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The impact of public *versus* private insurance on trauma patients

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ABSTRACT

Background: The socioeconomic status has been associated with disparities in the incidence and mortality of traumatic injuries. However, there is a lack of studies on the level of health insurance with regard to various epidemiologic data of traumatic injuries, which this study opted to clarify.

Materials and methods: All consecutive 6595 patients admitted to a level one trauma center in 2012 and 2013 were included in this retrospective cohort study. Patients were grouped according to their health insurance status (public *versus* private extended health care insurance) and compared with regard to several epidemiologic variables, that is, the type of injuries, inhospital outcome, and surgical procedures.

Results: Public insurance coverage was significantly more common than private insurance (75% *versus* 25%). Public insurance was associated with younger age, male sex, transfers to another hospital or mental institution, head concussions, head fractures, and increased mortality. Contrarily, patients with private insurance were more often associated with longer hospital stay, discharge to a rehabilitation clinic, fractures of the proximal humerus, and shoulder dislocations. However, there were no significant differences for the remaining majority of studied variables.

Conclusions: In a trauma setting, the level of insurance does not seem to play a crucial role in most types of injuries and surgical procedures in a country with a high level of obligatory health care coverage. Nonetheless, it appears that publicly insured patients are more commonly younger, males, transferred to another hospital more often, more prone to head trauma, and subject to increased mortality, whereas privately insured patients show longer hospital stays, increased transfers to rehabilitation clinics, and more fractures of the proximal humerus.

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1. Introduction

Traumatic injuries due to accidents and violence are one of the most common causes of death in Switzerland [1] and around the world [2], where they account for about 5.8 million deaths each year [3]. Most of them are caused by a fall (40.7%) or motor vehicle traffic accident (28.1%). Furthermore, males and the head are often affected.

Health care insurance has been compulsory for all residents of Switzerland since the Federal Health Insurance Act in 1996 [4]. Although accidental insurance is covered by the employer, health insurance is offered by many providers through managed competition with varying deductibles and co-payments leaving consumers rather conscious about financial consequences of health care decisions [5]. Lower premiums are offered through managed-care plans, which involve higher deductibles of up to 2500 Swiss francs (CHF), channeling the choice of providers or gatekeeping by general practitioners [6]. Coverage by additional private health insurance with extended health care benefits involves, among others, hospital stays in wards with two- or single-bedrooms and exclusive surgical treatment from senior physicians.

Although it was shown that publicly insured patients may be at greater risk for complications in elective surgeries [7], disparities in injuries and treatment of patients according to the level of health insurance in trauma patients may seem surprising because traumatic injuries are usually accidental emergencies and immediate caretakers are typically unaware of the insurance status when giving standardized care. So far, higher mortality rates have been shown for uninsured trauma patients and infants without private health insurance [8]. However, most studies have focused on differences between patients without insurance and those with insurance [9–15], there is a lack of studies on the actual level of health insurance because most studies have been conducted in the United States, which have a different health care system than European countries, such as Switzerland, where health insurance is mandatory and differences may arise from the level of insurance [14]. Furthermore, most studies [16–18] were based on the National Trauma Data Bank, which provides a large sample size with abundant general information but does not offer data about the incidence of specific injuries or surgeries.

The objective of this study was to investigate the association between the level of health insurance and epidemiologic factors of trauma patients, such as the type of injuries, inhospital outcome, and surgical procedures, in an industrialized country with compulsory health insurance.

2. Materials and methods

This retrospective cohort study included all consecutive patients admitted to a level one trauma center between January 1, 2012 and December 31, 2013. Data were extracted from the diagnosis codes based on the World Health Organization's *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, German Modification, Version 2010* [19,20] and surgical procedure codes according to the catalogue of the "Swiss Surgical Classification" (*Schweizerische Operationsklassifikation* [CHOP], 2011 and 2012) [21]. It included epidemiologic data, such as the level of insurance as the exposure variable as well as several outcome variables consisting of the type of injury, inhospital outcome, and surgical procedures of trauma patients (Tables 1 and 2). The level of insurance was grouped into public or private, which included any insurance plan that covered extended health care benefits for the treatment of injuries. All diagnoses and procedures were documented if multiple injuries were found in a patient to avoid data loss. This study complied with the regulations of the local cantonal ethical review board (Zürich, Switzerland).

Categorical data are presented as the number of patients with percentages and compared between groups using the chi-square or Fisher exact test. Proportions of insurance levels were compared with a one-sample chi-square test. Continuous and ordinal data are presented as medians with interquartile ranges and compared using the Mann–Whitney test. Linear, binary, and multinomial logistic regression analyses were performed to adjust for age and sex. Two-sided *P* values less than 0.005 were determined statistically significant due to the large number of tests. *P* values less than 0.05 were assumed to show a trend toward statistical significance. All analyses were carried out with IBM SPSS Statistics, version 21.0 (IBM Corp, Armonk, NY).

3. Results

The present study included 6595 patients, 39.8% females and 60.2% males, with a mean age of 50.8 y (standard deviation, 21.2 y). Coverage by public insurance was significantly more common than private insurance (4929 [75%] *versus* 1666 [25%], $P < 0.001$). Moreover, private insurances were used significantly more by females and elderly patients ($P < 0.001$) (Table 3).

Publicly insured patients were more likely to be transferred to another hospital or mental institution ($P < 0.001$) (Table 4). Furthermore, patients with public insurance sustained concussions to the head and fractures of the skull and head significantly more often ($P = 0.004$). To understand the significant effect of insurance level on mortality, we split the age into tertiles and analyzed sexes separately. In this analysis, publicly insured elderly women ≥61 y had higher mortality rates ($P < 0.001$). No differences were observed in other subgroups. The trend for calcaneus fractures was not observed anymore after adjusting for age and sex.

Patients with private insurance stayed in the hospital significantly longer and were more likely to be transferred to a rehabilitation clinic ($P < 0.001$) (Table 5). Moreover, they had significantly more fractures of the proximal humerus and shoulder dislocations ($P < 0.001$). The trend toward increased rates of open reductions and internal fixations of the humerus was not present after adjustment for age and sex.

There were no significant differences for the length of stay in the intensive care unit, number of concomitant injuries, injury severity score as well as the abundant number of remaining traumatic injuries, surgeries, and postoperative complications listed in Tables 1 and 2.