Developing a scheme to report AIS-coded injury severity for Swiss traffic accident data

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I. INTRODUCTION

National accident statistics in European countries as well as in many other countries are based on data recorded by the police. Generally, such data also include police reported estimates of the injury severity of accident victims. While the number of traffic fatalities is usually very reliable, information on the number of surviving casualties and the severity of their injuries is of a lesser quality. Latest policy approaches such as the EU Vision 2020, however, shift the focus from fatalities to the seriously injured. To formulate reasonable targets for reducing the number of persons seriously injured in traffic accidents, detailed information on the injury severity is needed for assessing the status quo as well as for monitoring the progress. Recent approaches to improve the data basis therefore call for a classification of injury severity using the Abbreviated Injury Scale (AIS). Serious injuries in terms of MAIS3+ are of particular concern. While there is currently no general agreement on how such data should be derived, different recommendations are available (see e.g. [1]).

In this study an approach to combine Swiss national accident data and hospital data was explored [2]. AIS codes were derived based on available ICD data. Similar approaches were already performed in the past (e.g. [3-5]), but are not available for standard use. This study thus highlights the need for international harmonisation of methods by which AIS data should be established if comparable data is to be obtained.

II. METHODS

Using data for 2011, hospital data were matched with the Swiss national traffic accident data base. As there is no unique identifier that allows matching the personal data, different criteria (such as age, postal code) were used to link the two data sets. The hospital data include different medical information including up to 8 diagnostic codes per person but only persons who were treated in hospital for at least 24h are recorded. The German version of ICD10 was used for the hospital data. The accident data base is established by the police forces using a standardised report.

An algorithm was developed to derive AIS codes (version AIS 2005) based on the available ICD codes. Only ICD codes of chapter 19 (injuries) were considered. The algorithm automatically derives AIS codes for all given ICD codes and then determines the patient's maximum AIS (MAIS) and the corresponding body region. Since not all ICD codes correspond to an unique AIS code, a decision tree was implemented also considering further medical information (such as need for intensive care) to derive the AIS codes. Generally a conservative approach was implemented; in cases where one ICD code corresponded to two possible AIS codes, the lower AIS code was chosen, i.e. the true injury severity was at least the chosen AIS code. ICD chapter 19 consists of 2026 diagnoses of which 1204 were regarded relevant in the context of transport accidents. Of these 1204 entries only 480 correspond to one unique AIS code. 215 diagnoses can be transferred to a set of AIS codes of the same severity (e.g. an ICD describing a fracture can correspond to several entries in the AIS dictionary all having the same code). Consequently these 215 diagnoses result in the same AIS. For a further 229 ICD codes several options of AIS coding exist where the difference of these AIS codes is only 1. The remaining 280 ICD codes can be mapped to AIS codes of different severity (e.g. the ICD code for concussion can correspond to AIS codes ranging from AIS1 to AIS5 depending on the duration of unconsciousness which is not included in the ICD and hence unknown in the data set). Particularly the differentiation between AIS2 and AIS3 is important to obtain the number of MAIS 3+ victims. Therefore, an additional AIS category called AIS3+ was introduced reflecting an ICD code that cannot be transferred to a unique AIS, but that all possible AIS codes are AIS3– AIS6.

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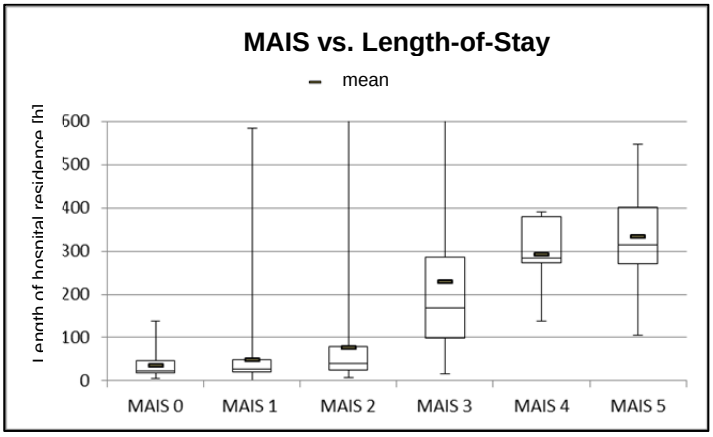

Fig. 1: Correlation of MAIS vs. length-of-stay at hospital.

Table 1: Number of cases available in the 2011 data sets

Injury severity according to police data	Number of cases in traffic accident data base	Number of these cases which were found in hospital data (ICD available)
not injured	83'510	321
minor injuries	18'805	1'898
severe injuries	4'437	2'022
died on the spot	195	0
died within 30 days	125	35
unknown	6'168	1
total	113'240	4'277

III. INITIAL FINDINGS

To date ICD-to-AIS mapping was completed for traffic accident and hospital data for the year 2011. A total of 113'240 traffic accidents with 23'242 persons that sustained minor or severe injuries were recorded during that period (Table 1). In the hospital data 4'277 cases were identified that could be mapped to a traffic accident. Thus 2'887 cases were identified with both MAIS codes and linked accident data (Tables 1 and 2).

Significant differences between police recorded injury severity and ICD-based AIS codes can be observed. Police officers often overestimated the injury severity (police officer's rating false positive), but in some cases persons regarded as not injured were found in the hospital data (false negative) as well. Correlating the AIS codes and the length-of-stay at hospital shows a remarkable increase in duration between AIS2 and AIS3 (Fig. 1).

Table 2: MAIS codes that could be derived based on the available ICD data

MAIS	Number of cases based on ICD codes
0	14
1	596
2	1'131
3	357
3+	456
4	6
5	19
6	1
unknown	307
total	2'887

IV. DISCUSSION

The investigation of causes of serious injuries sustained in traffic accidents requires more detailed information regarding injury severity. Reporting MAIS codes instead of injury severity as quantified by the police is reasonable. In line with previous studies it was shown that mapping hospital data to accident records and transferring ICD to AIS does result in a more detailed picture.

However, the development of a corresponding algorithm requires various assumptions and strategies and depends on national characteristics (such as the version of ICD used). Standardised procedures are currently not available. For the comparison of AIS data from different countries, it is, however, important to obtain these codes in a consistent manner. An international approach to harmonise the establishment of AIS codes seems therefore desirable.

With regard to Switzerland this study represents the first attempt to determine AIS codes for the classification of injuries sustained in traffic accidents. The additional information gained allows more detailed analysis of accident outcome and is thus of importance for policy making and the development of measures to prevent injury.

V. REFERENCES

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