Predictors of Duration of Injury-Related Disability Leave

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Abstract

Background: Medical leave due to workplace injury is common in the US workforce and creates significant financial drain on the economy. Although there are abundant data relating the duration of medical leave to specific injuries, there is a paucity of research correlating the duration of medical leave with a patient's attributes or occupation. The primary objective of this study is to examine the influence of specific occupational and patient characteristics on the medical leave taken by employees.

Methods: Using records accessed from a major academic institution of 2449 patients reporting medical leave, 547 patients met the inclusion criteria. Worker occupations were divided into three groups based on level of physical activity required for the job. Patient characteristics available for analysis included age, education level, sex, type of injury, and type of medical claim. The association between these factors and duration of disability leave was analyzed using bivariate and multivariable analysis as well Kaplan-Meier survival analysis.

Results: Bivariate regression analysis showed that days off work were significantly correlated to physical requirement group (p= 0.0002), age (p=0.00357), injury type (p=0.002), insurance claim type (p=0.0001), injured body part (p=0.001), and level of education (p= 0.0005). On multivariable analysis, physical group, level of education, body part injured, and claim type remained statistically significant. Patient sex did not show significant correlation to days off work.

Conclusions: Age, claim type, level of physical requirement, body part injured, and educational requirement are independent predictors of days lost from work following injury. Physicians should be aware of these factors when estimating length of disability leave to patients and their employers.

Introduction

Medical leave due to workplace-induced injury is a common occurrence in the US workforce and creates significant financial drain on the country's economy. In 2017 alone, 1,109,270 employees lost time from work due to an occupational injury, with a median of 9 days lost from work per employee and amounting to 70 million days lost in total [1, 2]. According to the Occupational Safety and Health Administration, each instance of workplace injury-related medical leave costs $39,000 on average, amassing a total cost of $161.5 billion in 2017 [2]. Musculoskeletal injuries are the most common cause of disability in the United States [3]. Although there are abundant data relating the duration of medical leave to specific injuries, there is a paucity of research on the correlation of patient characteristics, such as occupation type and education level, to the duration of medical leave. There are currently no strong guidelines available to physicians to determine when a patient may safely return to their specific profession. Without sufficient data or guidelines, recommendations given by physicians regarding length of disability leave become largely anecdotal. This can lead to unnecessary time lost from work or return to work inappropriately early, risking further injury.

The primary goal of this study was to examine all instances of medical leave taken by employees of a major academic institution over a ten-year period as a function of several worker specific characteristics. We hypothesized that length of medical leave will be influenced by specific worker characteristics, and that this information would allow physicians to better inform their patients about their expected absence from work, set more reasonable expectations for employees and their employers, and contribute to evidence-based guidelines for injury-related medical leave.

Methods

Study design and population

This retrospective observational study was IRB approved by our institution and meets STROBE guidelines for reporting observational studies [4]. Records were accessed from a major academic institution with 10 campuses, which list all individual medical leave claims due to injury occurring between 2006 and 2016 (n=2449). Details in these records include profession, age, gender, type of claim (classified as medical, indemnity, or medical-CAE), type of injury (classified as crushing, fracture, amputation, or multiple), body part injured, and the number of days lost from work for each claimant. No names, dates of birth, addresses, or other specific identifiers were listed nor recorded.

Inclusion Criteria

All instances of leave caused by injury and resulting in at least one day lost from work were included (n=995). Of these employees, 971 had job descriptions available on the institution's website. In the interest of focusing on patients who lost a substantial number of work days but were able to return to work, final statistical analysis was performed on patients that lost between 15 and 200 days of work.

Physical Groups

Qualifying patients were separated into one of three groups based on the level of physical activity required to perform their occupation: sedentary jobs (e.g. office assistants, analysts, programmers), jobs with both sedentary and physical requirements (nurses, medical assistants), and jobs in which physical activity is necessary to complete their essential functions (carpenters, manual laborers, heavy equipment technicians). Patients were separated based on detailed job descriptions listed on the institution's website

that include all possible job requirements. These groups were compared to determine the correlation between a job's physical requirement and days lost from work following injury.

