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Healthcare costs and productivity costs of hand and wrist injuries by external cause
A population-based study in working-age adults in the period 2008–2012

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ABSTRACT

Background: Hand and wrist injuries are very common at the Emergency Departments (ED), and among the most costly injury types in the working population. The purpose of this study was to explore the causes of non-trivial hand and wrist injuries (i.e., hand fractures, wrist fractures and complex soft-tissue injuries) in working-age adults in order to identify target areas for prevention.

Methods: Data were extracted from the Dutch Injury Surveillance System, from the National Hospital Discharge Registry and from a patient follow-up survey in working-age adults (aged 20–64 years) in the period 2008–2012. An incidence-based cost model was used to estimate healthcare costs, and an absenteeism model for estimating the productivity costs. Total costs were calculated by external cause, subdivided in their main categories (home, sports, work, traffic and violence) and their most important subclasses.

Results: Total costs of these injuries in The Netherlands were US $410 million per year, of which 75% (US $307 million) productivity costs. Males represented 66% (US $271 million) of the total costs. Within the male group, the group 35–49 years had the highest contribution to total costs (US $112 million), as well as the highest costs per case (US $10,675). Work-related injuries showed the highest costs per case (US $11,797), however, only 25% of the total costs were work-related. The top five causes in terms of total costs were: accidents at home (falls 23%, contact with an object 17%), traffic (cycling 9%) and work (industrial work 4%, and construction work 4%).

Conclusion: Hand and wrist injuries are a major cause of healthcare and productivity costs in working-age adults. To reduce the costs to society, prevention initiatives should be targeted at major contributing causes, that are mainly related to activities at home (falls, contact with an object) and accidents at the road (cycling).

Introduction

Hand and wrist injuries are very common at the Emergency Department (ED). These injuries are frequent work-related and are also one of the most costly injury types [1–4]. Hand and wrist injuries can occur during a wide variety of activities at home, during recreation, in traffic and at work [5–7]. Therefore, to define target areas for prevention, and to reduce costs, it is important to study the underlying causes.

Research has already provided some insight into the costs of upper extremity injuries and injuries to the hand and arm and hand [8–11], but an analysis of the most important causes of the

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costs of hand and wrist injuries is lacking. Our group previously demonstrated that the high costs of hand and wrist injuries are mainly related to lost productivity due to absenteeism resulting from non-trivial hand and wrist injuries (i.e., hand fractures, wrist fractures and complex soft tissue injuries) in the working population [3].

The current study extends this analysis and aims to determine the most important causes of the costs non-trivial hand and wrist injuries in working-age adults in the Netherlands.

Methods

Data sources

The absolute number of annual ED visits in the period 2008–2012 were retrieved from the Dutch Injury Surveillance System (for non-hospitalised patients) and the National Hospital Discharge Registry (for hospitalised patients). In the Dutch Injury Surveillance System, all injuries treated at the ED of the 15 participating hospitals are recorded. These hospitals form a representative sample of 12% of the patients attending EDs in the Netherlands (16.8 million inhabitants in 2012), and estimations can be made to national level [12,13]. Injury diagnoses and injury mechanisms are registered by using the International Classification of Diseases of the World Health Organisation (ICD 10th revision). We included patients (aged 20–64 years) with non-trivial hand and wrist injuries (i.e., hand fractures, wrist fractures and complex soft-tissue injuries; ICD 10th revision, see Appendix A). Patients were selected based on the registered primary diagnosis, according to the Eurocost classification of diagnostic groups, as developed and recommended by European experts [14,15]. Causes of injury were routinely recorded according to the International Classification of External Causes of Injuries, divided over five categories (home, sport, work, traffic and violence), as well as their main subcategories [16].

Healthcare costs

To estimate healthcare costs for 2012, our previously described incidence-based cost-model was used [3,17]. For each injury group, healthcare consumption and related costs were calculated based on data in the Dutch Injury Surveillance System, the National Hospital Discharge Registry, and a patient follow-up survey conducted in 2012. In this model, the age and injury-specific costs are based on the estimated healthcare consumption of the individual patient. Healthcare costs were calculated by multiplication of the incidence, healthcare volumes (e.g., length of stay) and unit costs (e.g., costs per day in hospital; see Appendix B).

Productivity costs

We used our previously described absenteeism model to estimate productivity costs [3,17]. We used the friction–cost method in this study, because in the majority of patients the largest proportion of healthcare needs are made during the first year after the injury. The friction–cost method is based on the fact that in case of unemployment the absent worker will be replaced after an adaptation period (the friction period). Within the patient follow-up survey, questions relating to work absence, days lost from work, and return to work were included. The observed duration of absenteeism in working days was converted into the costs of absenteeism according to age, gender and type of injury, using the value-added per employment hour. In national accounts, the net value added equals the total monetary value generated by all units engaged in production activities. We divided the net value added (obtained from Statistics Netherlands) through the total number of hours worked to calculate the productivity of one hour worked. This net value added per employment hour was adjusted for age and gender using the mean wage per category [3]. The days lost from work were converted into the productivity costs (according to age, gender and type of injury). The probabilities of work absenteeism were multiplied with the average duration of absenteeism, classified by age, gender, type of injury and hospitalisation status. Finally, the estimated absenteeism in days was multiplied by the age- and gender-specified productivity cost. All costs are reported in US dollars and we used the year 2012 average exchange rate for conversion from Euros to US dollars (€1.00 = US $1.29).

Results

During the study-period, approximately 56,000 patients (aged 20–64 years, 57% males) with non-trivial hand and wrist injuries were annually treated at the ED, resulting in an age-standardised incidence rate of 635.2 (per 100,000 person-years; 95% CI, 578.0–692.4) for males, and 479.1 (95% CI, 436.0–522.2) for females. In both males (42.8%) and females (62.1%), hand and wrist injuries most frequently occurred at home. In males, work-related injuries rank second (21.9%), whereas the contribution to hand and wrist injuries in working-age females is low (4.6%; Table 1).

The total costs were estimated at US $410 million per year, with 75% (US $307 million) productivity costs. Males represented 66%

Table 1
Average annual number of patients (aged 20–64 years) with non-trivial hand and wrist injuries in the Netherlands (2008–2012), according to gender and external cause.

	Males (%) (n = 32,211)	Females (%) (n = 24,066)
Home		
Fall	17.2	45.0
Contact with object	21.6	12.7
Contact with person	1.5	1.7
Overuse	0.8	1.2
Other	1.7	1.5
Subtotal	42.8	62.1
Sport		
Hockey	1.2	1.2
Soccer (outdoor)	6.2	0.7
Soccer (indoor)	0.8	0.1
Skiing	0.5	0.5
Fight sports	1.0	0.2
Other	9.4	16.2
Subtotal	19.1	18.9
Work		
Agriculture	1.6	0.3
Industry	3.8	0.3
Construction work	4.2	–[a]
Trading and services	5.3	2.7
Other	7.0	1.3
Subtotal	21.9	4.6
Traffic		
Pedestrian	0.2	0.3
Cyclist	7.4	9.8
Moped	1.4	1.0
Motorcycle, scooter	2.0	0.4
Car	0.8	1.1
Other	0.3	0.3
Subtotal	12.1	12.9
Violence	4.1	1.5
Total	100	100

[a] Numbers too low for reliable estimation.