

Correlation between AIS-coded injury severity and injury severity classified by the NACA score

Kai-Uwe Schmitt, Kerstin Furter, Markus Muser

I. INTRODUCTION

In line with policy approaches such as the EU Vision 2020, persons seriously injured in traffic accidents are currently the focus of attempts to improve injury severity recordings in accident data. Member States of the European Union, as well as associated States, are asked to use the Abbreviated Injury Scale (AIS) to report the number of road users seriously injured. Serious injuries in terms of maximum AIS3+ (MAIS3+) are of particular concern. At present there is no general agreement on how such data should be derived, which means different approaches are being followed, including linking accident statistics to hospital statistics. The use of such data is not possible in all countries, however, for example because of restrictions related to privacy of data. In Switzerland, linking hospital to accident data is possible, but the hospital data only becomes available after a delay of about two years [1-2].

National accident statistics are usually based on data recorded by the police. Generally, such data also includes police-reported estimates of the injury severity of accident victims. While the number of traffic fatalities is usually reliable in police-recorded data sets, information on the number of surviving casualties and the severity of their injuries is of a lesser quality.

Besides the AIS code, various other classification schemes are available to score injury severity [see, for example, 3]. One other scheme to classify injury severity, as well as the potential need for an intervention, was issued by the National Advisory Committee for Aeronautics (NACA), predecessor of the National Aeronautics and Space Administration (NASA), and is used by rescue services [4-5]. The NACA score consists of seven different levels, ranging from NACA1 (minor injury) to NACA5 (life-threatening injury), NACA6 (reanimation) and NACA7 (death). In practice, the NACA score is sometimes also linked to additional medical aspects, such as the demand for an emergency doctor on-site or the use of blue flashing lights and sirens by the paramedic crew.

Today, the NACA score is defined and recorded by the rescue services, as is the case in Switzerland. It is not recorded in the police reports, however, and thus is not included in the accident statistics. Given that the NACA score is an overall injury severity rating that does not include any specific diagnosis, the privacy of data would not be violated if this score were communicated between the rescue service and the police. This is an important point since it would allow the police to specifically ask the rescue service for this code and to include it in the national accident statistics. Consequently, the injury severity score was determined by medical staff and was thus more reliable than if the police had rated the injury severity. This study will therefore investigate the correlation between NACA and AIS scores reported in traffic accidents.

II. METHODS

Building on previous work, Swiss national hospital data for the years 2011 and 2012 were used to identify individuals who were admitted to hospital after a traffic accident [2]. The national hospital statistics record only those persons who were treated as inpatients. The available data includes all diagnoses of the patient coded in ICD-10-GM (German version of the International Classification of Diseases). In this study, only diagnoses related to an injury were considered, i.e. only diagnoses covered by the ICD categories "S" and "T". For all cases in which an injury was reported, the available ICD code was translated into an AIS code using a previously developed ICD-AIS-translator [1-2]. In a final step, the MAIS for each patient was established.

In addition, data were obtained from the major Swiss rescue services. The services of the cantons of Ticino and St Gallen, as well as the service of the city of Zurich, provided data covering all cases related to traffic accidents; these data included the NACA code.

The correlation between AIS and NACA was assessed based on these two data sets.

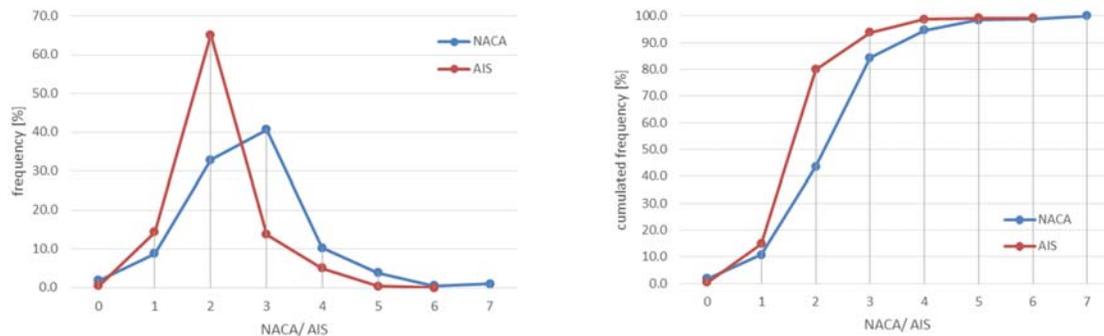


Fig. 1. Frequency of MAIS and NACA scores for persons injured in traffic accidents.

III. INITIAL FINDINGS

While the national hospital statistics identified 31,898 patients who were treated after a traffic accident, there were 3,442 cases available from rescue services, i.e. cases with a NACA code. Figure 1 shows the distribution of MAIS and NACA, respectively. The vast majority of injuries sustained by hospital patients were rated MAIS2; while MAIS3+ injuries accounted for approx. 20% of cases. In comparison, NACA2 and NACA3 were most common; approx. 16% of all cases were scored NACA4+. The evaluation was repeated for head injury only and very similar results were obtained. Focusing on MAIS3+ injuries, it was found that the number of MAIS3+ injuries increases with increasing NACA score. While there was no MAIS3+ case in the sub-sample of NACA1 cases, all NACA6 cases were MAIS3+ injuries (Fig. 2). For head injury only, the data showed that there was no MAIS3+ head injury in NACA1 and NACA2 cases, few in the NACA3 group, approx. 25% in the NACA4 group, but over 60% in the NACA5 category.

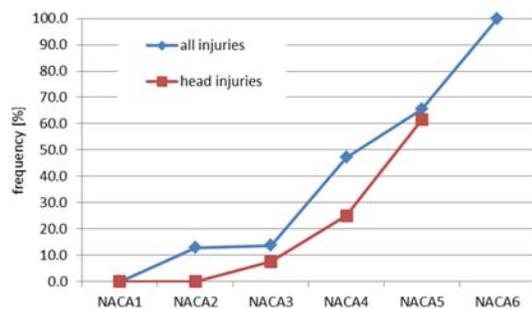


Fig. 2. Frequency of MAIS3+ in different NACA classes for all cases (blue) and head injury only (red). The sample did not include a MAIS6 head injury.

IV. DISCUSSION

The analysis of MAIS and NACA scores in traffic accident casualties indicated that it is reasonable to assume that MAIS3+ injuries correspond to NACA4+ injuries. Although the two injury severity ratings have different origins and are based on different systematics, there is a good overall agreement between them, which would allow – for statistical purposes – the identification of the expected number of MAIS3+ cases based on NACA scores. Given the practical difficulties of establishing AIS scores on-site, as well as doing so retrospectively, it seems a reasonable possibility to identify seriously injured persons based on a standardised coding system used by rescue services. Using the NACA score as a basis for police-recorded injury severity might be an

appropriate option to enable the estimation and monitoring of the frequency of MAIS3+ injuries. However, while the NACA score seems capable of an overall approximation of MAIS3+ injuries, there might be differences when looking at individual types of injury. While the exponential increase of the number of MAIS3+ head injuries with increasing NACA score is plausible, more analysis is needed to examine the correlation between AIS and NACA for other body regions.

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VI. REFERENCES

- [1] Schmitt, K-U. *et al.*, IRCOBI, 2014.
- [2] Schmitt, K-U. *et al.*, 24th ESV Conf., Paper No. 15-0323, 2015.
- [3] Chawda, M. *et al.*, *Injury, Int. J. Care Injured*, 2004.
- [4] Weiss, M. *et al.*, *Anaesthesist*, 2001.
- [5] Raatiniemi, L. *et al.*, *Acta Anaesthesiol Scand*, 2013.