threatening trauma and more concretely:

- ❖ to assess the possibilities for coding of life threatening traumas with the AIS system;
- ❖ to assess which severity AIS codes correspond to (temporary and permanently) life-threatening traumas according to the Bulgarian medico-biological qualifications.

MATERIALS AND METHODS

The current study is based on the work of 20 experts from 8 (out of 28 in total) regional centers of forensic medicine in the country. Every expert made available their medical specialists' reports on written data for a five-year period 2009-2013. The total number of reports reached 12 428. Out of this pool we selected all the reports in which at least one of the traumas was qualified as life-threatening (permanent global life-threatening health impairment or temporary life-threatening health impairment). The reported medico-biological qualifications of the traumas by the forensic experts were compared with the evaluations based on AIS. According to the Penal Code of Bulgaria a life-threat is regarded as:

- ❖ Severe bodily injury – “Permanent global life-threatening health damage” when the life-threatening condition is continuous and long-term.
- ❖ Medium bodily injury – “Temporary life threatening health damage” when the life-threatening condition is short-term and can be over-

come without medical intervention (e.g. brain concussion) (2).

An association between the experts' medico-biological qualification of life-threatening conditions (according to the Bulgarian criteria) and the severity code according to AIS was assessed with non parametric tests. The data was processed using SPSS.

RESULTS

In the total of 1 147 medical reports, 1 305 traumas were described as life-threatening. The number of traumas is higher than the number of reports, because in some of them more than one trauma qualified as life-threatening. Out of the 1 305 life-threatening traumas – 1 108 (84.90 %) qualified as temporarily life-threatening and 197 (15.10 %) as permanently life-threatening.

tween the minimal grade 1 and the maximal grade 6 according to AIS. (Table 1)

It must be noted that traumas scored as minimal (AIS 1) and moderate (AIS 2) are a small proportion (15.00 %) of all traumas considered temporary life-threatening. The majority of them (96 cases) are “brain concussion, accompanied by a total loss of consciousness” accepted by experts as temporarily life-threatening in accordance with a sublegislative document of the Supreme Court of the Republic of Bulgaria, stating them to be a “temporary life-threatening health impairment” (3). However, according to AIS they are graded as minimal (AIS 1) or moderate (AIS 2). If brain concussions are excluded, the remaining minimal and moderate traumas are barely 5.60 % of all the cases qualified as temporary life-threatening health impairment.

Table 1. Frequency of AIS severity scores by the type of medico-biological qualification of traumas

BG Medico-biological qualification of traumas	AIS Severity Score						Total
	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
1. Temporary life-threatening	9 (0.81)	150 (13.54)	614 (55.42)	229 (20.67)	104 (9.39)	2 (0.18)	1108 (100.00)
2. Permanent global life-threatening	0 (0.00)	0 (0.00)	46 (23.47)	80 (40.82)	67 (34.18)	3 (1.53)	196 (100.00)
Total	9 (0.69)	150 (11.50)	660 (50.61)	309 (23.69)	171 (13.11)	5 (3.83)	1304 (100.0)

AIS allowed the evaluation of all the traumas included in the study, but it was not applicable for evaluating resulting complications such as traumatic epilepsy, traumatic pneumonia, peritonitis etc. One of the permanently life-threatening traumas qualified as such by the Bulgarian expert was not possible to be coded for severity with the AIS classification. This was a case of post-traumatic epilepsy and there is no code in AIS for such a condition. Thus, 196 permanently life-threatening cases were further included and analyzed.

When comparing the Bulgarian medico-legal qualification of the reported traumas to their corresponding grades on AIS, the following was discovered:

- ❖ Traumas, qualified as “temporary life-threatening health impairment” vary in severity be-

- ❖ The traumas qualified as “permanent global life-threatening health impairment” are 15.10% of all the life-threatening traumas. Their severity varies between serious (AIS 3) and maximal (AIS 6). The majority of permanent life threatening traumas fall into grades 4 (severe) and 5 (critical) according to AIS (Table 1).

DISCUSSION

The analysis of the data suggests that AIS is an applicable objective system which allows for evaluation of traumas' severity in forensic medical practice.

Based on the results it can be claimed that AIS can be used to distinguish life-threatening conditions. Those traumas graded between 3 and 6 according to AIS can be considered as “life threatening”. Similar results have been obtained by Günay Y et al. as to the possibilities of applying this system

in accordance with the legislation of the Republic of Turkey (4).

At the same time it is difficult to use AIS in order to differentiate between permanent and temporarily life-threatening traumas as described by the Bulgarian legislation. We consider that the current wording of the Bulgarian Penal Code (existing with no changes since 1896) (5) allows for contradictory interpretations of the severity of injuries and hence to variation in medico-biological qualifications as well as other authors (6,7). This is particularly well exemplified by our results, showing that equally severe traumas according to AIS are evaluated differently by different experts, either as temporally or permanently life-threatening.

CONCLUSION

Imposing a unified method of trauma severity evaluation, based on objective and standardized criteria, is possible and will lead to a dramatic improvement of the quality of forensic medical specialists' reports and hence improvement of the quality of work in the judiciary system of Bulgaria and other countries from the European Union. For Bulgaria this should be coupled with changes in the Penal Code and other legal documents.

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