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Return to work following accidental injury: a prospective follow-up study

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Abstract

Objective

The aim of this study was to predict return to work following accidental injuries leading to hospital admission.

Design

Prospective 6 months follow-up study.

Setting

Department of trauma surgery of a university hospital.

Participants

Consecutively recruited victims of accidental injuries (n=221) hospitalised for a minimum of 32 hours including two consecutive nights. All participants were aged 18-65 years and able to participate in an assessment within 30 days of the accident.

Main outcome measures

Interview-assessed number of days off work during the 6 months immediately following the accidental injury.

Results

The patients' subjective appraisals of a) accident severity and b) their ability to cope with the resulting injury and its job-related consequences predicted time off work following the accident beyond the impact of the objective severity of their injury and the type of accident involved.

Conclusions

Patients' subjective appraisals of the accident severity and of their ability to cope with its consequences are highly relevant for return to work after accidents. Extending findings from previous studies in severely injured and otherwise pre-selected accident victims, this seems to apply to the whole spectrum of patients hospitalised with accidental injuries.

Introduction

In the EU every year 6.5 million people are admitted to hospitals following accidental (involuntary) injuries.[1] This figure corresponds to more than 1% of the 500 million inhabitants in the EU. In addition to the direct costs of the treatment, accidental injuries cause even higher indirect costs. Sick-leave following accidental injuries is one of the most important contributors to these indirect costs.[2 3] Although return to work is one of the most relevant measures of functional outcome of injuries,[4] few studies on return to work after accidental injuries have been conducted.[2 5-12]

Generally, return to work is not only predicted by injury related or medical factors. Job related factors,[2 11 13 14] socioeconomic factors,[2 6 8 11 15] psychological distress,[8 10 11] causal attribution,[16] and compensation eligibility[9 17] become increasingly important factors for return to work the longer the medical condition lasts. How patients' expectations of recovery affect their health and vocational outcome is insufficiently researched.[18 19] Compared to those remaining on sick-leave, patients returning to work after injury had stronger internal health beliefs, i.e. they believed they had an influence on their own health and considered themselves powerful.[6] In several studies involving various medical conditions, patients' own expectations and predictions of their future work ability predicted return to work.[20-22] There are relatively few studies examining the role of the subjectively experienced accident severity and the subjectively experienced ability to cope with the accidental injury regarding return to work.[6-8 12 23] The findings from these studies cannot be generalised as they are compromised by their highly selective samples: the studies were either restricted to severely injured patients without pre-existing mental disorders,[6 7 12 24] and/or they excluded foreign-language patients.[6 7 11 12 17 24 25] In a previous study of severely injured accident victims we found that time off work was

best predicted by the patients' own appraisals of accident severity and by the patients' own expectations regarding their ability to cope with the accidental injury and its job-related consequences.[12] Whereas at the one-year follow-up, injury severity measured by the injury severity score (ISS)[26] and type of accident (traffic, workplace, sporting/leisure) were also predictive of time off work,[7] at the three-years follow-up only the self-reported appraisals of accident severity and the patients' ability to cope with the accidental injury remained predictive of days absent from the workplace.[12] However, the sample in this previous study was highly selective. We included only severely injured (ISS≥10), German-speaking patients and excluded patients who had been under treatment for any mental disorders and/or serious somatic illnesses at the time of the accident. By doing this we may have excluded patients at a higher risk for sick-leave and the results may therefore not be generalised to apply to all accident survivors.

The aim of this study was to determine whether the predictive value of the patients' own appraisals of the severity of their accident and of their coping abilities may be replicated in a larger and less selective sample of patients with any accidental injury requiring hospital admission.

Methods

Sample

Participants were recruited from the Department of Trauma Surgery at the Zurich University Hospital. All the patients qualifying for the study had sustained accidental injuries that required hospitalisation for a minimum of 32 hours including two consecutive nights. Further inclusion criteria were: age between 18 to 65 years; ability to participate in an extensive assessment within 30 days of the accident; and sufficient proficiency in one of the study languages (German, Italian, Spanish, Portuguese, Serbo-Croatian, Turkish, or Albanian) to participate in the interview and to complete the self-report questionnaires. Non-German speaking participants were assessed using interpreters and professionally translated psychometric instruments. Exclusion criteria were: a Glasgow Coma Scale score (GCS)[27] below 9; unconsciousness for more than 15 minutes after the accident; pathological findings in the cranial CT; attempted suicide.

In contrast to our previous study,[7 12] neither serious somatic illness, nor being in treatment for a mental disorder prior to the accident was an exclusion criterion in the present study.[28] With regard to the possibility of generalising the present study's findings, we also retained patients who showed marked clinical signs or symptoms of mental disorders that were obviously unrelated to the accidental injury.

Patients were recruited over a period of 12 months. During this time period 787 patients aged between 18 and 65 years were admitted with accidental injuries. Of these patients 253 did not meet the inclusion criteria due to early discharge (104; 41.1%), poor clinical condition (74; 29.2%), GCS score below 9 (46; 18.2%), insufficient proficiency in one of the study

languages (21; 8.3%) or other reasons (29; 11.5%) (multiple reasons possible). As a result, 534 patients fulfilled all criteria and were eligible for the study. Due to a restricted interviewing capacity, not all the eligible patients could be assessed. A random procedure was applied to select the patients; this procedure has been described in detail in a previous publication.[29] The 148 patients who could not be contacted due to our limited interviewing capacity did not differ from the participating patients with regard to age (mean difference=-0.40 years; 95%-CI=-2.93 to 2.12; t=-0.31; df=481; P=0.754) and gender (Pearson's χ^2=0.77, df=1, P=0.375). Of the 386 patients who were contacted, 335 gave their written consent to participate. The 51 (13.2%) who declined participation did not differ significantly from the participating patients with regard to age (mean difference=3.75 years; 95%-CI=-0.12 to 7.61; t=-1.91; df=384; P=0.057) and gender (Pearson's χ^2=0.07; df=1; P=0.792).

After the exclusion of a small number of victims of physical violence (n=12), the sample consisted of 323 patients who all attended the interview at T1. On average the T1 interview was performed 5 days after the referral to the hospital (SD 4.2 days; range: 2 to 28 days). 34 patients had no regular work and were excluded from further analyses regarding time off work. However, four patients who were receiving unemployment compensation at the time of the accident were retained for further analyses. For these patients accident-related time off work was traceable since they needed a doctor's certificate to continue to be eligible for unemployment compensation. In all, valid data regarding time off work were obtainable from 289 patients.

On average the follow-up interview (T2) took place 188 (SD 16.2; range 155 to 257) days after the accidental injury. 68 (23.5%) dropped out during the follow-up period; these 68

drop-outs did not differ significantly from the final sample with regard to age (mean difference=-2.78 years; 95%-CI=-6.13 to 0.57; t=-1.63; df=287; P=0.104), gender (Pearson's χ^2=3.3; df=1; P=0.069), type of accident (Pearson's χ^2=6.5; df=1; P=0.088), clinician-rated Injury Severity Score[26] (mean difference=-0.77; 95%-CI=-3.54 to 1.99; t=-0.55; df=287; P=0.582), and patient-rated subjective accident severity (t=1.19; df=287; P=0.237), appraisal of coping abilities (mean difference=-0.16; 95%-CI=-0.37 to 0.04; t=-1.58; df=283; P=0.115), and intrusions as measured by the Impact of Event Scale[30] (mean difference=0.87; 95%-CI=-1.14 to 2.28; t=0.86; df=276; P=0.393). The final sample consisted of 221 patients.

Measures

The Injury Severity Score (ISS)[26] and the Glasgow Coma Scale (GCS)[27] were routinely assessed by the surgeons immediately after admission to the emergency room. The ISS permits an evaluation of the severity of injuries by a trauma surgeon: Each part or area of the body affected is given a score (1=minimum to 6=fatal injury). If the score is 6 in one area, the ISS is assigned a sum score of 75. Otherwise, the scores for the three most severely injured areas of the body are squared and then summed, producing a maximum score of 75. Patients with a score of 10 or more are generally considered severely injured. The GCS is an observer-rated scale for the clinical appraisal of the gravity of coma after injury to the skull and brain. Patients with severe traumatic brain injuries generally have a score under 9.

The semi-structured interview at T1 covered socio-demographic data, a detailed work record and information about the accident. Existing pre-accident psychiatric disorders were assessed using the Primary Care Evaluation of Mental Disorders.[31] The patients rated their appraisal of the injury severity on a Likert scale ranging from "1=very slight" to "5=very severe". They

also rated their ability to cope with the accidental injury and its job-related consequences on a Likert scale ranging from "1=very poor" to "5=very good".[7 12] Posttraumatic psychological symptoms were assessed by the Impact of Event Scale (IES),[30] a 15 item self-rating questionnaire comprising two subscales (intrusion and avoidance) with high reliability and validity.[32] Time off work, assessed at 6 months (T2) post-accident, was defined as the number of sick-leave days attributable to the accidental injury and its consequences including time of hospitalisation.

A week off work was set to equal seven days of leave. Where subjects who had previously been full-time employees returned to work on a part-time basis, the days on which they worked less were added to the total days of leave on a pro rata basis.[12] The interviews were performed by two medical doctors (SHB and JFP). Each patient was interviewed by the same interviewer at T1 and T2. Detailed information on the study design and the interrater reliability is described in an earlier publication.[29]

Statistical analysis

Hierarchical linear multiple regression analyses were performed to predict the number of sick-leave days. They allowed for highlighting the relevance of patient's appraisal among the selected potential predictor variables. To enable us to enter the type of accident (road traffic, workplace, household, or leisure-time accidents) as a predictor into the multiple regression analysis, this categorical variable was converted into a set of three new variables so that a deviation contrast resulted. In this way the effect of each accident category was compared to the mean effect of all accident categories. Since there was one new variable for each degree of freedom, one accident category (household) had to be omitted in the regression analysis. In the final regression model including all potential predictors multi-collinearity was low (tolerance

>0.75) and the distribution of regression standardised residuals was normal (Kolmogorov-Smirnov Z=0.63, P=0.827). Group comparisons of dimensional variables were performed with t-tests.

Ethical approval

Ethical approval was granted by the Ethics Committee of the Canton of Zurich. Written informed consent was obtained from all participants.

Results

The socio-demographic characteristics are presented in table 1. 35 (15.8%) of the 221 patients suffered from one or multiple pre-existing mental disorders immediately prior to the accident. Characteristics related to the accidental injury of the 221 patients are found in table 2. The types of accident were as follows: 72 (32.6%) traffic accidents, 66 (29.9%) workplace accidents, 6 (2.7%) household accidents, and 77 (34.8%) sports/leisure activity-related accidents. The mean ISS differed significantly between the types of accident (traffic: M 16.0, SD 12.4; workplace or household: M 11.8, SD 8.2; sporting/leisure activity: M 8.7, SD 7.7; ANOVA: $F=10.7$; $df=2, 218$; $P<0.001$).

According to the surgeons' files, 44 (19.9%) patients sustained a mild or moderate traumatic brain injury (MTBI). 41 (18.6%) patients were first referred to the intensive care unit (ICU), with a mean duration of ICU stay of 4.0 days (SD 3.7; range 1-19). The mean length of stay at the acute hospital including the ICU was 15.8 days (SD 16.9; range 2-110). 46 patients had a further stay in a rehabilitation hospital, with a mean length of stay of 35.0 days (SD 25.0; range 3-141). The mean number of sick-leave days was 95.7 (SD 58.1; range 6-183). Patients suffering from pre-existing mental disorders did not differ significantly from the rest of the sample with regard to the number of sick-leave days (mean difference=2.7 days; 95%-CI=-18.4 to 23.8; $t=0.25$; $df=219$; $P=0.801$).

Bivariate correlations of all variables included in the regression analyses are presented in table 3. The objective injury severity (ISS) and the patients' subjective appraisals of the accident severity were positively correlated. Subjective appraisals of the accident severity (but not the objective injury severity scores) were negatively related with self-rated coping abilities.

Time off work was significantly correlated with the injury severity (ISS), IES intrusion scores, and the patients' own appraisals of both their injury severity and their coping abilities. Finally, time off work was longer after workplace related accidents and shorter after sports/leisure accidents.

In a simultaneous regression analysis the variables injury severity (ISS), sex, age, type of accident (road traffic, workplace, or leisure-time accidents), and IES intrusion were entered as potential predictors of time off work. Combined, these predictors explained 24.3% of the variance of time off work ($F=9.75$; $df=7, 213$; $P<0.001$). When in a series of hierarchical regressions each of these predictors was examined when added last to this first set, ISS (8.3%, $F=23.38$; $df=1, 213$; $P<0.001$), type of accident (7.6%; F change=7.14; $df=3, 213$; $P<0.001$), and IES intrusion added unique variance (2.0%; $F=5.63$; $df=1, 213$; $P=0.019$). These five variables were then treated as the first set added in hierarchical regressions focusing on two additional predictors, patients' appraisals of accident severity and of their coping abilities. These two variables were entered in the second step accounting for an additional 9.4% of the variance of the time off work 6 months post accident (F change=15.04; $df=2, 211$; $P<0.001$). Self-reported appraisal of accident severity added 6.0% (F change=18.14; $df=1, 212$, $P<0.001$), and self reported appraisal of their coping abilities added 4.7% (F change=14.17; $df=1, 212$; $P<0.001$). Finally, each of the seven predictors in table 4 was evaluated for unique variance contributed with the other six predictors already in the model. The severity of the injury (ISS), type of accident, and the two appraisals variables remained significant, whereas age, gender, and IES intrusion did not contribute significantly to the prediction of time off work.

In order to visualize the effects of appraisals on sick-leave days, the sample was divided into four groups based on median-splits in the two variables appraisal of accident severity and appraisal of coping abilities (fig. 1). The median was 4 Likert points in the subjective accident severity scale, and 5 Likert points in the self-rated coping abilities scale. Patients with values equal or higher than the median were grouped as 'higher' in the respective characteristic, patients with values lower than the median were grouped as 'lower' concerning subjective injury severity or self-rated coping abilities, respectively. Regarding the two groups of particular interest, namely patients who assessed the accident severity as higher and their coping abilities as lower, compared with patients who estimated the accident severity as lower and their coping abilities as higher, there were twice as many sick-leave days for the former group (mean difference=-68.1 days; 95%-CI=-85.7 to -50.5; t=-7.67; df=124; P<0.001).