Educational Groups

Patients were grouped by the minimum level of education required to be hired for their position, separated into high school or lower (e.g. manual labor), trade school (e.g. vocational nurse), undergraduate (e.g. engineer), and graduate education (e.g. physician). Patients were stratified based on minimum qualifications listed on the institution's website for each position, which were available for 835 employees. These groups were compared to determine the correlation between level of education and days lost from work following injury.

Types of Medical Claims

Medical claims were classified by our institution into four types: Medical, medical-CAE, indemnity, and future medical claims. A claim was type 'Medical' if the claim involved medical treatment, with full recovery anticipated. A claim was type 'Medical-CAE' if it was considered more complex than a medical claim, needing a more extensive investigation to confirm work-relatedness. The claim was of 'Indemnity' if the claim included both temporary and permanent disability, as well as both partial and complete disability claims. 'Future Medical' type claims were resolved claims with future medical care preserved for the life of the injured worker.

Statistical Analysis

Shapiro-Wilk Normality Test and Quantile-Quantile Plots were used to determine whether the days off work variable followed a normal distribution prior to performing regression analysis. After determining that it was not (Figure 1), a natural logarithmic transformation was performed and the Shapiro-Wilk test and Quantile-Quantile Plots were repeated, which verified normality of the transformed data. Bi-variable regression analysis was then used to determine the variables that most likely influence work days lost, our primary variable. These variables were then tested for independent influence on outcome using a multivariable linear regression analysis with forward and backward stepwise elimination. A p-value of <0.05 was considered significant.

Kaplan-Meier survival curves were generated with return to work as the survival event in order to graphically describe the effect of job physicality and education level on the probability of returning to work after a given time. A log-rank test was used to judge statistical significance of difference between the curves.

Results

The study population included 995 subjects. There were 607 females, 387 males and one unknown gender. Average age was 47.46 years (range 18-91, median 50). The most common claim type was indemnity (n=828, 83%, Figure 2). Fractures were the most common injury type resulting in days lost from work (n=664, 67%), Figure 3). Average days off for the complete study population was 85.97 days (range 1-755, median 33). Injuries to multiple body parts were the most common reason for loss of work days, followed by isolated injuries to the hands, feet, wrists and ankles (Figure 4).

There were 547 patients that lost between 15 and 200 days of work and therefore were included in final analysis (Figure 1). Bivariate regression analysis showed that days off work were significantly correlated to age (p=0.00357), injury type (p=0.002), insurance claim type (p=0.0001), injured body part (p=0.001), physical requirement group (p= 0.0002) and educational group (p= 0.0005). Patient sex did not show significant correlation to days off work. After multivariable analysis type of medical claim, injured body part, education group and physical group were found to be independent predictor of days lost from work. Having an indemnity claim (p=0.0119), finger injury (p=0.0337), rib and sternal injuries (p=0.0371), and belonging to educational group 3 (p=0.0464) were independent predictors of fewer days lost from work (Table 1). Belonging physical group 3 (p=0.0137) was an independent predictor of increased days lost from work. Age narrowly missed statistical significance on multivariable analysis (p=0.0579).

Kaplan-Meier survival curves demonstrated a higher probability of delayed return to work with a lower education level (p=0.0005) and higher physicality (p=0.003) of the job description (Figures 5 & 6).

Variable	Standard Error	T Value	P Value
Age	0.0029	1.9	0.0579
Female Sex	0.0724	0.171	0.864
Indemnity Claim	**0.1055**	**-2.526**	**0.0119**
Medical-CAE Claim	0.5008	-1.837	0.0669
Crushing Injury	0.2477	-1.828	0.682
Fracture	0.2114	-0.144	0.8858
Multiple Injuries	0.2423	-0.952	0.3414
Lumbar Back	0.6993	0.576	0.5648
Thoracic Back	0.6934	-0.768	0.4429
Elbow	0.1997	-0.548	0.5842
Facial bones	0.6913	-0.224	0.8228
Facial combination	0.7022	-1.325	0.1857
Finger(s)	**0.1403**	**-2.13**	**0.0337**
Foot/feet/toes	0.1313	0.455	0.6497
Forearm(s)	0.3554	-0.583	0.5599
Hand(s)	0.1927	-0.846	0.3978
Head	0.7061	-0.973	0.3313
Hip(s)	0.3262	0.684	0.4945
Knee(s)	0.1705	1.876	0.0613
Leg/calf/thigh(s)	0.2649	0.34	0.7344
Multiple Back	0.3608	0.981	0.3274
Multiple Head	0.705	-1.072	0.2843
Multiple Lower Ext.	0.3015	0.684	0.4947
Multiple Upper Ext.	0.247	0.403	0.6872
Multiple Body Parts	0.1506	0.637	0.5245
Neck	0.6906	-1.342	0.1803
Nose	0.4922	-1.134	0.2575
Ribs/sternum	**0.3544**	**-2.092**	**0.0371**

