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# The Costs and Characteristics of Occupational Injuries Admitted to a Trauma Unit

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*Occupational injuries requiring admission to a trauma unit were examined to outline the events surrounding the injury and to examine the costs. Sixty-nine patients were admitted over a 12-month period, representing 4.30% of all work-related injuries attending the emergency department and 4.25% of all admissions to the trauma unit. Most were male (91%), working in skilled trade occupations (65%), with a mean age of 38.8 years. Personal protective equipment was used only by 46% of injured workers who should have been using it. Sixty-one percent of patients believed that their injury was preventable. Half of the injuries were to the upper limb, fall was the most frequent mechanism (25%) and the median duration of admission was 2 days. The direct hospital costs were estimated at over 300 000 GBP. Failure to use protective equipment and to follow health and safety guidelines suggests that opportunities exist for injury prevention.*

occupational health   occupational safety   injury   prevention

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## 1. INTRODUCTION

Occupational injuries can generate significant costs to employers, place a burden on healthcare providers and potentially have a detrimental effect on the long-term health and socioeconomic status of injured workers [1, 2]. In Scotland, in 2009/2010, 23 people died as a result of injuries sustained at work, over 2500 were seriously injured and ~8000 sustained injuries requiring 3 or more days off work [2].

Current evidence indicates up to 16.5% of all injuries attending the emergency department could be work-related [3, 4]. There are no data on occupational injuries admitted to an orthopaedic trauma unit. To address the lack of information in the literature, we assessed occupational injuries admitted to a trauma unit. We evaluated the events surrounding the injuries and estimated the costs.

## 2. METHODS

Over a 12-month period, all patients admitted the trauma unit of the Western Infirmary, Glasgow, UK, were interviewed by the admitting orthopaedic doctor and had a form completed for all occupational injuries. The hospital is one of four in the city with an emergency department and serves a population of 250 000 people. Occupational injuries were defined as personal injury or disease arising out of or in the course of work [5].

Data recorded included demographics, job description, activity at the time of injury, use of personal protective equipment (PPE), if the patient considered the injury as preventable and how, length of time in the job, the injury sustained and treatment required. Hospital patient records were subsequently reviewed to establish the number of outpatient consultation appointments.

Occupations were categorised according to their standard occupational classification (SOC) grading [6]. The recommended use of PPE was considered according to regulations laid out by the Health and Safety Executive (HSE) in the United Kingdom [7]. Career-ending injuries were those considered to lead to the individual being unable to continue with their occupation at the time of injury. The estimated National Health Service (NHS) costs for treating the injuries were obtained using published statistics for health service costs, which is based on the average costs of treating an emergency orthopaedic inpatient and the average costs of an outpatient consultation [8].

### 3. RESULTS

During the 12-month period, 56289 patients presented to the emergency department, 1614 (2.90%) were categorised as occupational injuries, of these 69 patients were admitted to the orthopaedic trauma unit. This represented 4.30% of all work-related injuries attending the emergency department and 4.25% of all admissions to the trauma unit. The mean age was 38.80 (*SD* 12.86, range 20–64) years and 91.30% were males ( $n = 63$ ). Most of those requiring admission were working in skilled trade occupations ( $n = 45$ , 65%) followed by SOC category 8 and 9 (both  $n = 7$ , 10%) which included factory workers, machine operators and labourers. All occupational groups were represented except SOC 7 (sales and customer service occupations)

There were a total of 86 injuries to 69 patients. Fourteen patients had more than one injury and 3 of these patients had injuries to three different body parts.

Table 1 outlines the mechanism of injuries. The most serious injuries included a spinal fracture causing paraplegia and lower limb trauma resulting in amputation. Fracture was the most common type of injury (38%, 33/86) followed by open wounds (30%, 26/86); infection (17%, 15/86); head injury (9%, 8/86) and other soft tissue injury (5%, 4/86). Thirteen percent of subjects (9/69) were deemed to have potentially career-ending injuries. The upper limb (50%,

43/86) was injured more frequently than any other body part ( $p < .05$ ). Hands were injured more frequently than the rest of the upper limb (36%, 31/86). The next most commonly injured body part was the lower limb (27%, 23/86); followed by head (9%, 8/86); spine (8%, 7/86); pelvis (4%, 3/86) and trunk (3%, 2/86).