Discussion

How patients perceive the severity of their accident and their ability to cope with the resulting injury and its job-related consequences are crucial predictors for return to work after accidental injuries which lead to hospital admission. The current study demonstrated that the patients' own appraisals of the severity of their accident and of their coping resources predict time off work after accidents beyond the impact of the objective injury severity (ISS).

Some limitations of this study have to be addressed. To enable the findings from this current study to be better generalised, we applied very few exclusion criteria. For example, we did not exclude patients with pre-existing somatic and psychiatric morbidity. While this may have strengthened the external validity of our findings, factors other than the accidental injury might have influenced outcomes. By including patients with pre-existing somatic and psychiatric morbidity we possibly included patients who were at higher risk for sick-leave following accidental injury. However, patients suffering from pre-existing mental disorders did not differ from other patients with regard to the number of sick-leave days. Furthermore, there were 68 (23.5%) drop-outs from T1 to T2 in our study. It is unlikely that these drop-outs affected the results substantially as they did not differ significantly from the final sample. Finally, the number of days off work was assessed by means of self-rating by the patients. Strict data privacy protection laws in Switzerland prevent the use of health insurance companies' data for the purpose of research projects. Such data would have been more reliable.

The relevance of psychosocial and subjective factors for a successful return to work after accidents has been increasingly recognised in literature.[6 10 18 24 25 33] Extending the findings

from previous studies among severely injured accident victims,[6 7 12] the current study confirmed the predictive value of patients' subjective appraisals of the accident severity for the whole spectrum of patients admitted to hospitals with accidental injuries. In contrast to our previous study in severely injured accident victims who were hospitalised at the ICU,[7 12] the current study included all accidental injuries leading to hospital admission, with only 18.6% of the patients requiring ICU treatment. In an effort to enable the findings from this current study to be better generalised, unlike in our previous study[7 12], we did not exclude foreign language patients and patients with pre-existing somatic illnesses and mental disorders. In some cases these particular patients may be less well socially integrated or have greater difficulties dealing with the consequences of accidental injuries; both being risk factors for work disability. In our sample including moderately injured and foreign language accident victims with pre-existing somatic and psychiatric morbidity, the subjectively experienced accident severity predicted time off work after the accidents to the same degree as the objective injury severity (regression weights: Betas = .24 vs. .25). The role of the objective injury severity regarding time off work after accidental injuries is ambiguous. In keeping with some previous studies,[2 6 7] we found the more severe injuries to be related to more days off work. However, some other studies could not find that association.[8 10 11 34] These inconsistent findings might be explained by the different ranges of injury severities and by the different follow-up intervals used in different studies. The wider the range of injury severities in a study, the higher the chance that the severity of the physical impairment predicts subsequent time off work. The more time that has elapsed since the accident, the less impact the objective injury severity is expected to have on time off work. The physical condition may play a more important role immediately following the accident because hospitalisation and rehabilitation directly contribute to the time off work, whereas in the longer term other factors might gain in

importance regarding sick-leave. In our previous study among severely injured accident victims, the objective injury severity predicted time off work during the first year after the accident but was no longer predictive for the number of days off work at the three year follow-up.[7 12] In a longer term perspective, factors other than the objective physical impairment, e.g. psychosocial or subjective factors, might gain in importance regarding return to work.

Concerning subjective factors predicting return to work, the patients' appraisals of the ability to cope with the accidental injury and its job-related consequences turned out to be another important predictor of sick-leave after hospital admissions due to accidental injuries. The more coping resources patients perceived themselves to have at their disposal immediately after the accident, the better his or her chances for vocational rehabilitation actually were. The significance of subjectively perceived coping abilities for return to work has already been found in earlier studies.[7 11 12] The predictive value of the patients' appraisals of the accident severity and of the coping abilities regarding time off work after accidental injuries may be explained by Lazarus' theories on stress, appraisal and coping.[35 36] Lazarus emphasized the significance of primary and secondary appraisal of a stressful situation or event. In a primary appraisal the same situation can be judged as harmful, as a threat or as a challenge by different individuals. In a secondary appraisal the individual judges the ability to cope with the situation depending on his or her individual coping strategies. If a stressful situation is appraised as controllable by action, problem-focused coping will predominate. In a situation viewed as refractory to change, however, emotion-focused coping is more likely to predominate. Among accident victims these two steps of appraisals seem to be related. In our sample, the more threatening the patients judged their accident to have been, the fewer resources they perceived themselves to have at their disposal for coping with the accidental

injury and its job-related consequences. However, the subjective appraisal of the coping abilities was not correlated with the objective injury severity. This further emphasizes the importance of considering not only the patient's objective injury severity but also their own appraisal of the accident severity and the coping abilities when predicting the chances of return to work. Coping with stressful events is increasingly viewed as a process rather than an inert (personality) style. If coping is open to change over time in accordance with the situational context,[28 35] this may be promising for preventive and therapeutic interventions.

Conclusion

A patient's own appraisal of the severity of their accident and of their ability to cope with the accidental injury and its job-related consequences, are highly relevant for return to work after accidents leading to hospital admission. Both subjective appraisals predict time off work beyond the impact of the objective injury severity in the whole spectrum of patients hospitalised due to accidental injuries.

In Western countries the quality of surgical care of accident victims has reached a high standard. In patients hospitalised with accidental injuries, even where acute surgical care is inevitable, from a less immediate standpoint and bearing in mind future rehabilitation, a patient's subjective assessment seems to gain in importance where their recovery is concerned. It appears that relevant prognostic information regarding return to work can be obtained by asking the patient two simple questions:

1.) How severe do you think your accident was?

2.) How well do you think you will be able to handle the consequences of the accident with regard to return to work?

Any comprehensive treatment following accidental injuries should routinely be accompanied by a brief psychosocial assessment and should include information and practical advice.

Article summary

Article focus

- Sick leave is one of the most important contributors to the indirect costs of accidental injuries and often surpasses the direct costs of treatment.
- In severely injured accident victims sick leave depends to a considerable degree on the patients' own appraisal of the severity of the accident and their coping abilities.
- In this study we examined whether the significance of patients' subjective appraisals for return to work may be replicated in a larger and less selective sample of patients with any accidental injury requiring hospital admission.

Key messages

- The patients' own appraisals of the severity of their accidents and of their coping abilities are highly relevant for return to work in the whole spectrum of hospitalised accident victims.
- The answers to two simple questions about patients' appraisals of the accident severity and their perceived coping abilities provide relevant prognostic information regarding return to work.
- A comprehensive treatment after accidental injuries should routinely be accompanied by a psychosocial assessment which includes giving information and practical advice.

Strengths and limitations of the study

- The application of very few exclusion criteria may have strengthened the study's external validity (generalisability), but at the same time may have limited its internal validity (i.e., factors other than the accidental injury might have influenced time off work).
- There were 68 (23.5%) drop-outs from baseline to follow-up, which however did not differ from the completers with respect to available patient and accident-related characteristics.
- The number of days off work was assessed by means of self-rating by the patients due to strict data privacy protection laws in Switzerland.

Competing interests

This study was supported by the Swiss National Science Foundation (32-053736.98). The Swiss National Science Foundation is a government-funded national institution. No commercial sponsorship was involved in the design and conduct of the study. All authors declare that they have no financial relationships with any organisation that might have an interest in the submitted work in the previous three years, and that they have no other relationships or activities that could appear to have influenced the submitted work.

Author contributions

US and HM designed the study. HM, SHB and JFP were involved in the data collection. HM performed the statistical analyses. UH, HM, NS, US were involved in the interpretation of the data. NS, UH and HM drafted the manuscript. US reviewed the manuscript several times. All authors have read and approved the final version of the manuscript.

Data sharing

There is no additional data available.

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Figure captions

Figure 1

Sick-leave days of accident victims depending on appraisals of injury severity and coping abilities (N=221, n=31 to 78 per group). Comparison of the group „lower appraisal of injury severity and higher appraisal of coping abilities" with the three other groups: *** p≤.001.

Table 1| Socio-demographic characteristics of injured accident victims (N=221)

Variable	No	Percentage
Age (years)*	40.0 (12.1)	
Sex:		
Male	156	70.6
Marital status:		
Single	103	46.6
Married	87	39.4
Divorced/widowed	31	14.0
Living arrangements:		
Alone	65	29.4
With others (family, partner, friends)	156	70.6
Maximum educational level:		
No education	2	0.9
Obligatory school	33	14.9
Apprenticeship	121	54.8
College	13	5.9
Technical or commercial college/University	52	23.5
Employment status:		
Paid work (full-time)	159	71.9
Paid work (part-time)	37	16.7
In education/ student (part-time paid work)	21	9.5
Unemployed at time of accident	4	1.8

Nationality		
Swiss	163	73.8
German/ Austrian	16	7.2
South European countries	24	10.9
Balkanian countries	14	6.3
Others	4	1.8

*Mean (standard deviation)

Table 2| Injury related characteristics of injured accident victims (N=221)

Variable	Mean	Standard Deviation	Minimum	Maximum
Injury Severity Score	12.1	10.1	1	66
Glasgow Coma Scale	14.8	0.7	9	15
Length of stay (days) at the intensive care unit*	4.0	3.7	1	19
Length of stay (days) at the University Hospital†,‡	15.8	16.9	2	110
Length of stay (days) at the University Hospital and Rehabilitation†,‡	23.1	28.8	2	163
Time off work at T2‡	95.7	58.1	6	183

*n=41 cases at the intensive care unit

† n=220

‡Subsumes the row above it

Table 3| Bivariate correlations (Pearson correlation coefficients) between potential predictor variables (assessed 3-28 days after the accident) to each other and to the dependent variable time off work due to the accidental injury (assessed 6 months after the accident) (N=221).

Variable	TOW	ISS	Sex*	Age	TRAFF	WORK	SPORT	IESIN	AIS
ISS	0.35***								
Sex	-0.08	-0.17*							
Age	0.09	-0.19**	0.09						
TRAFF	-0.01	0.27***	0.01	-0.22***					
WORK	0.23***	0.01	-0.23***	0.16*	-0.21**				
SPORT	-0.28***	-0.21**	0.04	-0.06	-0.26***	-0.23***			
IESIN	0.21**	0.23***	0.11	0.03	0.10	-0.08	-0.04		
AAS	0.40***	0.34***	-0.06	-0.02	0.12	0.13	-0.13	0.27***	
ACC	-0.29***	-0.08	-0.01	-0.01	-0.01	-0.09	0.06	-0.15*	-0.19**

TOW=time off work (days) due to the accidental injury; ISS=Injury Severity Score; TRAFF=traffic accident; SPORT=sports or leisure accident; WORK=workplace accident; IESIN=Impact of Event Scale–intrusion subscale; AAS=appraisal of accident severity; ACA=appraisal of coping abilities.

*Sex: 1=male, 2=female

Return to work 31

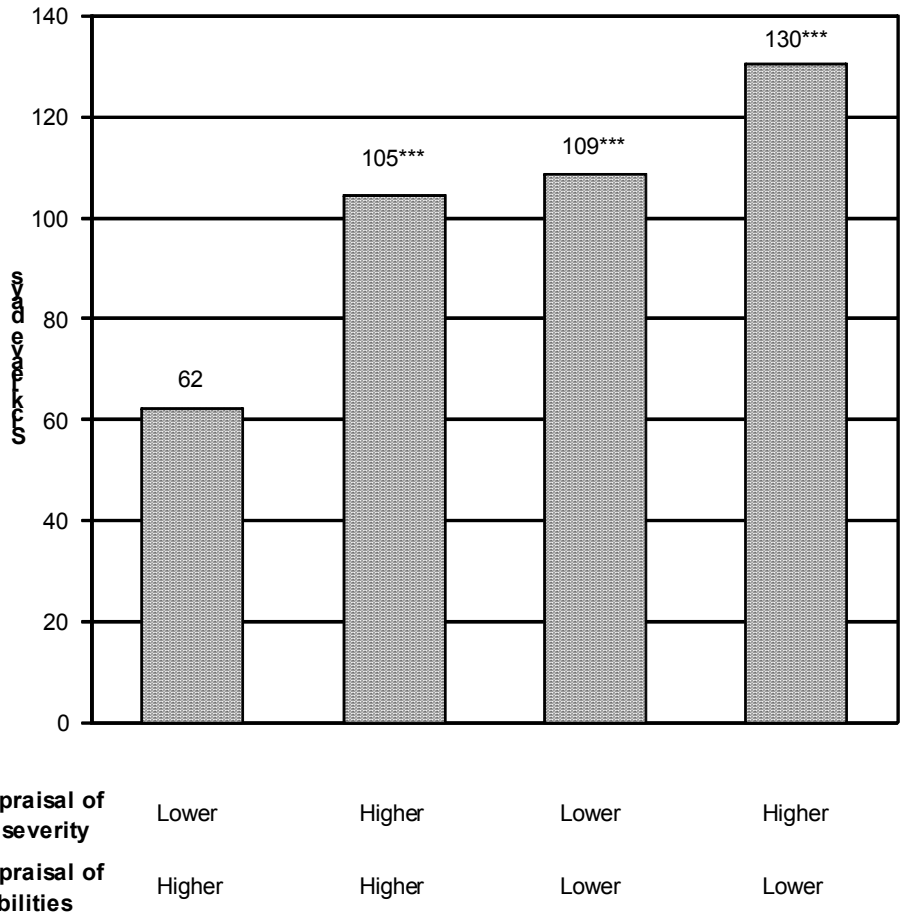
*p≤0.05, **p≤0.01, ***p≤0.001

Table 4| Prediction of time off work over 6 months after the accident

Predictor variable	Beta	95%-CI for Beta		p
Injury Severity Score	.25	0.12	0.37	<.001
Female gender	-.01	-0.13	0.11	.893
Age	.09	-0.03	0.21	.140
Type of accident:				
Traffic	-.12	-0.24	0.01	.062
Workplace	.10	-0.02	0.23	.112
Sports/leisure	-.18	-0.31	-0.06	.003
IES intrusion subscale	.07	-0.05	0.19	.261
Appraisal of accident severity	.24	0.12	0.36	<.001
Appraisal of coping abilities	-.19	-0.31	-0.08	.001

Multiple Regression: N=221; R=0.58; R^2=0.34; F=11.93, df=9, 211; P<0.001.

