

Maxillofacial injuries related to work accidents: a new concept of a hospital-based full electronic occupational trauma surveillance system

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The objective of this study was to investigate the occurrence of occupational maxillofacial injuries using a newly installed relational database. Twenty-six injuries were identified out of 28 624 patients admitted to the emergency unit during a 12 month period. Falls from height or being struck by moving objects were common causes of these injuries. Two-thirds of those identified were construction workers. This paper demonstrates the power of modern databases to identify specific occurrences that may provide the basis for prevention in the future.

Key words: Computer; hospital; occupational; surveillance; trauma.

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Introduction

An unknown number of severely injured patients are treated every year in emergency departments around the world after a work-related injury. Numerous reports describe the different injury patterns of those patients [1–5]. Unfortunately, many of these important studies have been discontinued, because of either limited manpower or limited electronic resources. Handwritten patient records are often difficult to read and may disappear in conventional hospital archives.

Estimates at Bern's Inselspital have shown that up to 20% of X-rays and 30% of medical records cannot be located when they are needed. The loss of data is estimated at 10% (unpublished internal investigation of the Department of Orthopaedic Surgery, Inselspital, Bern). On the other hand, other involved departments depend on the data provided by the emergency unit. Therefore, in January 2000, newly developed software in the form of a comprehensive electronic medical record

was introduced in the Department of Orthopaedic Surgery.

The software has a dual use: first, as a clinical tool, and secondly, as an integrated tool for continuing education and research. The program was developed by senior trauma and emergency physicians in collaboration with computer specialists. We show here an example of how the new software can be used to develop a strategy for injury prevention, presenting a study of work-related maxillofacial injuries over a 12 month period. This study analysed the incidence, causes and injury pattern of work-related maxillofacial trauma in Bern. The aim of the study was to establish the first occupational trauma database in Switzerland.

Materials and methods

The hospital unit

A total of 28 624 case histories of patients treated in the University Hospital Department of Trauma and Emergency Medicine, over the period January–December 2000, were reviewed using the 'Qualicare' data bank.

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The emergency unit and the Department of Maxillofacial Surgery are the only referral centres for severe facial trauma in this region, serving a population of ~750 000 people and providing a 24 h on-call service.

This study includes only adult patients because of the different injury patterns and anatomy of the skull in younger patients [6].

All cases of maxillofacial fractures were collected prospectively by the computer program using a defined list of key words. The case histories detected were reviewed on a monthly basis, and information was collected in detail on sex, age, cause and circumstances of the accident, and type and location of the facial fractures. For this paper, we reviewed exclusively those maxillofacial injuries that were sustained during work.

The nature of the accident is described according to the International Classification of Diseases (ICD). The fractures were classified according to the anatomical site of injury (alveolar bone fractures, zygomatic fractures, Le Fort fractures, orbital fractures, etc.).

The electronic medical record

The new emergency room software was developed by collaboration between the Department of Orthopaedic Surgery, Inselspital (Bern, Switzerland), Harvard University (Boston, MA), the Maurice E. Müller Foundation (Bern, Switzerland), the 'Arbeitsgemeinschaft für Osteosynthese' (Davos, Switzerland) and a software-development company (Qualidoc AG, Trimbach, Switzerland; www.qualidoc.ch). The result is practice-oriented, easy-to-use software that works at the department level and provides a parallel service to Macintosh® and Windows® users in the same network.

Every physician who has access to the program can immediately display complete patient records and write progress reports. In particular, work flow can be defined according to speciality (internal medicine, occupational medicine, etc.) and specific diagnoses. Diagnoses are always accessible, or pre-defined keywords are used (e.g. 'work', 'fracture') and can be retrieved with a mouse click. The electronic medical record allows instantaneous retrieval of past discharge summaries, other text documents or the patient's laboratory results and X-rays. Diagnoses are transferred directly into a search engine and semi-automatically coded (ICD codes). All newly generated reports are continuously saved on the electronic medical record. Diagnoses or therapies can be marked in order to start an automatic Medline search or to search in a linked online textbook (internal medicine, emergency medicine, occupational medicine, etc.). The speed of access to clinically relevant data is generally <3 s, while free text searches in diagnostic fields or in discharge summaries take ~5 s.

Results

During the 12 month period, 28 624 patients were admitted to the emergency unit. Of these, 153 needed referral to the Department of Maxillofacial Surgery, 26 of them due to a work-related accident (24 males, 2 females). The mean age of the patients was 43.5 years.