Sacrum	0.6928	-1.014	0.311
Shoulder(s)	0.2077	-0.529	0.5969
Upper arm(s)	0.2142	-1.112	0.2669
Upper leg/thigh(s)	0.4944	0.073	0.942
Wrist(s)	0.1441	1.231	0.2192
Physical Group 2	0.0988	0.9	0.3688
Physical Group 3	**0.1033**	**2.475**	**0.0137**
Education Group 2	0.0879	1.041	0.2985
Education Group 3	**0.1134**	**-1.998**	**0.0464**
Education Group 4	0.1308	-1.082	0.2799

Table 1. Results of multivariable analysis.

Discussion

The purpose of this study was to identify patient characteristics that influence the time lost from work after worker injury. As hypothesized, our findings demonstrate that the worker's claim type, injured body part, physical requirement, and educational group are independent predictors of days taken off from work following injury (Table 1). Although the number of subjects that were available for analysis precluded from recommending a formula for estimating the number of days lost given a specific injury and specific patient characteristics, the identified characteristics may be used by medical providers to make recommendations and set patients' expectations for the anticipated days lost from work.

Patients in jobs with more significant physical requirement were more likely to require more days away from work following injury (Figure 5). This was expected, as employees can perform sedentary tasks sooner than physical ones when recovering from injury, and is consistent with findings in current literature, which have demonstrated that patients in jobs involving constant lifting are more likely to remain disabled at one year with musculoskeletal back pain [5]. Gillen et al. also reported that patients with increased job strain relative to reward are less likely to return to work [6]. In our study, both bivariate and multivariate analysis demonstrated correlation between the physicality of the job description and days lost from work. An explanation for these finding could be that more physical jobs, especially those requiring use of heavy machinery, may require more complete healing of the injury to allow adequate

performance and therefore require longer healing time. Patients that have mixed physical/sedentary jobs are likely to take less time off work because they can return to their sedentary functions prior to the more physical ones.

Our findings demonstrate that employees in jobs requiring lower educational requirement are likely to return to work later than patients with undergraduate or graduate degrees (Figure 6). Similar results have been found in previous studies, which have demonstrated that educational level, white-collar occupation, job satisfaction, and expectation to return to work were significantly correlated to earlier return to work [5,7,8,9], while lower socioeconomic status is associated with less likelihood of returning to work [6]. Occupations requiring advanced education have been shown to increase satisfaction and to be associated with higher compensation compared to lower academic categories, motivating employees to return to work earlier [10]. Furthermore, patients in these occupations may also have stronger expectation to return to work due to greater job security and/or less severe injuries, while patients in lower academic categories have less job security and/or more severe injuries, making expectation to return less clear. Previous studies have also reported that jobs requiring less education are associated with increased work stress, which could reduce a patient's interest in returning to work [11]. Additionally, pressure to return to work may be greater in higher educational groups because these jobs tend to be more specialized and therefore less replaceable than those requiring less education. Lastly, occupations requiring more education are often less physical and therefore may require shorter healing time to return to basic job functions. However, the findings of our study suggest that education level and the physicality of the occupation are independent influencers of time lost from work.

Finger and rib/sternum injuries were independent predictors of fewer days lost from work on multivariable analysis (Table 1). This is consistent with injury severity scoring systems used by the United States Department of Labor, in which finger injuries are given the lowest possible scores [12,13]. It is possible that these injuries are associated with fewer days lost from work because they are less likely to require surgery or affect mobility, therefore allowing for shorter healing time and a higher level of functional ability despite the injury.