Figure 1


140
120
100
80
60
40
20
0
62
105***
109***
130***
Initial appraisal of accident severity
Lower
Higher
Lower
Higher
Initial appraisal of coping abilities
Higher
Higher
Lower
Lower

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	page(s)
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5-6
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	—
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	8-9
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, explain how loss to follow-up was addressed	6-7
		(*e*) Describe any sensitivity analyses	—
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5-7
		(b) Give reasons for non-participation at each stage	5-7
		(c) Consider use of a flow diagram	—
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	6-7
		(c) Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	Report numbers of outcome events or summary measures over time	10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	~~12~~
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	—

			page(s)
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-11
Discussion			
Key results	18	Summarise key results with reference to study objectives	13/18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-16/17
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

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Return to work following unintentional injury: a prospective follow-up study

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Return to work following unintentional injury: a prospective follow-up study

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Abstract

Objective

The aim of this study was to predict return to work following unintentional injuries due to accidents leading to hospital admission.

Design

Prospective 6 months follow-up study.

Setting

Department of trauma surgery of a university hospital.

Participants

Consecutively recruited victims of unintentional injuries (n=221) hospitalised for a minimum of 32 hours including two consecutive nights. All participants were aged 18-65 years and able to participate in an assessment within 30 days of the accident.

Main outcome measures

Interview-assessed number of days off work during the 6 months immediately following the accident.

Results

The patients' subjective appraisals of a) accident severity and b) their ability to cope with the resulting injury and its job-related consequences predicted time off work following the accident beyond the impact of the objective severity of their injury and the type of accident involved.

Conclusions

Patients' subjective appraisals of the accident severity and of their ability to cope with its consequences are highly relevant for return to work after accidents. Extending findings from

previous studies in severely injured and otherwise pre-selected accident victims, this seems to apply to the whole spectrum of patients hospitalised with unintentional injuries.

Article summary

Strengths and limitations of the study

- The application of very few exclusion criteria may have strengthened the study's external validity (generalisability), but at the same time may have limited its internal validity (i.e., factors other than the unintentional, accident-related injury might have influenced time off work).
- There were 68 (23.5%) drop-outs from baseline to follow-up, which however did not differ from the completers with respect to available patient and accident-related characteristics.
- Sick leave after unintentional injuries due to accidents was assessed in terms of time off work during the follow-up period, which provided a more accurate estimation of work-related consequences of accidents than the mere assessment whether the accident victim had returned to work or not at a particular point in time.
- However, the number of days off work was assessed by means of self-reports by the patients due to strict data privacy protection laws in Switzerland.

Introduction

In the EU every year 6.5 million people are admitted to hospitals following unintentional injuries due to accidents.[1] This figure corresponds to more than 1% of the 500 million inhabitants in the EU. In addition to the direct costs of the treatment, unintentional injuries cause even higher indirect costs. Sick-leave following unintentional injuries is one of the most important contributors to these indirect costs.[2 3] Return to work is one of the most relevant measures of functional outcome of injuries,[4] and there is a growing body of literature on return to work after chronic injuries such as low-back pain.[5] However, there are still relatively few studies on return to work after unintentional injuries due to accidents.[2 6-14]

Generally, return to work is not only predicted by injury related or medical factors. Job related factors,[2 12 15 16] socioeconomic factors,[2 7 9 12 17] psychological distress,[9 11 12] causal attribution,[18] and compensation eligibility[10 19] become increasingly important factors for return to work the longer the medical condition lasts. How patients' expectations of recovery affect their health and vocational outcome is insufficiently researched.[20 21] Compared to those remaining on sick-leave, patients returning to work after injury had stronger internal health beliefs, i.e. they believed they had an influence on their own health and considered themselves powerful.[7] In several studies involving various medical conditions, patients' own expectations and predictions of their future work ability predicted return to work.[22-24] There are relatively few studies examining the role of the subjectively experienced accident severity and the subjectively experienced ability to cope with the unintentional injury regarding return to work.[7-9 13 25] The findings from these studies cannot be generalised as they are compromised by their highly selective samples: the studies were either restricted to severely injured patients without pre-existing mental disorders,[7 8 13 26] and/or they excluded foreign-language patients.[7]

[8 12 13 19 26 27] In a previous study of severely injured accident victims we found that time off work was best predicted by the patients' own appraisals of accident severity and by the patients' own expectations regarding their ability to cope with the unintentional injury and its job-related consequences.[13] Whereas at the one-year follow-up, injury severity measured by the injury severity score (ISS)[28] and type of accident (traffic, workplace, sporting/leisure) were also predictive of time off work,[8] at the three-years follow-up only the self-reported appraisals of accident severity and the patients' ability to cope with the unintentional injury remained predictive of days absent from the workplace.[13] However, the sample in this previous study was highly selective. We included only severely injured (ISS≥10), German-speaking patients and excluded patients who had been under treatment for any mental disorders and/or serious somatic illnesses at the time of the accident. By doing this we may have excluded patients at a higher risk for sick-leave and the results may therefore not be generalised to apply to all accident survivors.

The aim of this study was to predict return to work following unintentional, accident-related injuries in an independent, larger and less selective sample of patients with any unintentional injury requiring hospital admission.

Methods

Sample

Participants were recruited from the Department of Trauma Surgery at the Zurich University Hospital. All the patients qualifying for the study had sustained unintentional injuries that required hospitalisation for a minimum of 32 hours including two consecutive nights (the latter guaranteed exclusion of patients who were treated in the emergency room overnight but who were not really hospitalised on a ward of the Department of Trauma Surgery). Further inclusion criteria were: age between 18 to 65 years; ability to participate in an extensive assessment within 30 days of the accident; and sufficient proficiency in one of the study languages (German, Italian, Spanish, Portuguese, Serbo-Croatian, Turkish, or Albanian) to participate in the interview and to complete the self-report questionnaires. Non-German speaking participants were assessed using interpreters and professionally translated psychometric instruments. Exclusion criteria were: a Glasgow Coma Scale score (GCS)[29] below 9; unconsciousness for more than 15 minutes after the accident; pathological findings in the cranial CT; attempted suicide.

In contrast to our previous study,[8 13] neither serious somatic illness, nor being in treatment for a mental disorder prior to the accident was an exclusion criterion in the present study.[30] Note that the sample of the previous study[8 13] and the sample of the present study on time off work were completely independent from each other (recruitment of the second sample started 18 months after the end of recruitment for the first sample). With regard to the possibility of generalising the present study's findings, we also retained patients for the present study who showed marked clinical signs or symptoms of mental disorders that were obviously unrelated to the unintentional injury.

Patients were recruited over a period of 12 months. During this time period 787 patients aged between 18 and 65 years were admitted with unintentional injuries. Of these patients 253 did not meet the inclusion criteria due to early discharge (104; 41.1%), poor clinical condition (74; 29.2%), GCS score below 9 (46; 18.2%), insufficient proficiency in one of the study languages (21; 8.3%) or other reasons (29; 11.5%) (multiple reasons possible). As a result, 534 patients fulfilled all criteria and were eligible for the study. Due to a restricted interviewing capacity, not all the eligible patients could be assessed. The following procedure was applied to ensure the recruitment of a representative sample and to control for potential bias attributable to the time of admission: on day 1, every other consecutive patient (i.e. patient 1, 3, 5, etc.) was interviewed. On day 2 the order of the list of admissions was reversed so that the last patient admitted was interviewed first, the third last patient was interviewed second and so forth. On day 3, the order was reversed again, etc. The 148 patients who could not be contacted due to our limited interviewing capacity did not differ from the participating patients with regard to age (mean difference=-0.40 years; 95%-CI=-2.93 to 2.12; t=-0.31; df=481; P=0.754) and gender (Pearson's χ^2=0.77, df=1, P=0.375). Of the 386 patients who were contacted, 335 gave their written consent to participate. The 51 (13.2%) who declined participation did not differ significantly from the participating patients with regard to age (mean difference=3.75 years; 95%-CI=-0.12 to 7.61; t=-1.91; df=384; P=0.057) and gender (Pearson's χ^2=0.07; df=1; P=0.792).

After the exclusion of a small number of victims of physical violence (n=12), the sample consisted of 323 patients who all attended the interview at T1. On average the T1 interview was performed 5 days after the referral to the hospital (SD 4.2 days; range: 2 to 28 days). 34

patients had no regular work and were excluded from further analyses regarding time off work. However, four patients who were receiving unemployment compensation at the time of the accident were retained for further analyses. For these patients accident-related time off work was traceable since they needed a doctor's certificate to continue to be eligible for unemployment compensation. In all, valid data regarding time off work were obtainable from 289 patients.

On average the follow-up interview (T2) took place 188 (SD 16.2; range 155 to 257) days after the unintentional injury. 68 (23.5%) dropped out during the follow-up period; these 68 drop-outs did not differ significantly from the final sample with regard to age (mean difference=-2.78 years; 95%-CI=-6.13 to 0.57; t=-1.63; df=287; P=0.104), gender (Pearson's χ^2=3.3; df=1; P=0.069), type of accident (Pearson's χ^2=6.5; df=1; P=0.088), clinician-rated Injury Severity Score[28] (mean difference=-0.77; 95%-CI=-3.54 to 1.99; t=-0.55; df=287; P=0.582), and patient-rated subjective accident severity (t=1.19; df=287; P=0.237), appraisal of coping abilities (mean difference=-0.16; 95%-CI=-0.37 to 0.04; t=-1.58; df=283; P=0.115), and intrusions as measured by the Impact of Event Scale[31] (mean difference=0.87; 95%-CI=-1.14 to 2.28; t=0.86; df=276; P=0.393). The final sample consisted of 221 patients.

Measures

The Injury Severity Score (ISS)[28] and the Glasgow Coma Scale (GCS)[29] were routinely assessed by the surgeons immediately after admission to the emergency room. The ISS permits an evaluation of the severity of injuries by a trauma surgeon: Each part or area of the body affected is given a score (1=minimum to 6=fatal injury). If the score is 6 in one area, the ISS is assigned a sum score of 75. Otherwise, the scores for the three most severely injured

areas of the body are squared and then summed, producing a maximum score of 75. Patients with a score of 10 or more are generally considered severely injured. The GCS is an observer-rated scale for the clinical appraisal of the gravity of coma after injury to the skull and brain. Patients with severe traumatic brain injuries generally have a score under 9.

The semi-structured interview at T1 covered socio-demographic data, a detailed work record and information about the accident. Existing pre-accident psychiatric disorders were assessed using the Primary Care Evaluation of Mental Disorders.[32] The patients rated their appraisal of the injury severity on a Likert scale ranging from "1=very slight" to "5=very severe". They also rated their ability to cope with the unintentional injury and its job-related consequences on a Likert scale ranging from "1=very poor" to "5=very good".[8 13] Posttraumatic psychological symptoms were assessed by the Impact of Event Scale (IES),[31] a 15 item self-rating questionnaire comprising two subscales (intrusion and avoidance) with high reliability and validity.[33] Time off work, assessed at 6 months (T2) post-accident, was defined as the patient-reported number of sick-leave days attributable to the unintentional injury and its consequences including time of hospitalisation. To record their sick-leave days the patients used a specified journal they received at T1. A week off work was set to equal seven days of leave. Where subjects who had previously been full-time employees returned to work on a part-time basis, the days on which they worked less were added to the total days of leave on a pro rata basis.[13] The interviews were performed by two medical doctors (SHB and JFP). Each patient was interviewed by the same interviewer at T1 and T2. Detailed information on the study design and the interrater reliability is described in an earlier publication on the incidence of PTSD in that sample.[34]

Statistical analysis

Hierarchical linear multiple regression analyses were performed to predict the number of sick-leave days. They allowed for highlighting the relevance of patient's appraisal among the selected potential predictor variables. To enable us to enter the type of accident (road traffic, workplace, household, or leisure-time accidents) as a predictor into the multiple regression analysis, this categorical variable was converted into a set of three new variables so that a deviation contrast resulted. In this way the effect of each accident category was compared to the mean effect of all accident categories. Since there was one new variable for each degree of freedom, one accident category (household) had to be omitted in the regression analysis. In the final regression model including all potential predictors multi-collinearity was low (tolerance >0.75) and the distribution of regression standardised residuals was normal (Kolmogorov-Smirnov Z=0.63, P=0.827). Group comparisons of dimensional variables were performed with t-tests.

Ethical approval

Ethical approval was granted by the Ethics Committee of the Canton of Zurich. Written informed consent was obtained from all participants.

Results

The socio-demographic characteristics are presented in table 1. 35 (15.8%) of the 221 patients suffered from one or multiple pre-existing mental disorders immediately prior to the accident, and 31 patients (14.0%) did not speak German. Characteristics related to the unintentional injury of the 221 patients are found in table 2. The types of accident were as follows: 72 (32.6%) traffic accidents, 66 (29.9%) workplace accidents, 6 (2.7%) household accidents, and 77 (34.8%) sports/leisure activity-related accidents. The mean ISS differed significantly between the types of accident (traffic: M 16.0, SD 12.4; workplace or household: M 11.8, SD 8.2; sporting/leisure activity: M 8.7, SD 7.7; ANOVA: $F=10.7$; $df=2, 218$; $P<0.001$).

According to the surgeons' files, 44 (19.9%) patients sustained a mild or moderate traumatic brain injury (MTBI). 41 (18.6%) patients were first referred to the intensive care unit (ICU), with a mean duration of ICU stay of 4.0 days (SD 3.7; range 1-19). The mean length of stay at the acute hospital including the ICU was 15.8 days (SD 16.9; range 2-110). 46 patients had a further stay in a rehabilitation hospital, with a mean length of stay of 35.0 days (SD 25.0; range 3-141). The mean number of sick-leave days was 95.7 (SD 58.1; range 6-183). Patients suffering from pre-existing mental disorders did not differ significantly from the rest of the sample with regard to the number of sick-leave days (mean difference=2.7 days; 95%-CI=-18.4 to 23.8; $t=0.25$; $df=219$; $P=0.801$).

Bivariate correlations of all variables included in the regression analyses are presented in table 3. The objective injury severity (ISS) and the patients' subjective appraisals of the accident severity were positively correlated. Subjective appraisals of the accident severity (but not the objective injury severity scores) were negatively related with self-rated coping abilities.

Time off work was significantly correlated with the injury severity (ISS), IES intrusion scores, and the patients' own appraisals of both their injury severity and their coping abilities. Finally, time off work was longer after workplace related accidents and shorter after sports/leisure accidents.