Occupation

The most frequently recorded occupation was construction worker (16), followed by factory workers (eight) and farmers (two).

Causes of injury (Table 1)

According to the ICD, we found the following accident types: five (19%) patients were injured by falling objects. In four (15%) patients, a fall was the cause of maxillofacial injuries: one (4%) had fallen from a step ladder, while two (8%) had a fall of 3–5 m. Two (8%) farm workers were bitten or kicked by animals. Four (15%) patients were injured by their working tools, while four (15%) had been involved in a traffic accident at a building site. Another four (15%) patients were hit by an unknown object at their place of work.

Injury pattern (Table 2)

We found 34 maxillofacial fractures in 26 patients: nine (28%) fractures of the orbit and orbital rim, two (6%) mandibular fractures, three (9%) fractures of the bony sinuses, two (6%) Le Fort-type fractures, two (6%) panfacial fractures, four (12%) skull and base of skull fractures, eight (24%) fractures of the cheekbone and four (12%) nasal bone fractures.

Discussion

The increasing number of medical data made the computerization of our emergency room necessary because conventional paper-based systems have often not kept pace with the resulting demands, and once data are

Table 1. Causes of injury in 26 injured workers

<i>Causes of injury and ICD codes</i>	<i>No. of workers</i>
Injured by falling objects (W20)	5 (19%)
Fall (W01)	4 (15%)
Fallen from a step ladder (W11)	1 (4%)
Fall of 3–5 m (W12, W13)	2 (8%)
Bitten or kicked by animals (W55)	2 (8%)
Injured by working tools (W27, W29)	4 (15%)
Traffic accident at the building site (V80.9)	4 (15%)
Hit by an unknown object at the place of work (W20)	4 (15%)

Table 2. Injury pattern in patients with work-related maxillofacial fractures

Injury pattern (ICD S02 S03)	No. of cases (n = 34)
Orbit and orbital rim fractures	9 (26%)
Mandible fractures	2 (6%)
Fractures of the bony sinuses	3 (9%)
Le Fort-type fractures	2 (6%)
Panfacial fractures	2 (6%)
Skull and base of skull fractures	4 (12%)
Cheekbone fractures	8 (24%)
Nasal bone fractures	4 (12%)

recorded and printed, they are saved in such a manner that it can be very difficult and time consuming to locate them. This results not only in an enormous waste of time and energy, but also in an enormous loss of data.

In this study, performed using a new generation of emergency room software, maxillofacial fractures related to work accidents accounted for only 0.1% of all treated patients in the emergency unit but for 17% of all referrals from the emergency unit to the Department of Maxillofacial Surgery in the year 2000.

Although there are numerous reports on maxillofacial trauma, reports about work-related facial trauma are rare. The majority of studies reported describe isolated fracture sites, such as mandibular or zygomatic fractures [7,8].

According to studies from other European countries, the incidence of work-related facial bone fractures seems to vary from <1% to ~15%, depending presumably on the socio-economic status of the area [1,9].

In most of our cases, the injured person was male, since there is a predominance of men in construction and manufacturing work in Switzerland [10].

Work-related facial bone fractures occurred mostly in isolation as a result of a direct violent force to the face. While the head is protected by a helmet, the face is bare and vulnerable.

In Switzerland, all data regarding work-related injuries that lead to physical impairment are collected by a state-owned accident insurance company (SUVA). However, there is often a lack of information about injury pattern and medical treatment.

In order to establish preventive strategies, there is a strong interest in an accident surveillance system from industry and insurance companies. As an initial result of this study, we will ask both sides to consider the use of a new helmet with integrated face protectors in risky construction work in order to prevent workers from facial trauma.

Further prospective data analysis will hopefully reveal more factors relevant to occupational health physicians in

order to show how poor work practice or protective equipment contribute to this kind of injury. During 2001, more data about workplace-related injuries will be collected and analysed. We also promote the idea of establishing trauma data surveillance resources in other hospitals [11–13].

Conclusion

The computerization of trauma and emergency units and the introduction of customized software significantly reduce the workload of researchers and physicians [13,14]. Thus, the increasing utilization of new computer technology could have a significant influence on research and the quality of prospective and retrospective studies [15,16].

The maxillofacial trauma data bank is only one of the current ongoing scientific projects of the emergency unit in collaboration with other departments of the University Hospital Bern.

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