Older age was significantly associated with increased days lost from work on bivariate analysis and approached statistical significance in multi-variable analysis. This finding is supported by previous studies that showed that older patients do not heal as fast as younger ones [14,15,16]. Age was also shown to be an independent predictor of long-term disability leave in patients with musculoskeletal injury [15]. The results of our multi-variable analysis suggest that in our population age was less of a predicting factor for days lost from work than other associated factors (Table 1).

Limitations to this study primarily relate to the limited nature of the dataset used. First, despite the large population used by this data set, the number of events resulting in significant amount of days lost before returning to work was relatively small and did not allow for meaningful comparisons between subgroups. Next, while job descriptions were available for most of the occupations listed, specific indicators of physicality (i.e. number of pounds lifted) were not. Knowing the specific physical requirements would have allowed for more exact stratification of physical groups and therefore more accurate determination of how physicality affects time lost from work. Furthermore, these data do not describe the success of return to work. While the dataset states that a patient returned to work, we were unable to determine the capacity at which they returned (half-duty, full-duty, etc.). The institutional dataset used in this study included a wide range of occupations with employees from many academic and socioeconomic backgrounds, increasing its generalizability. However, the specific institutional rules regarding medical leave may not reflect those of other employers and may have influence the return to work time. Lastly, this dataset does not address the socioeconomic and cultural influences on days lost from work. Patients in an unstable socioeconomic situation will likely return sooner if they are not receiving their full pay while on disability, and lack of job security may push an employee to return faster than those who are confident that their job will continue to be available to them. Marital status, number of dependents, cost of living, and social behaviors may also affect days lost from work in a similar fashion. Future studies are needed to further analyze the association of these factors with days lost from work.

Conclusions

This study demonstrated that in the setting of injury, the worker's physical and educational job requirements, claim type, and injured body part are all independent predictors of days lost from work following injury. Physicians should be aware of these factors and take them into account when estimating length of disability leave to patients and their employers. Future studies are needed to make more specific guidelines, accounting for other patient factors not included in this dataset.