In a simultaneous regression analysis the variables injury severity (ISS), sex, age, type of accident (road traffic, workplace, or leisure-time accidents), and IES intrusion were entered as potential predictors of time off work. Combined, these predictors explained 24.3% of the variance of time off work ($F=9.75$; $df=7, 213$; $P<0.001$). When in a series of hierarchical regressions each of these predictors was examined when added last to this first set, ISS (8.3%, $F=23.38$; $df=1, 213$; $P<0.001$), type of accident (7.6%; F change=7.14; $df=3, 213$; $P<0.001$), and IES intrusion added unique variance (2.0%; $F=5.63$; $df=1, 213$; $P=0.019$). These five variables were then treated as the first set added in hierarchical regressions focusing on two additional predictors, patients' appraisals of accident severity and of their coping abilities. These two variables were entered in the second step accounting for an additional 9.4% of the variance of the time off work 6 months post accident (F change=15.04; $df=2, 211$; $P<0.001$). Self-reported appraisal of accident severity added 6.0% (F change=18.14; $df=1, 212$, $P<0.001$), and self reported appraisal of their coping abilities added 4.7% (F change=14.17; $df=1, 212$; $P<0.001$). Finally, each of the seven predictors in table 4 was evaluated for unique variance contributed with the other six predictors already in the model. The severity of the injury (ISS), type of accident, and the two appraisals variables remained significant, whereas age, gender, and IES intrusion did not contribute significantly to the prediction of time off work.

In order to visualize the effects of appraisals on sick-leave days, the sample was divided into four groups based on median-splits in the two variables appraisal of accident severity and appraisal of coping abilities (fig. 1). The median was 4 Likert points in the subjective accident severity scale, and 5 Likert points in the self-rated coping abilities scale. Patients with values equal or higher than the median were grouped as 'higher' in the respective characteristic, patients with values lower than the median were grouped as 'lower' concerning subjective injury severity or self-rated coping abilities, respectively. Regarding the two groups of particular interest, namely patients who assessed the accident severity as higher and their coping abilities as lower, compared with patients who estimated the accident severity as lower and their coping abilities as higher, there were twice as many sick-leave days for the former group (mean difference=-68.1 days; 95%-CI=-85.7 to -50.5; t=-7.67; df=124; P<0.001).

Discussion

How patients perceive the severity of their accident and their ability to cope with the resulting injury and its job-related consequences are crucial predictors for return to work after unintentional injuries which lead to hospital admission. The current study demonstrated that the patients' own appraisals of the severity of their accident and of their coping resources predict time off work after accidents leading to hospital admission beyond the impact of the objective injury severity (ISS).

Some limitations of this study have to be addressed. To enable the findings from this current study to be better generalised to all hospitalised accident victims, we applied very few exclusion criteria. For example, we did not exclude patients with pre-existing somatic and psychiatric morbidity or non-ICU patients. While this may have strengthened the external validity of our findings, factors other than the unintentional injury might have influenced outcomes. By including patients with pre-existing somatic and psychiatric morbidity we possibly included patients who were at higher risk for sick-leave following unintentional injury. However, patients suffering from pre-existing mental disorders did not differ from other patients with regard to the number of sick-leave days. The inclusion criterion of being hospitalised for at least 32 hours including two consecutive nights may limit the generalisability of the study's findings, but guaranteed that all patients in the sample were really hospitalised and not only received an overnight treatment in the emergency room (which formally is an instance of hospitalisation but in fact is an outpatient treatment). Another factor that may affect return to work is compensation eligibility.[10 19] In Switzerland all inhabitants receive compensation in the case of work incapacity or disability independent of the type of accident. For employees there is a mandatory accident insurance that covers

both work- and non-work-related injuries due to accidents Thus, it is unlikely that different compensation rules related to different types of accidents biased our results. Nevertheless, the very generous compensation system in Switzerland may limit the generalisability of our findings to other countries with other or less generous compensation systems. Furthermore, there were 68 (23.5%) drop-outs from T1 to T2 in our study. It is unlikely that these drop-outs affected the results substantially as they did not differ significantly from the final sample. Finally, the number of days off work was assessed by means of self-report by the patients. Strict data privacy protection laws in Switzerland prevent the use of health insurance companies' data for the purpose of research projects. Such data would have been more reliable.

The relevance of psychosocial and subjective factors for a successful return to work after accidents has been increasingly recognised in literature.[7 11 20 26 27 35] The total amount of explained variance in the present study was moderate (R^2=.34) but within the range of comparable studies.[8 9 12-14 26] Nevertheless, this suggests that other factors than the ones we examined are also important regarding return to work. Extending the findings from previous studies among severely injured accident victims,[7 8 13] the current study confirmed the predictive value of patients' subjective appraisals of the accident severity for the whole spectrum of patients admitted to hospitals with unintentional injuries. In contrast to our previous study in severely injured accident victims who were hospitalised at the ICU,[8 13] the completely independent sample of the current study included all unintentional injuries leading to hospital admission, with only 18.6% of the patients requiring ICU treatment. In an effort to enable the findings from this current study to be better generalised, unlike in our previous study with another sample,[8 13] we did not exclude foreign language patients and patients with

pre-existing somatic illnesses and mental disorders. In some cases these particular patients may be less well socially integrated or have greater difficulties dealing with the consequences of unintentional injuries; both being risk factors for work disability. In our heterogeneous sample including moderately injured and foreign language accident victims with pre-existing somatic and psychiatric morbidity, the subjectively experienced accident severity predicted time off work after the accidents to the same degree as the objective injury severity (regression weights: Betas = .24 vs. .25). The role of the objective injury severity regarding time off work after unintentional injuries is ambiguous. In keeping with some previous studies,[2 7 8] we found the more severe injuries to be related to more days off work. However, some other studies could not find that association.[9 11 12 36] These inconsistent findings might be explained by the different ranges of injury severities and by the different follow-up intervals used in different studies. The wider the range of injury severities in a study, the higher the chance that the severity of the physical impairment predicts subsequent time off work. The more time that has elapsed since the accident, the less impact the objective injury severity is expected to have on time off work. The physical condition may play a more important role immediately following the accident because hospitalisation and rehabilitation directly contribute to the time off work, whereas in the longer term other factors might gain in importance regarding sick-leave. In our previous study among severely injured accident victims, the objective injury severity predicted time off work during the first year after the accident but was no longer predictive for the number of days off work at the three year follow-up.[8 13] In a longer term perspective, factors other than the objective physical impairment, e.g. psychosocial or subjective factors, might gain in importance regarding return to work.

Concerning subjective factors predicting return to work, the patients' appraisals of the ability to cope with the unintentional injury and its job-related consequences turned out to be another important predictor of sick-leave after hospital admissions due to unintentional, accident-related injuries. The more coping resources patients perceived themselves to have at their disposal immediately after the accident, the better his or her chances for vocational rehabilitation actually were. The significance of subjectively perceived coping abilities for return to work has already been found in earlier studies.[8 12 13] The predictive value of the patients' appraisals of the accident severity and of the coping abilities regarding time off work after unintentional injuries may be explained by Lazarus' theories on stress, appraisal and coping.[37 38] Lazarus emphasized the significance of primary and secondary appraisal of a stressful situation or event. In a primary appraisal the same situation can be judged as harmful, as a threat or as a challenge by different individuals. In a secondary appraisal the individual judges the ability to cope with the situation depending on his or her individual coping strategies. If a stressful situation is appraised as controllable by action, problem-focused coping will predominate. In a situation viewed as refractory to change, however, emotion-focused coping is more likely to predominate. Among accident victims these two steps of appraisals seem to be related. In our sample, the more threatening the patients judged their accident to have been, the fewer resources they perceived themselves to have at their disposal for coping with the unintentional injury and its job-related consequences. However, the subjective appraisal of the coping abilities was not correlated with the objective injury severity. This further emphasizes the importance of considering not only the patient's objective injury severity but also their own appraisal of the accident severity and the coping abilities when predicting the chances of return to work. Coping with stressful events is increasingly viewed as a process rather than an inert (personality) style. If coping is open to

change over time in accordance with the situational context,[30 37] this may be promising for preventive and therapeutic interventions.

Conclusion

A patient's own appraisal of the severity of their accident and of their ability to cope with the unintentional injury and its job-related consequences, are highly relevant for return to work after accidents leading to hospital admission. Both subjective appraisals predict time off work beyond the impact of the objective injury severity in the whole spectrum of patients hospitalised due to unintentional injuries.

In Western countries the quality of surgical care of accident victims has reached a high standard. In patients hospitalised with unintentional injuries, even where acute surgical care is inevitable, from a less immediate standpoint and bearing in mind future rehabilitation, a patient's subjective assessment seems to gain in importance where their recovery is concerned. It appears that relevant prognostic information regarding return to work can be obtained by asking the patient two simple questions:

1.) How severe do you think your accident was?

2.) How well do you think you will be able to handle the consequences of the accident with regard to return to work?

Any comprehensive treatment following unintentional injuries should routinely be accompanied by a brief psychosocial assessment and should include information and practical advice.

Competing interests

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Author contributions

US and HM designed the study. HM, SHB and JFP were involved in the data collection. HM performed the statistical analyses. UH, HM, NS, US were involved in the interpretation of the data. NS, UH and HM drafted the manuscript. US reviewed the manuscript several times. All authors have read and approved the final version of the manuscript.

Data sharing

There is no additional data available.

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Figure captions

Figure 1

Sick-leave days of accident victims depending on appraisals of injury severity and coping abilities (N=221, n=31 to 78 per group). Comparison of the group „lower appraisal of injury severity and higher appraisal of coping abilities" with the three other groups: *** p≤.001.

Table 1| Socio-demographic characteristics of injured accident victims (N=221)

Variable	No	Percentage
Age (years)*	40.0 (12.1)	
Sex:		
Male	156	70.6
Marital status:		
Single	103	46.6
Married	87	39.4
Divorced/widowed	31	14.0
Living arrangements:		
Alone	65	29.4
With others (family, partner, friends)	156	70.6
Maximum educational level:		
No education	2	0.9
Obligatory school	33	14.9
Apprenticeship	121	54.8
College	13	5.9
Technical or commercial college/University	52	23.5
Employment status:		
Paid work (full-time)	159	71.9
Paid work (part-time)	37	16.7
In education/ student (part-time paid work)	21	9.5
Unemployed at time of accident	4	1.8

Nationality		
Swiss	163	73.8
German/ Austrian	16	7.2
South European countries	24	10.9
Balkanian countries	14	6.3
Others	4	1.8
Language		
Non German	31	14.5

*Mean (standard deviation)

Table 2| Injury related characteristics of injured accident victims (N=221)

Variable	Mean	Standard Deviation	Minimum	Maximum
Injury Severity Score	12.1	10.1	1	66
Glasgow Coma Scale	14.8	0.7	9	15
Length of stay (days) at the intensive care unit*	4.0	3.7	1	19
Length of stay (days) at the University Hospital†,‡	15.8	16.9	2	110
Length of stay (days) at the University Hospital and Rehabilitation†,‡	23.1	28.8	2	163
Time off work at T2‡	95.7	58.1	6	183

*n=41 cases at the intensive care unit

† n=220

‡Subsumes the row above it

Table 3| Bivariate correlations (Pearson correlation coefficients) between potential predictor variables (assessed 3-28 days after the accident) to each other and to the dependent variable time off work due to the unitentional injury (assessed 6 months after the accident) (N=221).

Variable	TOW	ISS	Sex*	Age	TRAFF	WORK	SPORT	IESIN	AAS
ISS	0.35***								
Sex	-0.08	-0.17*							
Age	0.09	-0.19**	0.09						
TRAFF	-0.01	0.27***	0.01	-0.22***					
WORK	0.23***	0.01	-0.23***	0.16*	-0.21**				
SPORT	-0.28***	-0.21**	0.04	-0.06	-0.26***	-0.23***			
IESIN	0.21**	0.23***	0.11	0.03	0.10	-0.08	-0.04		
AAS	0.40***	0.34***	-0.06	-0.02	0.12	0.13	-0.13	0.27***	
ACA	-0.29***	-0.08	-0.01	-0.01	-0.01	-0.09	0.06	-0.15*	-0.19**

TOW=time off work (days) due to the unintentional injury; ISS=Injury Severity Score; TRAFF=traffic accident; SPORT=sports or leisure accident; WORK=workplace accident; IESIN=Impact of Event Scale–intrusion subscale; AAS=appraisal of accident severity; ACA=appraisal of coping abilities.

*Sex: 1=male, 2=female

Return to work 32

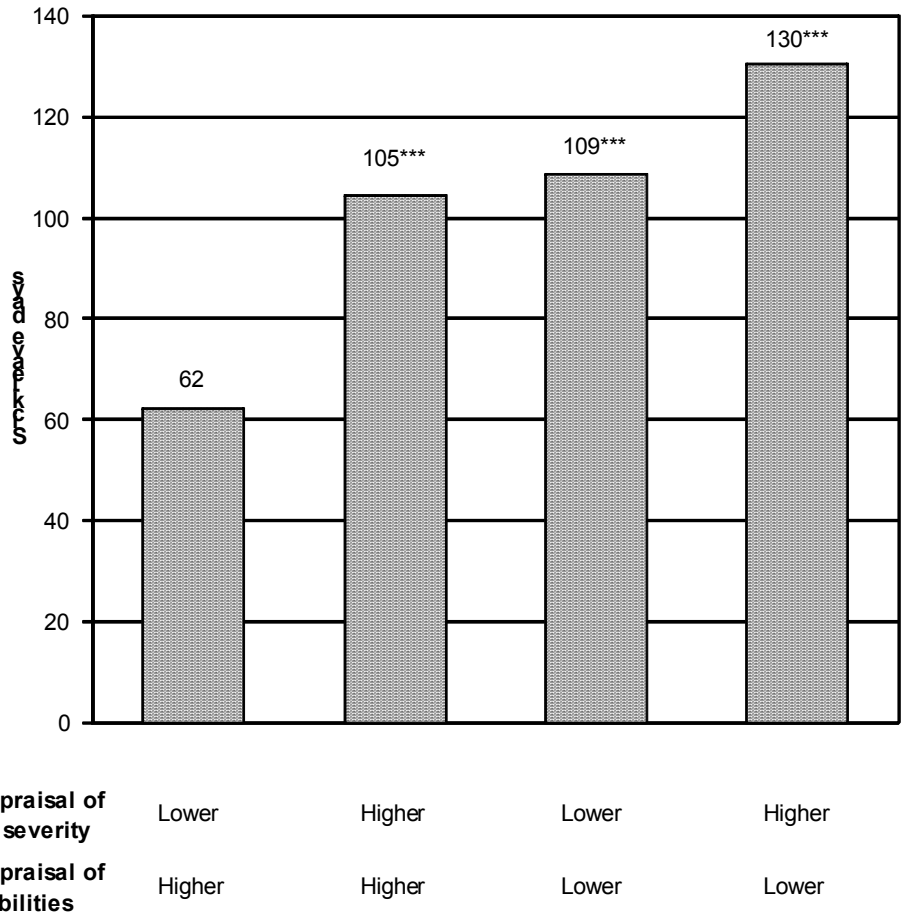
*p≤0.05, **p≤0.01, ***p≤0.001

Table 4| Prediction of time off work over 6 months after the accident

Predictor variable	Beta	95%-CI for Beta		p
Injury Severity Score	.25	0.12	0.37	<.001
Female gender	-.01	-0.13	0.11	.893
Age	.09	-0.03	0.21	.140
Type of accident:				
Traffic	-.12	-0.24	0.01	.062
Workplace	.10	-0.02	0.23	.112
Sports/leisure	-.18	-0.31	-0.06	.003
IES intrusion subscale	.07	-0.05	0.19	.261
Appraisal of accident severity	.24	0.12	0.36	<.001
Appraisal of coping abilities	-.19	-0.31	-0.08	.001

Multiple Regression: N=221; R=0.58; R^2=0.34; F=11.93, df=9, 211; P<0.001.