**TABLE 1. Injuries by Cause**

Cause of Injury	No. (%)
Fall	17 (25)
ladder	9
scaffolding	4
roof	2
slip	2
Cutting/penetrating injury	14 (20)
Struck by blunt object/crush	10 (15)
Chronic pressure	7 (10)
Nail gun	4 (6)
Other	9 (13)
Road traffic accident	1 (1)
Machinery-related	7 (10)

The length of hospital stay ranged from 1 to 91 days (*Mdn* 2). Three patients required time in the intensive care unit for a total of 13 days. A total of 222 outpatient visits were required (*M* 3.7, range 1–28): 193 in orthopaedics, 18 in ophthalmology, 9 in pain clinic and 2 in plastic surgery. The total estimated hospital costs of treating these injuries were ~326110 GBP. These did not include patient contact with primary care services, which was likely in many cases. Twenty-one (30%) patients were self-employed and did not receive any income while unable to work.

Forty-two of the 69 injured workers (61%) believed that their injury was preventable either by the use of appropriate protective clothing ( $n = 21$ ) or by following health and safety procedures ( $n = 23$ ). Forty-three (62%) received first aid before attending hospital, in 22 cases (32%) this was self-administered or provided by colleagues and in 21 cases (30%) by the emergency services. Fifty-two of the 69 workers were in occupations which recommended the use of PPE according to HSE guidelines. Only 24 (46%) of these workers were wearing any.

Out of 17 falls, 13 (77%) were believed by patients to be preventable, in 11 cases by follow-

ing correct protocol and in 2 cases if equipment had not failed. Seven (64%) of 11 crush injuries were considered preventable, 6 by following protocol and one by using safety equipment. Out of 12 cuts (open/incised wounds), 11 (92%) were preventable, in 8 cases by using protective gloves and in 3 cases by using the correct guards on circular saws.

A variety of reasons was given for noncompliance with HSE guidelines at the time of injury including

- gloves removed to complete a delicate task;
- protective guard broken on a circular saw;
- guard removed from a circular saw to cut a larger piece of wood;
- ladder not secured and over-stretching on the top rung of a ladder;
- work boots not available for a cleaner on a building site;
- machine cleaned without turning off the power;
- primed air-powered nail gun checked by firing into a hand;
- harness not worn as believed to be impractical.

#### 4. DISCUSSION

This is the first description of injuries sustained by U.K. workers resulting in admission to a trauma unit. While it is difficult to accurately state the true costs of hospital care in the NHS and our figures may underestimate the costs, there is no doubt that substantial costs are associated with the care of these injuries. The 69 workers were generally young males with a mean age just under 40 years old. In a review of occupational injuries among construction workers, Welch, Hunting and Murawski found very similar demographics and a similar proportion of patients requiring inpatient care (3.6%) [9].

Several studies suggest the hand is the body part most frequently affected in occupational injuries [10, 11, 12, 13]. A study from Hong Kong demonstrated that these injuries required an average of 8 weeks off work and 9 weeks of regular rehabilitation [14]. Our findings that hand injuries accounted for 36% of the occupational injuries

requiring admission to the trauma unit again reflect the importance of the hand when considering occupational injuries.

Fifty-two of the 69 injured patients worked in occupations which, according to HSE guidelines, required PPE but only 46% of these patients were wearing any, suggesting that opportunities exist for injury prevention. Over 60% of patients believed that their injury was preventable, either by wearing appropriate clothing or by following correct safety procedures. Information volunteered demonstrates that barriers include worker noncompliance with safety guidelines. Some workers felt that PPE interfered with their ability to work, resulting in noncompliance, e.g., by removing gloves for delicate tasks or by removing a circular saw guard to cut larger pieces of wood. Osborne found similar behaviour by operating room personnel, where the most common barrier to compliance was the belief that adhering to standard precautions interfered with duties [15]. This highlights that worker compliance is important in preventing occupational injuries. Our findings suggest there is scope for better compliance with PPE use and safe working practices in our patients. It is likely that this behaviour is also reflected in the wider occupational community.

Limitations of this report include a probable underestimate of the costs of treating occupational injuries, which are based on data for estimated hospital costs produced by the NHS. While some patients were transferred to other hospitals for ongoing care, it is possible that some were transferred from the emergency department to other subspecialties. Furthermore, we did not examine the long-term economic consequences of injuries, e.g., time off work, long-term disability, loss of income to the individual and loss of tax revenue for the government. These areas would be important for further investigation to help understand the full social and economic implications of injuries at work.

#### 5. CONCLUSION

The findings should be of interest to employers and other stakeholders in determining more effective injury preventative strategies which may

result in an overall reduction in healthcare costs of occupational injuries. Falls in particular are a serious safety concern in the workplace and many of these injuries were felt to be preventable. The high frequency of hand injuries suggests the importance of the hand in safety promotion activities.

Opportunities may exist for injury prevention through tighter compliance with health and safety guidelines and behaviour modification with the ultimate goal of reducing occupational-injury and related long-term disability and dependence on incapacity benefits. Further work is required to develop and evaluate preventive measures, to reduce the incidence of occupational accidents and particularly the severity of the resulting injuries.

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