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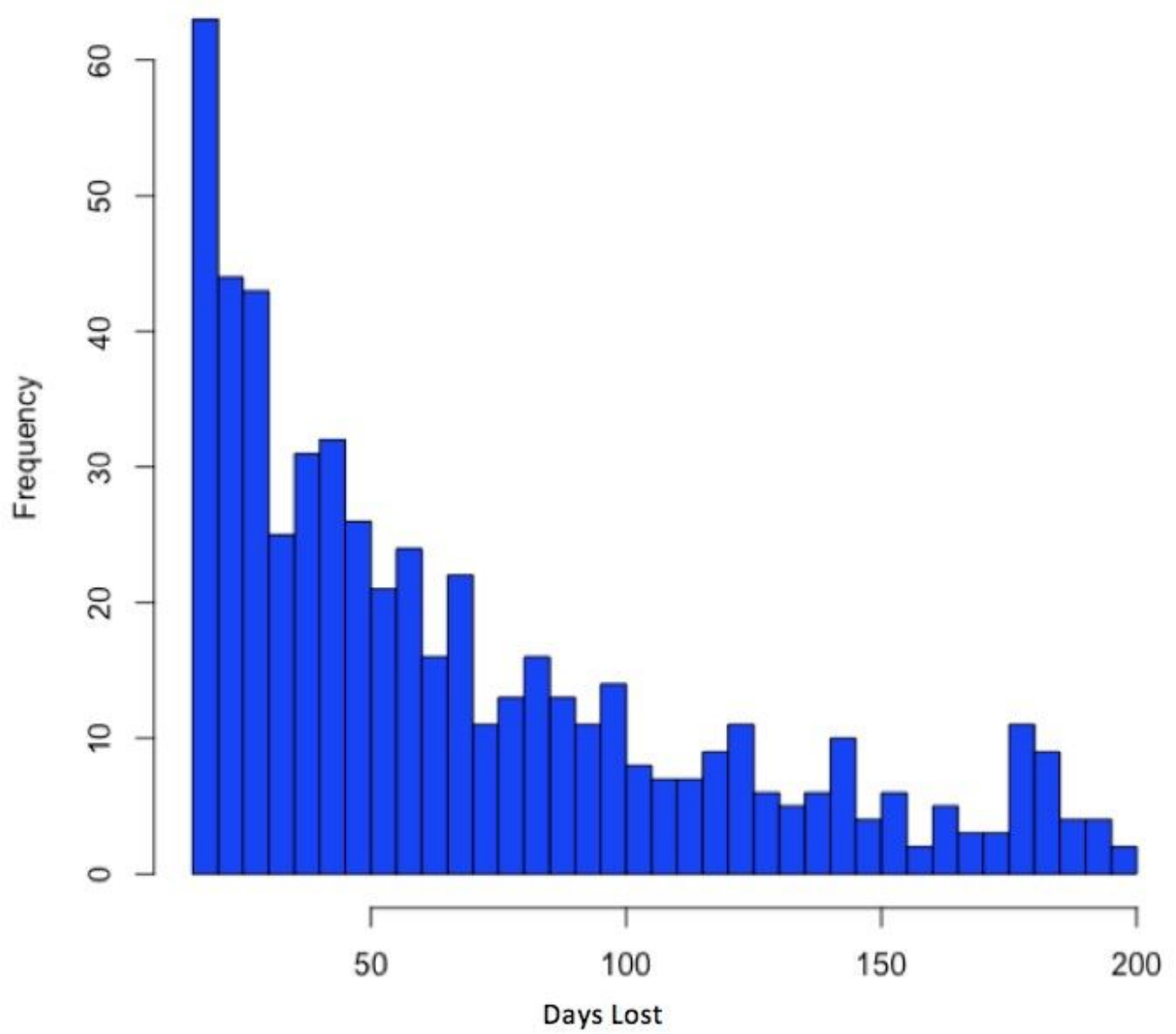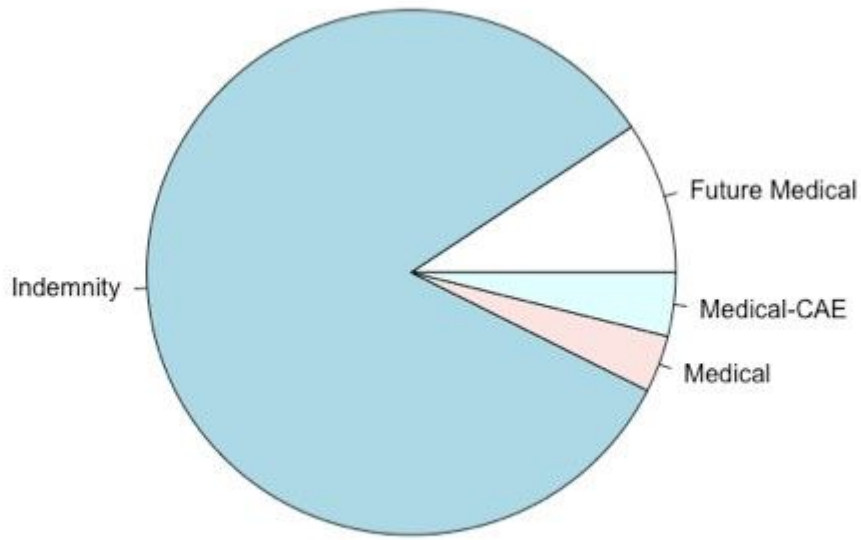
Figures

Figure 1

Frequency of number of days lost.

Figure 2

Indemnity was the most common type of disability claim.
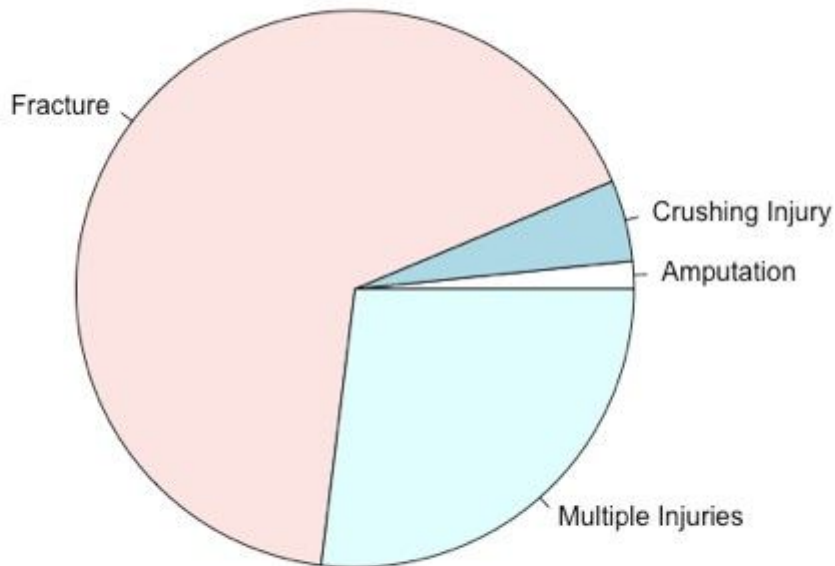