Figure 1


140
120
100
80
60
40
20
0
62
105***
109***
130***
Initial appraisal of accident severity
Lower
Higher
Lower
Higher
Initial appraisal of coping abilities
Higher
Higher
Lower
Lower

Return to work following ~~accidental~~ unintentional injury: a prospective follow-up study

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Abstract

Objective

The aim of this study was to predict return to work following ~~accidental~~ unintentional injuries due to accidents leading to hospital admission.

Design

Prospective 6 months follow-up study.

Setting

Department of trauma surgery of a university hospital.

Participants

Consecutively recruited victims of unintentional~~accidental~~ injuries (n=221) hospitalised for a minimum of 32 hours including two consecutive nights. All participants were aged 18-65 years and able to participate in an assessment within 30 days of the accident.

Main outcome measures

Interview-assessed number of days off work during the 6 months immediately following the accident~~al injury~~.

Results

The patients' subjective appraisals of a) accident severity and b) their ability to cope with the resulting injury and its job-related consequences predicted time off work following the accident beyond the impact of the objective severity of their injury and the type of accident involved.

Conclusions

Patients' subjective appraisals of the accident severity and of their ability to cope with its consequences are highly relevant for return to work after accidents. Extending findings from

previous studies in severely injured and otherwise pre-selected accident victims, this seems to apply to the whole spectrum of patients hospitalised with unintentional~~accidental~~ injuries.

Article summary

Strengths and limitations of the study

- The application of very few exclusion criteria may have strengthened the study's external validity (generalisability), but at the same time may have limited its internal validity (i.e., factors other than the unintentional, accident-related ~~accidental~~ injury might have influenced time off work).
- There were 68 (23.5%) drop-outs from baseline to follow-up, which however did not differ from the completers with respect to available patient and accident-related characteristics.
- Sick leave after unintentional injuries due to accidents was assessed in terms of time off work during the follow-up period, which provided a more accurate estimation of work-related consequences of accidents than the mere assessment whether the accident victim had returned to work or not at a particular point in time.
- However, t~~T~~he number of days off work was assessed by means of self-~~rating~~ reports by the patients due to strict data privacy protection laws in Switzerland.

Introduction

In the EU every year 6.5 million people are admitted to hospitals following unintentional~~accidental (involuntary)~~ injuries due to accidents.[1] This figure corresponds to more than 1% of the 500 million inhabitants in the EU. In addition to the direct costs of the treatment, unintentional~~accidental~~ injuries cause even higher indirect costs. Sick-leave following unintentional~~accidental~~ injuries is one of the most important contributors to these indirect costs.[2 3] ~~Although r~~Return to work is one of the most relevant measures of functional outcome of injuries,[4] and there is a growing body of literature on return to work after chronic injuries such as low-back pain.[5] However, there are still relatively few studies on return to work after unintentional~~accidental~~ injuries ~~have been conducted~~due to accidents.[2 6-14]

Generally, return to work is not only predicted by injury related or medical factors. Job related factors,[2 12 15 16] socioeconomic factors,[2 7 9 12 17] psychological distress,[9 11 12] causal attribution,[18] and compensation eligibility[10 19] become increasingly important factors for return to work the longer the medical condition lasts. How patients' expectations of recovery affect their health and vocational outcome is insufficiently researched.[20 21] Compared to those remaining on sick-leave, patients returning to work after injury had stronger internal health beliefs, i.e. they believed they had an influence on their own health and considered themselves powerful.[7] In several studies involving various medical conditions, patients' own expectations and predictions of their future work ability predicted return to work.[22-24] There are relatively few studies examining the role of the subjectively experienced accident severity and the subjectively experienced ability to cope with the unintentional~~accidental~~ injury regarding return to work.[7-9 13 25] The findings from these studies cannot be generalised as they are compromised by their highly selective samples: the studies were either restricted to severely

injured patients without pre-existing mental disorders,[7 8 13 26] and/or they excluded foreign-language patients.[7 8 12 13 19 26 27] In a previous study of severely injured accident victims we found that time off work was best predicted by the patients' own appraisals of accident severity and by the patients' own expectations regarding their ability to cope with the unintentional~~accidental~~ injury and its job-related consequences.[13] Whereas at the one-year follow-up, injury severity measured by the injury severity score (ISS)[28] and type of accident (traffic, workplace, sporting/leisure) were also predictive of time off work,[8] at the three-years follow-up only the self-reported appraisals of accident severity and the patients' ability to cope with the unintentional~~accidental~~ injury remained predictive of days absent from the workplace.[13] However, the sample in this previous study was highly selective. We included only severely injured (ISS≥10), German-speaking patients and excluded patients who had been under treatment for any mental disorders and/or serious somatic illnesses at the time of the accident. By doing this we may have excluded patients at a higher risk for sick-leave and the results may therefore not be generalised to apply to all accident survivors.

The aim of this study was to predict return to work following unintentional, accident-related injuries in an independent, larger and less selective sample of patients with any unintentional injury requiring hospital admission.~~The aim of this study was to determine whether the predictive value of the patients' own appraisals of the severity of their accident and of their coping abilities may be replicated in a larger and less selective sample of patients with any accidental injury requiring hospital admission.~~

Methods

Sample

Participants were recruited from the Department of Trauma Surgery at the Zurich University Hospital. All the patients qualifying for the study had sustained ~~accidental~~ unintentional injuries that required hospitalisation for a minimum of 32 hours including two consecutive nights (the latter guaranteed exclusion of patients who were treated in the emergency room overnight but who were not really hospitalised on a ward of the Department of Trauma Surgery). Further inclusion criteria were: age between 18 to 65 years; ability to participate in an extensive assessment within 30 days of the accident; and sufficient proficiency in one of the study languages (German, Italian, Spanish, Portuguese, Serbo-Croatian, Turkish, or Albanian) to participate in the interview and to complete the self-report questionnaires. Non-German speaking participants were assessed using interpreters and professionally translated psychometric instruments. Exclusion criteria were: a Glasgow Coma Scale score (GCS)[29] below 9; unconsciousness for more than 15 minutes after the accident; pathological findings in the cranial CT; attempted suicide.

In contrast to our previous study,[8 13] neither serious somatic illness, nor being in treatment for a mental disorder prior to the accident was an exclusion criterion in the present study.[30] Note that the sample of the previous study[8 13] and the sample of the present study on time off work were completely independent from each other (recruitment of the second sample started 18 months after the end of recruitment for the first sample). With regard to the possibility of generalising the present study's findings, we also retained patients for the present study who showed marked clinical signs or symptoms of mental disorders that were obviously unrelated to the unintentional~~accidental~~ injury.

Patients were recruited over a period of 12 months. During this time period 787 patients aged between 18 and 65 years were admitted with unintentional~~accidental~~ injuries. Of these patients 253 did not meet the inclusion criteria due to early discharge (104; 41.1%), poor clinical condition (74; 29.2%), GCS score below 9 (46; 18.2%), insufficient proficiency in one of the study languages (21; 8.3%) or other reasons (29; 11.5%) (multiple reasons possible). As a result, 534 patients fulfilled all criteria and were eligible for the study. Due to a restricted interviewing capacity, not all the eligible patients could be assessed. ~~A random~~The following procedure was applied to ensure the recruitment of a representative sample and to control for potential bias attributable to the time of admission~~to select the patients; ~~: on day 1, every other consecutive patient (i.e. patient 1, 3, 5, etc.) was interviewed. On day 2 the order of the list of admissions was reversed so that the last patient admitted was interviewed first, the third last patient was interviewed second and so forth. On day 3, the order was reversed again, etc. The 148 patients who could not be contacted due to our limited interviewing capacity did not differ from the participating patients with regard to age (mean difference=-0.40 years; 95%-CI=-2.93 to 2.12; t=-0.31; df=481; P=0.754) and gender (Pearson's χ^2=0.77, df=1, P=0.375). Of the 386 patients who were contacted, 335 gave their written consent to participate. The 51 (13.2%) who declined participation did not differ significantly from the participating patients with regard to age (mean difference=3.75 years; 95%-CI=-0.12 to 7.61; t=-1.91; df=384; P=0.057) and gender (Pearson's χ^2=0.07; df=1; P=0.792).

After the exclusion of a small number of victims of physical violence (n=12), the sample consisted of 323 patients who all attended the interview at T1. On average the T1 interview was performed 5 days after the referral to the hospital (SD 4.2 days; range: 2 to 28 days). 34

patients had no regular work and were excluded from further analyses regarding time off work. However, four patients who were receiving unemployment compensation at the time of the accident were retained for further analyses. For these patients accident-related time off work was traceable since they needed a doctor's certificate to continue to be eligible for unemployment compensation. In all, valid data regarding time off work were obtainable from 289 patients.

On average the follow-up interview (T2) took place 188 (SD 16.2; range 155 to 257) days after the unintentional~~accidental~~ injury. 68 (23.5%) dropped out during the follow-up period; these 68 drop-outs did not differ significantly from the final sample with regard to age (mean difference=-2.78 years; 95%-CI=-6.13 to 0.57; t=-1.63; df=287; P=0.104), gender (Pearson's χ^2=3.3; df=1; P=0.069), type of accident (Pearson's χ^2=6.5; df=1; P=0.088), clinician-rated Injury Severity Score[28] (mean difference=-0.77; 95%-CI=-3.54 to 1.99; t=-0.55; df=287; P=0.582), and patient-rated subjective accident severity (t=1.19; df=287; P=0.237), appraisal of coping abilities (mean difference=-0.16; 95%-CI=-0.37 to 0.04; t=-1.58; df=283; P=0.115), and intrusions as measured by the Impact of Event Scale[31] (mean difference=0.87; 95%-CI=-1.14 to 2.28; t=0.86; df=276; P=0.393). The final sample consisted of 221 patients.

Measures

The Injury Severity Score (ISS)[28] and the Glasgow Coma Scale (GCS)[29] were routinely assessed by the surgeons immediately after admission to the emergency room. The ISS permits an evaluation of the severity of injuries by a trauma surgeon: Each part or area of the body affected is given a score (1=minimum to 6=fatal injury). If the score is 6 in one area, the ISS is assigned a sum score of 75. Otherwise, the scores for the three most severely injured

areas of the body are squared and then summed, producing a maximum score of 75. Patients with a score of 10 or more are generally considered severely injured. The GCS is an observer-rated scale for the clinical appraisal of the gravity of coma after injury to the skull and brain. Patients with severe traumatic brain injuries generally have a score under 9.

The semi-structured interview at T1 covered socio-demographic data, a detailed work record and information about the accident. Existing pre-accident psychiatric disorders were assessed using the Primary Care Evaluation of Mental Disorders.[32] The patients rated their appraisal of the injury severity on a Likert scale ranging from "1=very slight" to "5=very severe". They also rated their ability to cope with the unintentional~~accidental~~ injury and its job-related consequences on a Likert scale ranging from "1=very poor" to "5=very good".[8 13] Posttraumatic psychological symptoms were assessed by the Impact of Event Scale (IES),[31] a 15 item self-rating questionnaire comprising two subscales (intrusion and avoidance) with high reliability and validity.[33] Time off work, assessed at 6 months (T2) post-accident, was defined as the patient-reported number of sick-leave days attributable to the unintentional~~accidental~~ injury and its consequences including time of hospitalisation. To record their sick-leave days the patients used a specified journal they received at T1. A week off work was set to equal seven days of leave. Where subjects who had previously been full-time employees returned to work on a part-time basis, the days on which they worked less were added to the total days of leave on a pro rata basis.[13] The interviews were performed by two medical doctors (SHB and JFP). Each patient was interviewed by the same interviewer at T1 and T2. Detailed information on the study design and the interrater reliability is described in an earlier publication on the incidence of PTSD in that sample.[34]

Statistical analysis

Hierarchical linear multiple regression analyses were performed to predict the number of sick-leave days. They allowed for highlighting the relevance of patient's appraisal among the selected potential predictor variables. To enable us to enter the type of accident (road traffic, workplace, household, or leisure-time accidents) as a predictor into the multiple regression analysis, this categorical variable was converted into a set of three new variables so that a deviation contrast resulted. In this way the effect of each accident category was compared to the mean effect of all accident categories. Since there was one new variable for each degree of freedom, one accident category (household) had to be omitted in the regression analysis. In the final regression model including all potential predictors multi-collinearity was low (tolerance >0.75) and the distribution of regression standardised residuals was normal (Kolmogorov-Smirnov Z=0.63, P=0.827). Group comparisons of dimensional variables were performed with t-tests.

Ethical approval

Ethical approval was granted by the Ethics Committee of the Canton of Zurich. Written informed consent was obtained from all participants.

Results

The socio-demographic characteristics are presented in table 1. 35 (15.8%) of the 221 patients suffered from one or multiple pre-existing mental disorders immediately prior to the accident~~.~~ , and 31 patients (14.0%) did not speak German. Characteristics related to the unintentional~~accidental~~ injury of the 221 patients are found in table 2. The types of accident were as follows: 72 (32.6%) traffic accidents, 66 (29.9%) workplace accidents, 6 (2.7%) household accidents, and 77 (34.8%) sports/leisure activity-related accidents. The mean ISS differed significantly between the types of accident (traffic: M 16.0, SD 12.4; workplace or household: M 11.8, SD 8.2; sporting/leisure activity: M 8.7, SD 7.7; ANOVA: F=10.7; df=2, 218; P<0.001).

According to the surgeons' files, 44 (19.9%) patients sustained a mild or moderate traumatic brain injury (MTBI). 41 (18.6%) patients were first referred to the intensive care unit (ICU), with a mean duration of ICU stay of 4.0 days (SD 3.7; range 1-19). The mean length of stay at the acute hospital including the ICU was 15.8 days (SD 16.9; range 2-110). 46 patients had a further stay in a rehabilitation hospital, with a mean length of stay of 35.0 days (SD 25.0; range 3-141). The mean number of sick-leave days was 95.7 (SD 58.1; range 6-183). Patients suffering from pre-existing mental disorders did not differ significantly from the rest of the sample with regard to the number of sick-leave days (mean difference=2.7 days; 95%-CI=-18.4 to 23.8; t=0.25; df=219; P=0.801).

Bivariate correlations of all variables included in the regression analyses are presented in table 3. The objective injury severity (ISS) and the patients' subjective appraisals of the accident

severity were positively correlated. Subjective appraisals of the accident severity (but not the objective injury severity scores) were negatively related with self-rated coping abilities. Time off work was significantly correlated with the injury severity (ISS), IES intrusion scores, and the patients' own appraisals of both their injury severity and their coping abilities. Finally, time off work was longer after workplace related accidents and shorter after sports/leisure accidents.

In a simultaneous regression analysis the variables injury severity (ISS), sex, age, type of accident (road traffic, workplace, or leisure-time accidents), and IES intrusion were entered as potential predictors of time off work. Combined, these predictors explained 24.3% of the variance of time off work ($F=9.75$; $df=7, 213$; $P<0.001$). When in a series of hierarchical regressions each of these predictors was examined when added last to this first set, ISS (8.3%, $F=23.38$; $df=1, 213$; $P<0.001$), type of accident (7.6%; F change=7.14; $df=3, 213$; $P<0.001$), and IES intrusion added unique variance (2.0%; $F=5.63$; $df=1, 213$; $P=0.019$). These five variables were then treated as the first set added in hierarchical regressions focusing on two additional predictors, patients' appraisals of accident severity and of their coping abilities. These two variables were entered in the second step accounting for an additional 9.4% of the variance of the time off work 6 months post accident (F change=15.04; $df=2, 211$; $P<0.001$). Self-reported appraisal of accident severity added 6.0% (F change=18.14; $df=1, 212$, $P<0.001$), and self reported appraisal of their coping abilities added 4.7% (F change=14.17; $df=1, 212$; $P<0.001$). Finally, each of the seven predictors in table 4 was evaluated for unique variance contributed with the other six predictors already in the model. The severity of the injury (ISS), type of accident, and the two appraisals variables remained significant, whereas

age, gender, and IES intrusion did not contribute significantly to the prediction of time off work.

In order to visualize the effects of appraisals on sick-leave days, the sample was divided into four groups based on median-splits in the two variables appraisal of accident severity and appraisal of coping abilities (fig. 1). The median was 4 Likert points in the subjective accident severity scale, and 5 Likert points in the self-rated coping abilities scale. Patients with values equal or higher than the median were grouped as 'higher' in the respective characteristic, patients with values lower than the median were grouped as 'lower' concerning subjective injury severity or self-rated coping abilities, respectively. Regarding the two groups of particular interest, namely patients who assessed the accident severity as higher and their coping abilities as lower, compared with patients who estimated the accident severity as lower and their coping abilities as higher, there were twice as many sick-leave days for the former group (mean difference=-68.1 days; 95%-CI=-85.7 to -50.5; t=-7.67; df=124; P<0.001).

Discussion

How patients perceive the severity of their accident and their ability to cope with the resulting injury and its job-related consequences are crucial predictors for return to work after unintentional~~accidental~~ injuries which lead to hospital admission. The current study demonstrated that the patients' own appraisals of the severity of their accident and of their coping resources predict time off work after accidents leading to hospital admission beyond the impact of the objective injury severity (ISS).

Some limitations of this study have to be addressed. To enable the findings from this current study to be better generalised to all hospitalised accident victims, we applied very few exclusion criteria. For example, we did not exclude patients with pre-existing somatic and psychiatric morbidity or non-ICU patients. While this may have strengthened the external validity of our findings, factors other than the unintentional~~accidental~~ injury might have influenced outcomes. By including patients with pre-existing somatic and psychiatric morbidity we possibly included patients who were at higher risk for sick-leave following unintentional~~accidental~~ injury. However, patients suffering from pre-existing mental disorders did not differ from other patients with regard to the number of sick-leave days. The inclusion criterion of being hospitalised for at least 32 hours including two consecutive nights may limit the generalisability of the study's findings, but guaranteed that all patients in the sample were really hospitalised and not only received an overnight treatment in the emergency room (which formally is an instance of hospitalisation but in fact is an outpatient treatment). Another factor that may affect return to work is compensation eligibility.[10 19] In Switzerland all inhabitants receive compensation in the case of work incapacity or disability independent of the type of accident. For employees there is a mandatory accident insurance that covers

both work- and non-work-related injuries due to accidents Thus, it is unlikely that different compensation rules related to different types of accidents biased our results. Nevertheless, the very generous compensation system in Switzerland may limit the generalisability of our findings to other countries with other or less generous compensation systems. Furthermore, there were 68 (23.5%) drop-outs from T1 to T2 in our study. It is unlikely that these drop-outs affected the results substantially as they did not differ significantly from the final sample. Finally, the number of days off work was assessed by means of self-report~~rating~~ by the patients. Strict data privacy protection laws in Switzerland prevent the use of health insurance companies' data for the purpose of research projects. Such data would have been more reliable.

The relevance of psychosocial and subjective factors for a successful return to work after accidents has been increasingly recognised in literature.[7 11 20 26 27 35] The total amount of explained variance in the present study was moderate (R^2=.34) but within the range of comparable studies.[8 9 12-14 26] Nevertheless, this suggests that other factors than the ones we examined are also important regarding return to work. Extending the findings from previous studies among severely injured accident victims,[7 8 13] the current study confirmed the predictive value of patients' subjective appraisals of the accident severity for the whole spectrum of patients admitted to hospitals with unintentional~~accidental~~ injuries. In contrast to our previous study in severely injured accident victims who were hospitalised at the ICU,[8 13] the completely independent sample of the current study included all unintentional~~accidental~~ injuries leading to hospital admission, with only 18.6% of the patients requiring ICU treatment. In an effort to enable the findings from this current study to be better generalised, unlike in our previous study with another sample,[8 13]~~,~~ we did not exclude foreign language

patients and patients with pre-existing somatic illnesses and mental disorders. In some cases these particular patients may be less well socially integrated or have greater difficulties dealing with the consequences of unintentional~~accidental~~ injuries; both being risk factors for work disability. In our heterogeneous sample including moderately injured and foreign language accident victims with pre-existing somatic and psychiatric morbidity, the subjectively experienced accident severity predicted time off work after the accidents to the same degree as the objective injury severity (regression weights: Betas = .24 vs. .25). The role of the objective injury severity regarding time off work after unintentional~~accidental~~ injuries is ambiguous. In keeping with some previous studies,[2 7 8] we found the more severe injuries to be related to more days off work. However, some other studies could not find that association.[9 11 12 36] These inconsistent findings might be explained by the different ranges of injury severities and by the different follow-up intervals used in different studies. The wider the range of injury severities in a study, the higher the chance that the severity of the physical impairment predicts subsequent time off work. The more time that has elapsed since the accident, the less impact the objective injury severity is expected to have on time off work. The physical condition may play a more important role immediately following the accident because hospitalisation and rehabilitation directly contribute to the time off work, whereas in the longer term other factors might gain in importance regarding sick-leave. In our previous study among severely injured accident victims, the objective injury severity predicted time off work during the first year after the accident but was no longer predictive for the number of days off work at the three year follow-up.[8 13] In a longer term perspective, factors other than the objective physical impairment, e.g. psychosocial or subjective factors, might gain in importance regarding return to work.

Concerning subjective factors predicting return to work, the patients' appraisals of the ability to cope with the unintentional~~accidental~~ injury and its job-related consequences turned out to be another important predictor of sick-leave after hospital admissions due to unintentional, ~~accidental~~ accident-related injuries. The more coping resources patients perceived themselves to have at their disposal immediately after the accident, the better his or her chances for vocational rehabilitation actually were. The significance of subjectively perceived coping abilities for return to work has already been found in earlier studies.[8 12 13] The predictive value of the patients' appraisals of the accident severity and of the coping abilities regarding time off work after unintentional~~accidental~~ injuries may be explained by Lazarus' theories on stress, appraisal and coping.[37 38] Lazarus emphasized the significance of primary and secondary appraisal of a stressful situation or event. In a primary appraisal the same situation can be judged as harmful, as a threat or as a challenge by different individuals. In a secondary appraisal the individual judges the ability to cope with the situation depending on his or her individual coping strategies. If a stressful situation is appraised as controllable by action, problem-focused coping will predominate. In a situation viewed as refractory to change, however, emotion-focused coping is more likely to predominate. Among accident victims these two steps of appraisals seem to be related. In our sample, the more threatening the patients judged their accident to have been, the fewer resources they perceived themselves to have at their disposal for coping with the unintentional~~accidental~~ injury and its job-related consequences. However, the subjective appraisal of the coping abilities was not correlated with the objective injury severity. This further emphasizes the importance of considering not only the patient's objective injury severity but also their own appraisal of the accident severity and the coping abilities when predicting the chances of return to work. Coping with stressful events is increasingly viewed as a process rather than an inert (personality) style. If coping is

open to change over time in accordance with the situational context,[30 37] this may be promising for preventive and therapeutic interventions.

Conclusion

A patient's own appraisal of the severity of their accident and of their ability to cope with the unintentional~~accidental~~ injury and its job-related consequences, are highly relevant for return to work after accidents leading to hospital admission. Both subjective appraisals predict time off work beyond the impact of the objective injury severity in the whole spectrum of patients hospitalised due to unintentional~~accidental~~ injuries.

In Western countries the quality of surgical care of accident victims has reached a high standard. In patients hospitalised with unintentional~~accidental~~ injuries, even where acute surgical care is inevitable, from a less immediate standpoint and bearing in mind future rehabilitation, a patient's subjective assessment seems to gain in importance where their recovery is concerned. It appears that relevant prognostic information regarding return to work can be obtained by asking the patient two simple questions:

1.) How severe do you think your accident was?

2.) How well do you think you will be able to handle the consequences of the accident with regard to return to work?

Any comprehensive treatment following unintentional~~accidental~~ injuries should routinely be accompanied by a brief psychosocial assessment and should include information and practical advice.

Competing interests

This study was supported by the Swiss National Science Foundation (32-053736.98). The Swiss National Science Foundation is a government-funded national institution. No commercial sponsorship was involved in the design and conduct of the study. All authors declare that they have no financial relationships with any organisation that might have an interest in the submitted work in the previous three years, and that they have no other relationships or activities that could appear to have influenced the submitted work.

Author contributions

US and HM designed the study. HM, SHB and JFP were involved in the data collection. HM performed the statistical analyses. UH, HM, NS, US were involved in the interpretation of the data. NS, UH and HM drafted the manuscript. US reviewed the manuscript several times. All authors have read and approved the final version of the manuscript.

Data sharing

There is no additional data available.

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Figure captions

Figure 1

Sick-leave days of accident victims depending on appraisals of injury severity and coping abilities (N=221, n=31 to 78 per group). Comparison of the group „lower appraisal of injury severity and higher appraisal of coping abilities" with the three other groups: *** p≤.001.

Table 1| Socio-demographic characteristics of injured accident victims (N=221)

Variable	No	Percentage
Age (years)*	40.0 (12.1)	
Sex:		
Male	156	70.6
Marital status:		
Single	103	46.6
Married	87	39.4
Divorced/widowed	31	14.0
Living arrangements:		
Alone	65	29.4
With others (family, partner, friends)	156	70.6
Maximum educational level:		
No education	2	0.9
Obligatory school	33	14.9
Apprenticeship	121	54.8
College	13	5.9
Technical or commercial college/University	52	23.5
Employment status:		
Paid work (full-time)	159	71.9
Paid work (part-time)	37	16.7
In education/ student (part-time paid work)	21	9.5
Unemployed at time of accident	4	1.8

Nationality		
Swiss	163	73.8
German/ Austrian	16	7.2
South European countries	24	10.9
Balkanian countries	14	6.3
Others	4	1.8
Language		
Non German	31	14.5

*Mean (standard deviation)

Table 2| Injury related characteristics of injured accident victims (N=221)

Variable	Mean	Standard Deviation	Minimum	Maximum
Injury Severity Score	12.1	10.1	1	66
Glasgow Coma Scale	14.8	0.7	9	15
Length of stay (days) at the intensive care unit*	4.0	3.7	1	19
Length of stay (days) at the University Hospital†,‡	15.8	16.9	2	110
Length of stay (days) at the University Hospital and Rehabilitation†,‡	23.1	28.8	2	163
Time off work at T2‡	95.7	58.1	6	183

*n=41 cases at the intensive care unit

† n=220

‡Subsumes the row above it

Table 3| Bivariate correlations (Pearson correlation coefficients) between potential predictor variables (assessed 3-28 days after the accident) to each other and to the dependent variable time off work due to the ~~accidental~~ unitentional injury (assessed 6 months after the accident) (N=221).

Variable	TOW	ISS	Sex*	Age	TRAFF	WORK	SPORT	IESIN	~~AIS~~AAS
ISS	0.35***								
Sex	-0.08	-0.17*							
Age	0.09	-0.19**	0.09						
TRAFF	-0.01	0.27***	0.01	-0.22***					
WORK	0.23***	0.01	-0.23***	0.16*	-0.21**				
SPORT	-0.28***	-0.21**	0.04	-0.06	-0.26***	-0.23***			
IESIN	0.21**	0.23***	0.11	0.03	0.10	-0.08	-0.04		
AAS	0.40***	0.34***	-0.06	-0.02	0.12	0.13	-0.13	0.27***	
~~ACC~~ACA	-0.29***	-0.08	-0.01	-0.01	-0.01	-0.09	0.06	-0.15*	-0.19**

TOW=time off work (days) due to the ~~accidental~~ unintentional injury; ISS=Injury Severity Score; TRAFF=traffic accident; SPORT=sports or leisure accident; WORK=workplace accident; IESIN=Impact of Event Scale–intrusion subscale; AAS=appraisal of accident severity; ACA=appraisal of coping abilities.