Figure 3
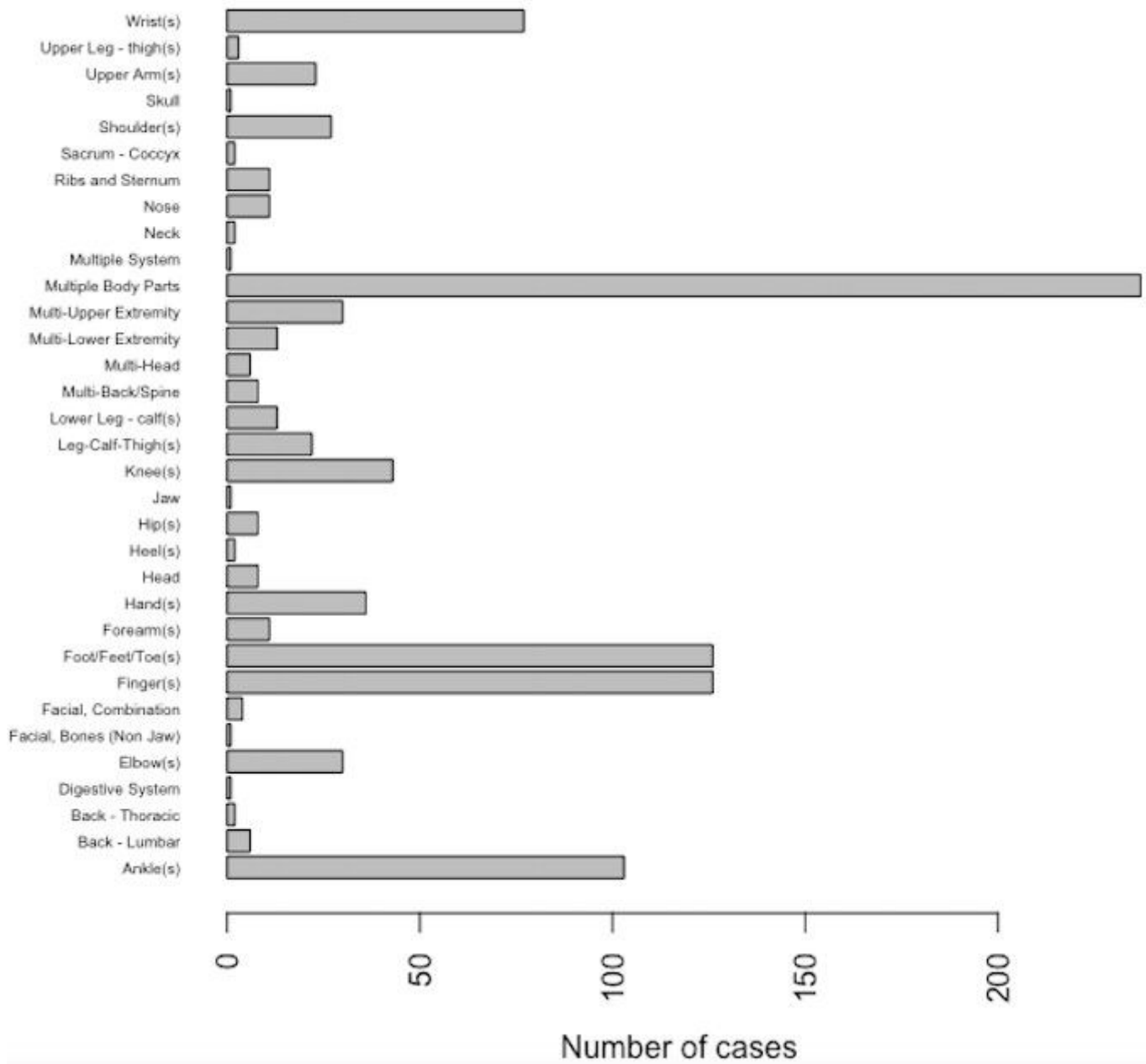
Fracture was the most common injury type.