*Sex: 1=male, 2=female

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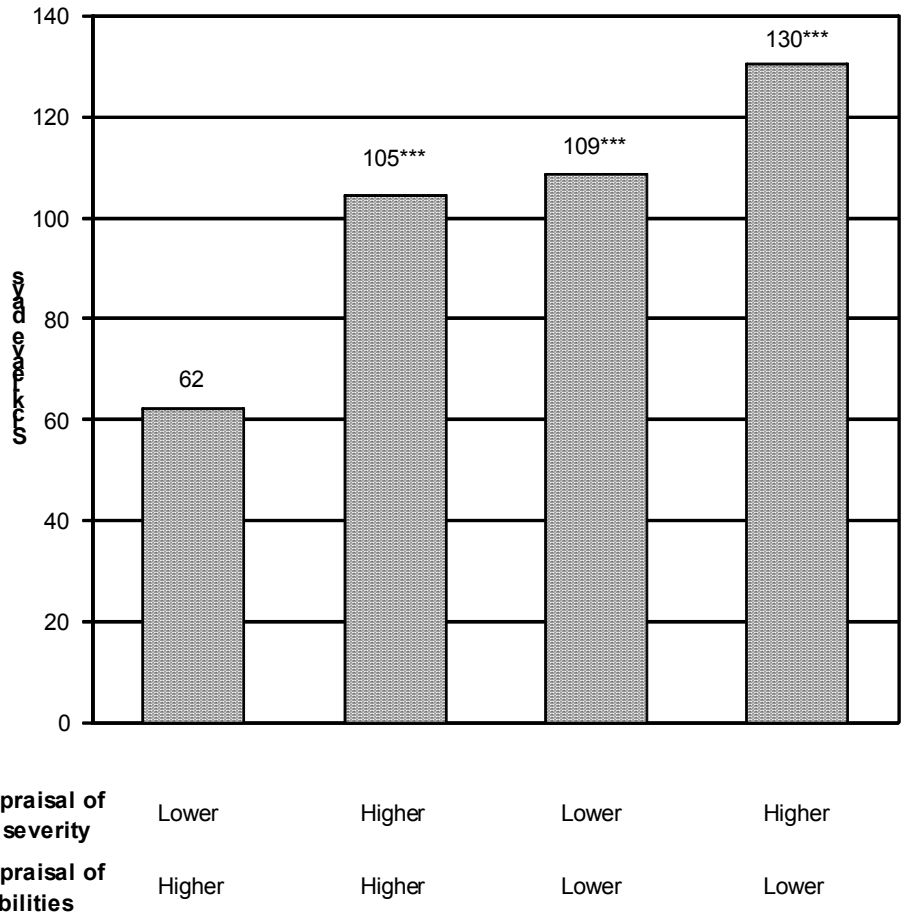
*p≤0.05, **p≤0.01, ***p≤0.001

Table 4| Prediction of time off work over 6 months after the accident

Predictor variable	Beta	95%-CI for Beta		p
Injury Severity Score	.25	0.12	0.37	<.001
Female gender	-.01	-0.13	0.11	.893
Age	.09	-0.03	0.21	.140
Type of accident:				
Traffic	-.12	-0.24	0.01	.062
Workplace	.10	-0.02	0.23	.112
Sports/leisure	-.18	-0.31	-0.06	.003
IES intrusion subscale	.07	-0.05	0.19	.261
Appraisal of accident severity	.24	0.12	0.36	<.001
Appraisal of coping abilities	-.19	-0.31	-0.08	.001

Multiple Regression: N=221; R=0.58; R^2=0.34; F=11.93, df=9, 211; P<0.001.

Figure 1


140
120
100
80
60
40
20
0
62
105***
109***
130***
Initial appraisal of accident severity
Lower
Higher
Lower
Higher
Initial appraisal of coping abilities
Higher
Higher
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STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	page(s)
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5-6
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	—
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	8-9
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, explain how loss to follow-up was addressed	6-7
		(*e*) Describe any sensitivity analyses	—
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5-7
		(b) Give reasons for non-participation at each stage	5-7
		(c) Consider use of a flow diagram	—
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	6-7
		(c) Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	Report numbers of outcome events or summary measures over time	10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	~~12~~
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	—

			page(s)
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-11
Discussion			
Key results	18	Summarise key results with reference to study objectives	13/18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-16/17
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

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Return to work following unintentional injury: a prospective follow-up study

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Return to work following unintentional injury: a prospective follow-up study

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Abstract

Objective

The aim of this study was to predict time off work following unintentional injuries due to accidents leading to hospital admission.

Design

Prospective 6 months follow-up study.

Setting

Department of trauma surgery of a university hospital.

Participants

Consecutively recruited victims of unintentional injuries (n=221) hospitalised for a minimum of 32 hours including two consecutive nights. All participants were aged 18-65 years and able to participate in an assessment within 30 days of the accident.

Main outcome measures

Interview-assessed number of days off work during the 6 months immediately following the accident.

Results

The patients' subjective appraisals of a) accident severity and b) their ability to cope with the resulting injury and its job-related consequences predicted time off work following the accident beyond the impact of the objective severity of their injury and the type of accident involved.

Conclusions

Patients' subjective appraisals of the accident severity and of their ability to cope with its consequences are highly relevant for return to work after accidents. Extending findings from

previous studies in severely injured and otherwise pre-selected accident victims, this seems to apply to the whole spectrum of patients hospitalised with unintentional injuries.

Article summary

Strengths and limitations of the study

- The application of very few exclusion criteria may have strengthened the study's external validity (generalisability), but at the same time may have limited its internal validity (i.e., factors other than the unintentional, accident-related injury might have influenced time off work).
- There were 68 (23.5%) drop-outs from baseline to follow-up, which however did not differ from the completers with respect to available patient and accident-related characteristics.
- Sick leave after unintentional injuries due to accidents was assessed in terms of time off work during the follow-up period, which provided a more accurate estimation of work-related consequences of accidents than the mere assessment whether the accident victim had returned to work or not at a particular point in time.
- However, the number of days off work was assessed by means of self-reports by the patients due to strict data privacy protection laws in Switzerland.

Introduction

In the EU every year 6.5 million people are admitted to hospitals following unintentional injuries due to accidents.[1] This figure corresponds to more than 1% of the 500 million inhabitants in the EU. In addition to the direct costs of the treatment, unintentional injuries cause even higher indirect costs. Sick-leave following unintentional injuries is one of the most important contributors to these indirect costs.[2 3] Return to work is one of the most relevant measures of functional outcome of injuries,[4] and there is a growing body of literature on return to work after chronic injuries such as low-back pain.[5] However, there are still relatively few studies on return to work after unintentional injuries due to accidents.[2 6-14]

Generally, return to work is not only predicted by injury related or medical factors. Job related factors,[2 12 15 16] socioeconomic factors,[2 7 9 12 17] psychological distress,[9 11 12] causal attribution,[18] and compensation eligibility[10 19] become increasingly important factors for return to work the longer the medical condition lasts. How patients' expectations of recovery affect their health and vocational outcome is insufficiently researched.[20 21] Compared to those remaining on sick-leave, patients returning to work after injury had stronger internal health beliefs, i.e. they believed they had an influence on their own health and considered themselves powerful.[7] In several studies involving various medical conditions, patients' own expectations and predictions of their future work ability predicted return to work.[22-24] There are relatively few studies examining the role of the subjectively experienced accident severity and the subjectively experienced ability to cope with the unintentional injury regarding return to work.[7-9 13 25] The findings from these studies cannot be generalised as they are compromised by their highly selective samples: the studies were either restricted to severely injured patients without pre-existing mental disorders,[7 8 13 26] and/or they excluded foreign-language patients.[7]

[8 12 13 19 26 27] In a previous study of severely injured accident victims we found that time off work was best predicted by the patients' own appraisals of accident severity and by the patients' own expectations regarding their ability to cope with the unintentional injury and its job-related consequences.[13] Whereas at the one-year follow-up, injury severity measured by the injury severity score (ISS)[28] and type of accident (traffic, workplace, sporting/leisure) were also predictive of time off work,[8] at the three-years follow-up only the self-reported appraisals of accident severity and the patients' ability to cope with the unintentional injury remained predictive of days absent from the workplace.[13] However, the sample in this previous study was highly selective. We included only severely injured (ISS≥10), German-speaking patients and excluded patients who had been under treatment for any mental disorders and/or serious somatic illnesses at the time of the accident. By doing this we may have excluded patients at a higher risk for sick-leave and the results may therefore not be generalised to apply to all accident survivors.

The aim of this study was to predict time off work (i.e., the number of sick-leave days) during the first 6 months following unintentional, accident-related injuries in an independent, larger and less selective sample of patients with any unintentional injury requiring hospital admission.

Methods

Sample

Participants were recruited from the Department of Trauma Surgery at the Zurich University Hospital. All the patients qualifying for the study had sustained unintentional injuries that required hospitalisation for a minimum of 32 hours including two consecutive nights (the latter guaranteed exclusion of patients who were treated in the emergency room overnight but who were not really hospitalised on a ward of the Department of Trauma Surgery). Further inclusion criteria were: age between 18 to 65 years; ability to participate in an extensive assessment within 30 days of the accident; and sufficient proficiency in one of the study languages (German, Italian, Spanish, Portuguese, Serbo-Croatian, Turkish, or Albanian) to participate in the interview and to complete the self-report questionnaires. Non-German speaking participants were assessed using interpreters and professionally translated psychometric instruments. Exclusion criteria were: a Glasgow Coma Scale score (GCS)[29] below 9; unconsciousness for more than 15 minutes after the accident; pathological findings in the cranial CT; attempted suicide.

In contrast to our previous study,[8 13] neither serious somatic illness, nor being in treatment for a mental disorder prior to the accident was an exclusion criterion in the present study.[30] Note that the sample of the previous study[8 13] and the sample of the present study on time off work were completely independent from each other (recruitment of the second sample started 18 months after the end of recruitment for the first sample). With regard to the possibility of generalising the present study's findings, we also retained patients for the present study who showed marked clinical signs or symptoms of mental disorders that were obviously unrelated to the unintentional injury.

Patients were recruited over a period of 12 months. During this time period 787 patients aged between 18 and 65 years were admitted with unintentional injuries. Of these patients 253 did not meet the inclusion criteria due to early discharge (104; 41.1%), poor clinical condition (74; 29.2%), GCS score below 9 (46; 18.2%), insufficient proficiency in one of the study languages (21; 8.3%) or other reasons (29; 11.5%) (multiple reasons possible). As a result, 534 patients fulfilled all criteria and were eligible for the study. Due to a restricted interviewing capacity, not all the eligible patients could be assessed. The following procedure was applied to ensure the recruitment of a representative sample and to control for potential bias attributable to the time of admission: on day 1, every other consecutive patient (i.e. patient 1, 3, 5, etc.) was interviewed. On day 2 the order of the list of admissions was reversed so that the last patient admitted was interviewed first, the third last patient was interviewed second and so forth. On day 3, the order was reversed again, etc. The 148 patients who could not be contacted due to our limited interviewing capacity did not differ from the participating patients with regard to age (mean difference=-0.40 years; 95%-CI=-2.93 to 2.12; t=-0.31; df=481; P=0.754) and gender (Pearson's χ^2=0.77, df=1, P=0.375). Of the 386 patients who were contacted, 335 gave their written consent to participate. The 51 (13.2%) who declined participation did not differ significantly from the participating patients with regard to age (mean difference=3.75 years; 95%-CI=-0.12 to 7.61; t=-1.91; df=384; P=0.057) and gender (Pearson's χ^2=0.07; df=1; P=0.792).

After the exclusion of a small number of victims of physical violence (n=12), the sample consisted of 323 patients who all attended the interview at T1. On average the T1 interview was performed 5 days after the referral to the hospital (SD 4.2 days; range: 2 to 28 days). 34

patients had no regular work and were excluded from further analyses regarding time off work. However, four patients who were receiving unemployment compensation at the time of the accident were retained for further analyses. For these patients accident-related time off work was traceable since they needed a doctor's certificate to continue to be eligible for unemployment compensation. In all, valid data regarding time off work were obtainable from 289 patients.

On average the follow-up interview (T2) took place 188 (SD 16.2; range 155 to 257) days after the unintentional injury. 68 (23.5%) dropped out during the follow-up period; these 68 drop-outs did not differ significantly from the final sample with regard to age (mean difference=-2.78 years; 95%-CI=-6.13 to 0.57; t=-1.63; df=287; P=0.104), gender (Pearson's χ^2=3.3; df=1; P=0.069), type of accident (Pearson's χ^2=6.5; df=1; P=0.088), clinician-rated Injury Severity Score[28] (mean difference=-0.77; 95%-CI=-3.54 to 1.99; t=-0.55; df=287; P=0.582), and patient-rated subjective accident severity (t=1.19; df=287; P=0.237), appraisal of coping abilities (mean difference=-0.16; 95%-CI=-0.37 to 0.04; t=-1.58; df=283; P=0.115), and intrusions as measured by the Impact of Event Scale[31] (mean difference=0.87; 95%-CI=-1.14 to 2.28; t=0.86; df=276; P=0.393). The final sample consisted of 221 patients.

Measures

The Injury Severity Score (ISS)[28] and the Glasgow Coma Scale (GCS)[29] were routinely assessed by the surgeons immediately after admission to the emergency room. The ISS permits an evaluation of the severity of injuries by a trauma surgeon: Each part or area of the body affected is given a score (1=minimum to 6=fatal injury). If the score is 6 in one area, the ISS is assigned a sum score of 75. Otherwise, the scores for the three most severely injured

areas of the body are squared and then summed, producing a maximum score of 75. Patients with a score of 10 or more are generally considered severely injured. The GCS is an observer-rated scale for the clinical appraisal of the gravity of coma after injury to the skull and brain. Patients with severe traumatic brain injuries generally have a score under 9.