Figure 4

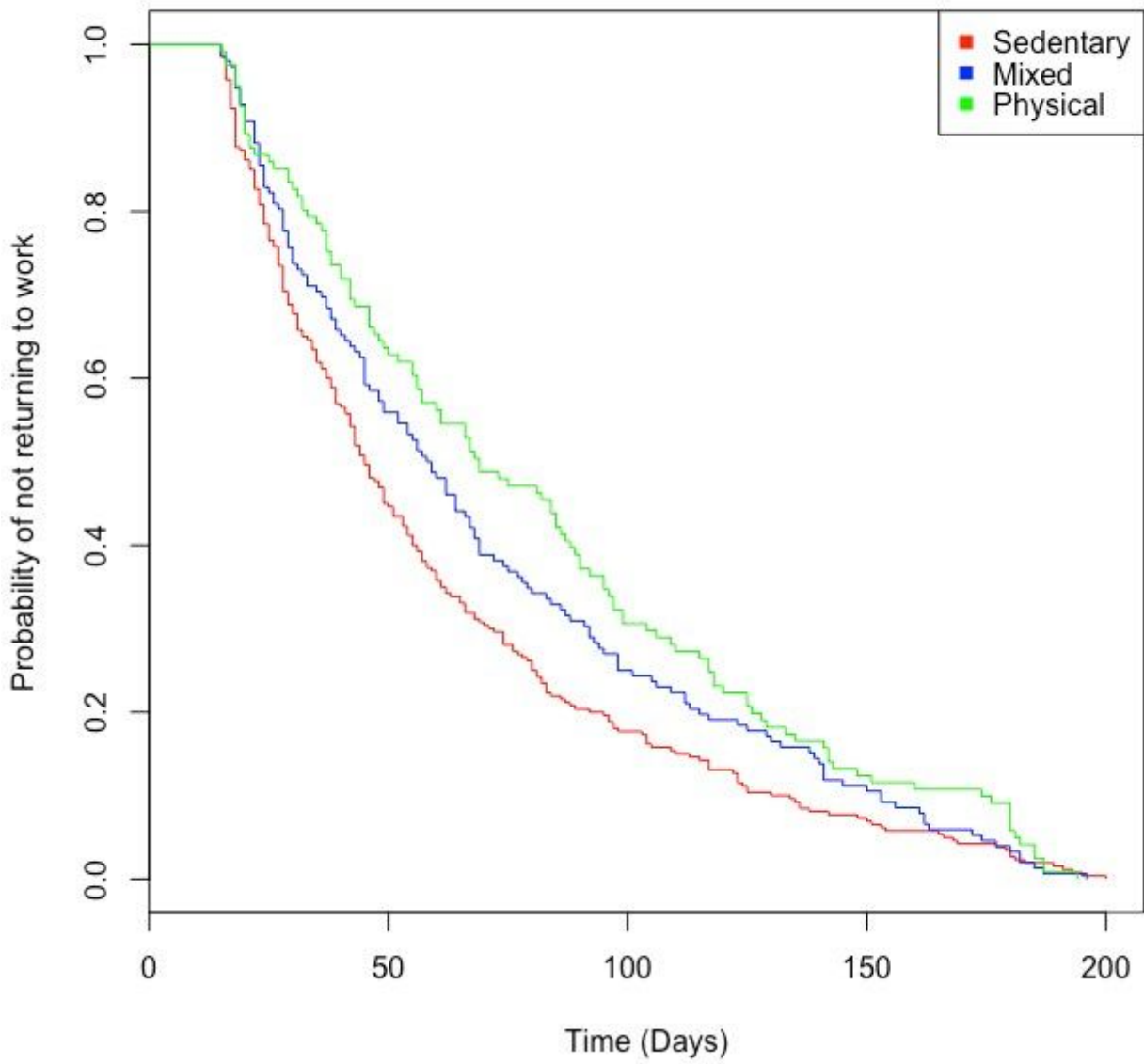Frequency of injured body parts resulting in days lost from work.

Figure 5

Probability of not returning to work versus number of days lost, compared between physical groups.
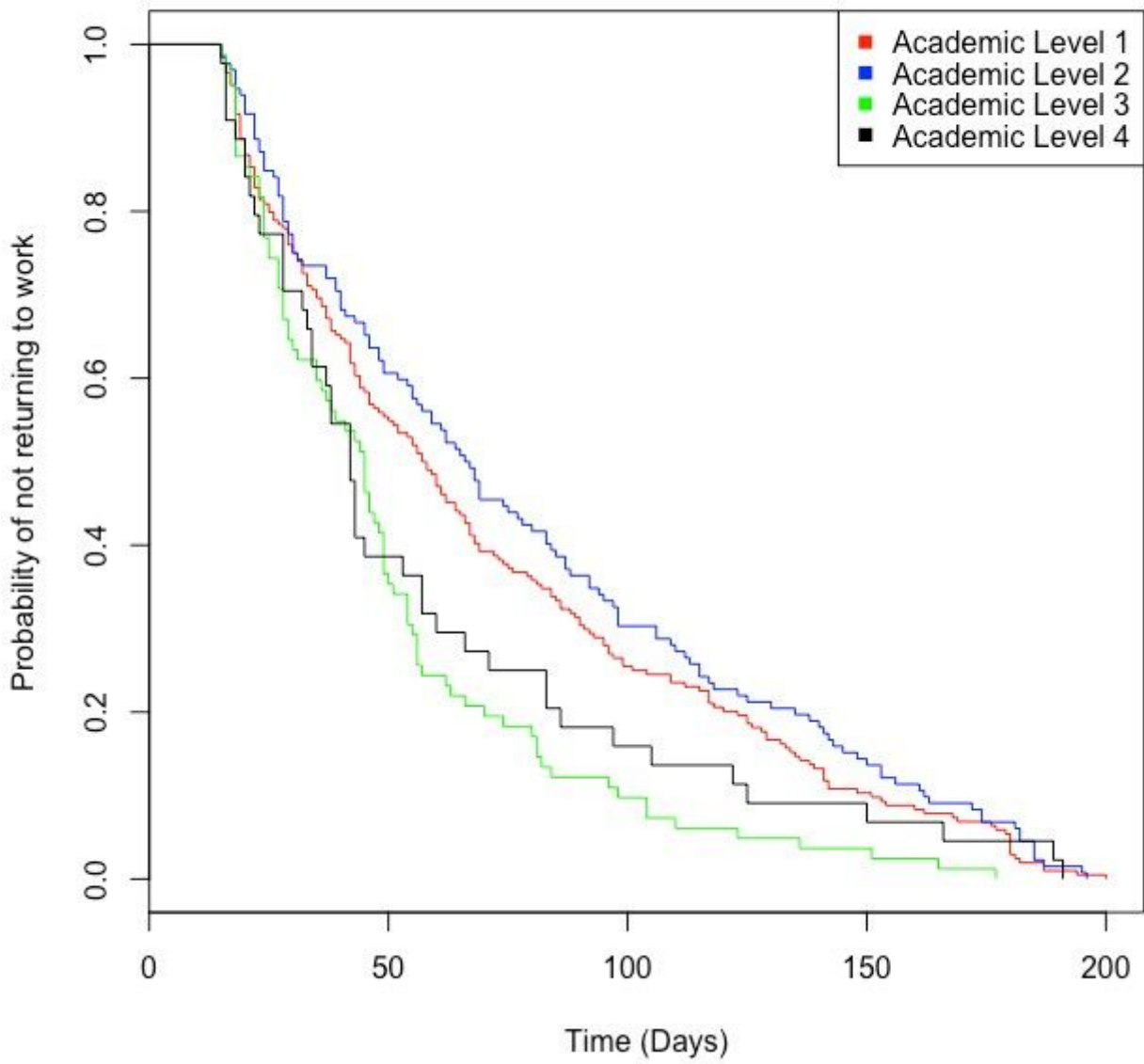
Figure 6

Probability of not returning to work versus number of days lost, compared between educational groups.