The semi-structured interview at T1 covered socio-demographic data, a detailed work record and information about the accident. Existing pre-accident psychiatric disorders were assessed using the Primary Care Evaluation of Mental Disorders.[32] The patients rated their appraisal of the injury severity on a Likert scale ranging from "1=very slight" to "5=very severe". They also rated their ability to cope with the unintentional injury and its job-related consequences on a Likert scale ranging from "1=very poor" to "5=very good".[8 13] Posttraumatic psychological symptoms were assessed by the Impact of Event Scale (IES),[31] a 15 item self-rating questionnaire comprising two subscales (intrusion and avoidance) with high reliability and validity.[33] Time off work, assessed at 6 months (T2) post-accident, was defined as the patient-reported number of sick-leave days attributable to the unintentional injury and its consequences including time of hospitalisation. To record their sick-leave days the patients used a specified journal they received at T1. A week off work was set to equal seven days of leave. Where subjects returned to work on a part-time basis, the days on which they worked less were added to the days of leave on a pro rata basis.[13] The interviews were performed by two medical doctors (SHB and JFP). Each patient was interviewed by the same interviewer at T1 and T2. Detailed information on the study design and the interrater reliability is described in an earlier publication on the incidence of PTSD in that sample.[34]

Statistical analysis

Hierarchical linear multiple regression analyses were performed to predict the number of sick-leave days. They allowed for highlighting the relevance of patient's appraisal among the selected potential predictor variables. To enable us to enter the type of accident (road traffic, workplace, household, or leisure-time accidents) as a predictor into the multiple regression analysis, this categorical variable was converted into a set of three new variables so that a deviation contrast resulted. In this way the effect of each accident category was compared to the mean effect of all accident categories. Since there was one new variable for each degree of freedom, one accident category (household) had to be omitted in the regression analysis. In the final regression model including all potential predictors multi-collinearity was low (tolerance >0.75) and the distribution of regression standardised residuals was normal (Kolmogorov-Smirnov Z=0.63, P=0.827). Group comparisons of dimensional variables were performed with t-tests.

Ethical approval

Ethical approval was granted by the Ethics Committee of the Canton of Zurich. Written informed consent was obtained from all participants.

Results

The socio-demographic characteristics are presented in table 1. 35 (15.8%) of the 221 patients suffered from one or multiple pre-existing mental disorders immediately prior to the accident, and 31 patients (14.0%) did not speak German. Characteristics related to the unintentional injury of the 221 patients are found in table 2. The types of accident were as follows: 72 (32.6%) traffic accidents, 66 (29.9%) workplace accidents, 6 (2.7%) household accidents, and 77 (34.8%) sports/leisure activity-related accidents. The mean ISS differed significantly between the types of accident (traffic: M 16.0, SD 12.4; workplace or household: M 11.8, SD 8.2; sporting/leisure activity: M 8.7, SD 7.7; ANOVA: $F=10.7$; $df=2, 218$; $P<0.001$).

According to the surgeons' files, 44 (19.9%) patients sustained a mild or moderate traumatic brain injury (MTBI). 41 (18.6%) patients were first referred to the intensive care unit (ICU), with a mean duration of ICU stay of 4.0 days (SD 3.7; range 1-19). The mean length of stay at the acute hospital including the ICU was 15.8 days (SD 16.9; range 2-110). 46 patients had a further stay in a rehabilitation hospital, with a mean length of stay of 35.0 days (SD 25.0; range 3-141). The mean number of sick-leave days was 95.7 (SD 58.1; range 6-183). Patients suffering from pre-existing mental disorders did not differ significantly from the rest of the sample with regard to the number of sick-leave days (mean difference=2.7 days; 95%-CI=-18.4 to 23.8; $t=0.25$; $df=219$; $P=0.801$).

Bivariate correlations of all variables included in the regression analyses are presented in table 3. The objective injury severity (ISS) and the patients' subjective appraisals of the accident severity were positively correlated. Subjective appraisals of the accident severity (but not the objective injury severity scores) were negatively related with self-rated coping abilities.

Time off work was significantly correlated with the injury severity (ISS), IES intrusion scores, and the patients' own appraisals of both their injury severity and their coping abilities. Finally, time off work was longer after workplace related accidents and shorter after sports/leisure accidents.

In a simultaneous regression analysis the variables injury severity (ISS), sex, age, type of accident (road traffic, workplace, or leisure-time accidents), and IES intrusion were entered as potential predictors of time off work. Combined, these predictors explained 24.3% of the variance of time off work ($F=9.75$; $df=7, 213$; $P<0.001$). When in a series of hierarchical regressions each of these predictors was examined when added last to this first set, ISS (8.3%, $F=23.38$; $df=1, 213$; $P<0.001$), type of accident (7.6%; F change=7.14; $df=3, 213$; $P<0.001$), and IES intrusion added unique variance (2.0%; $F=5.63$; $df=1, 213$; $P=0.019$). These five variables were then treated as the first set added in hierarchical regressions focusing on two additional predictors, patients' appraisals of accident severity and of their coping abilities. These two variables were entered in the second step accounting for an additional 9.4% of the variance of the time off work 6 months post accident (F change=15.04; $df=2, 211$; $P<0.001$). Self-reported appraisal of accident severity added 6.0% (F change=18.14; $df=1, 212$, $P<0.001$), and self reported appraisal of their coping abilities added 4.7% (F change=14.17; $df=1, 212$; $P<0.001$). Finally, each of the seven predictors in table 4 was evaluated for unique variance contributed with the other six predictors already in the model. The severity of the injury (ISS), type of accident, and the two appraisals variables remained significant, whereas age, gender, and IES intrusion did not contribute significantly to the prediction of time off work.

In order to visualize the effects of appraisals on sick-leave days, the sample was divided into four groups based on median-splits in the two variables appraisal of accident severity and appraisal of coping abilities (fig. 1). The median was 4 Likert points in the subjective accident severity scale, and 5 Likert points in the self-rated coping abilities scale. Patients with values equal or higher than the median were grouped as 'higher' in the respective characteristic, patients with values lower than the median were grouped as 'lower' concerning subjective injury severity or self-rated coping abilities, respectively. Regarding the two groups of particular interest, namely patients who assessed the accident severity as higher and their coping abilities as lower, compared with patients who estimated the accident severity as lower and their coping abilities as higher, there were twice as many sick-leave days for the former group (mean difference=-68.1 days; 95%-CI=-85.7 to -50.5; t=-7.67; df=124; P<0.001).

Discussion

How patients perceive the severity of their accident and their ability to cope with the resulting injury and its job-related consequences are crucial predictors for return to work after unintentional injuries which lead to hospital admission. The current study demonstrated that the patients' own appraisals of the severity of their accident and of their coping resources predict time off work after accidents leading to hospital admission beyond the impact of the objective injury severity (ISS).

Some limitations of this study have to be addressed. To enable the findings from this current study to be better generalised to all hospitalised accident victims, we applied very few exclusion criteria. For example, we did not exclude patients with pre-existing somatic and psychiatric morbidity or non-ICU patients. While this may have strengthened the external validity of our findings, factors other than the unintentional injury might have influenced outcomes. By including patients with pre-existing somatic and psychiatric morbidity we possibly included patients who were at higher risk for sick-leave following unintentional injury. However, patients suffering from pre-existing mental disorders did not differ from other patients with regard to the number of sick-leave days. The inclusion criterion of being hospitalised for at least 32 hours including two consecutive nights may limit the generalisability of the study's findings, but guaranteed that all patients in the sample were really hospitalised and not only received an overnight treatment in the emergency room (which formally is an instance of hospitalisation but in fact is an outpatient treatment). Another factor that may affect return to work is compensation eligibility.[10 19] In Switzerland all inhabitants receive compensation in the case of work incapacity or disability independent of the type of accident. For employees there is a mandatory accident insurance that covers

both work- and non-work-related injuries due to accidents Thus, it is unlikely that different compensation rules related to different types of accidents biased our results. Nevertheless, the very generous compensation system in Switzerland may limit the generalisability of our findings to other countries with other or less generous compensation systems. Furthermore, there were 68 (23.5%) drop-outs from T1 to T2 in our study. It is unlikely that these drop-outs affected the results substantially as they did not differ significantly from the final sample. Finally, the number of days off work was assessed by means of self-report by the patients. Strict data privacy protection laws in Switzerland prevent the use of health insurance companies' data for the purpose of research projects. Such data would have been more reliable.

The relevance of psychosocial and subjective factors for a successful return to work after accidents has been increasingly recognised in literature.[7 11 20 26 27 35] The total amount of explained variance in the present study was moderate (R^2=.34) but within the range of comparable studies.[8 9 12-14 26] Nevertheless, this suggests that other factors than the ones we examined are also important regarding return to work. Extending the findings from previous studies among severely injured accident victims,[7 8 13] the current study confirmed the predictive value of patients' subjective appraisals of the accident severity for the whole spectrum of patients admitted to hospitals with unintentional injuries. In contrast to our previous study in severely injured accident victims who were hospitalised at the ICU,[8 13] the completely independent sample of the current study included all unintentional injuries leading to hospital admission, with only 18.6% of the patients requiring ICU treatment. In an effort to enable the findings from this current study to be better generalised, unlike in our previous study with another sample,[8 13] we did not exclude foreign language patients and patients with

pre-existing somatic illnesses and mental disorders. In some cases these particular patients may be less well socially integrated or have greater difficulties dealing with the consequences of unintentional injuries; both being risk factors for work disability. In our heterogeneous sample including moderately injured and foreign language accident victims with pre-existing somatic and psychiatric morbidity, the subjectively experienced accident severity predicted time off work after the accidents to the same degree as the objective injury severity (regression weights: Betas = .24 vs. .25). The role of the objective injury severity regarding time off work after unintentional injuries is ambiguous. In keeping with some previous studies,[2 7 8] we found the more severe injuries to be related to more days off work. However, some other studies could not find that association.[9 11 12 36] These inconsistent findings might be explained by the different ranges of injury severities and by the different follow-up intervals used in different studies. The wider the range of injury severities in a study, the higher the chance that the severity of the physical impairment predicts subsequent time off work. The more time that has elapsed since the accident, the less impact the objective injury severity is expected to have on time off work. The physical condition may play a more important role immediately following the accident because hospitalisation and rehabilitation directly contribute to the time off work, whereas in the longer term other factors might gain in importance regarding sick-leave. In our previous study among severely injured accident victims, the objective injury severity predicted time off work during the first year after the accident but was no longer predictive for the number of days off work at the three year follow-up.[8 13] In a longer term perspective, factors other than the objective physical impairment, e.g. psychosocial or subjective factors, might gain in importance regarding return to work.

Concerning subjective factors predicting return to work, the patients' appraisals of the ability to cope with the unintentional injury and its job-related consequences turned out to be another important predictor of sick-leave after hospital admissions due to unintentional, accident-related injuries. The more coping resources patients perceived themselves to have at their disposal immediately after the accident, the better his or her chances for vocational rehabilitation actually were. The significance of subjectively perceived coping abilities for return to work has already been found in earlier studies.[8 12 13] The predictive value of the patients' appraisals of the accident severity and of the coping abilities regarding time off work after unintentional injuries may be explained by Lazarus' theories on stress, appraisal and coping.[37 38] Lazarus emphasized the significance of primary and secondary appraisal of a stressful situation or event. In a primary appraisal the same situation can be judged as harmful, as a threat or as a challenge by different individuals. In a secondary appraisal the individual judges the ability to cope with the situation depending on his or her individual coping strategies. If a stressful situation is appraised as controllable by action, problem-focused coping will predominate. In a situation viewed as refractory to change, however, emotion-focused coping is more likely to predominate. Among accident victims these two steps of appraisals seem to be related. In our sample, the more threatening the patients judged their accident to have been, the fewer resources they perceived themselves to have at their disposal for coping with the unintentional injury and its job-related consequences. However, the subjective appraisal of the coping abilities was not correlated with the objective injury severity. This further emphasizes the importance of considering not only the patient's objective injury severity but also their own appraisal of the accident severity and the coping abilities when predicting the chances of return to work. Coping with stressful events is increasingly viewed as a process rather than an inert (personality) style. If coping is open to

change over time in accordance with the situational context,[30 37] this may be promising for preventive and therapeutic interventions.

Conclusion

A patient's own appraisal of the severity of their accident and of their ability to cope with the unintentional injury and its job-related consequences, are highly relevant for return to work after accidents leading to hospital admission. Both subjective appraisals predict time off work beyond the impact of the objective injury severity in the whole spectrum of patients hospitalised due to unintentional injuries.

In Western countries the quality of surgical care of accident victims has reached a high standard. In patients hospitalised with unintentional injuries, even where acute surgical care is inevitable, from a less immediate standpoint and bearing in mind future rehabilitation, a patient's subjective assessment seems to gain in importance where their recovery is concerned. It appears that relevant prognostic information regarding return to work can be obtained by asking the patient two simple questions:

1.) How severe do you think your accident was?

2.) How well do you think you will be able to handle the consequences of the accident with regard to return to work?

Any comprehensive treatment following unintentional injuries should routinely be accompanied by a brief psychosocial assessment and should include information and practical advice.

Competing interests

This study was supported by the Swiss National Science Foundation (32-053736.98). The Swiss National Science Foundation is a government-funded national institution. No commercial sponsorship was involved in the design and conduct of the study. All authors declare that they have no financial relationships with any organisation that might have an interest in the submitted work in the previous three years, and that they have no other relationships or activities that could appear to have influenced the submitted work.

Author contributions

US and HM designed the study. HM, SHB and JFP were involved in the data collection. HM performed the statistical analyses. UH, HM, NS, US were involved in the interpretation of the data. NS, UH and HM drafted the manuscript. US reviewed the manuscript several times. All authors have read and approved the final version of the manuscript.

Data sharing

There is no additional data available.

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Figure captions

Figure 1

Sick-leave days of accident victims depending on appraisals of injury severity and coping abilities (N=221, n=31 to 78 per group). Comparison of the group „lower appraisal of injury severity and higher appraisal of coping abilities" with the three other groups: *** p≤.001.

Table 1| Socio-demographic characteristics of injured accident victims (N=221)

Variable	No	Percentage
Age (years)*	40.0 (12.1)	
Sex:		
Male	156	70.6
Marital status:		
Single	103	46.6
Married	87	39.4
Divorced/widowed	31	14.0
Living arrangements:		
Alone	65	29.4
With others (family, partner, friends)	156	70.6
Maximum educational level:		
No education	2	0.9
Obligatory school	33	14.9
Apprenticeship	121	54.8
College	13	5.9
Technical or commercial college/University	52	23.5
Employment status:		
Paid work (full-time)	159	71.9
Paid work (part-time)	37	16.7
In education/ student (part-time paid work)	21	9.5
Unemployed at time of accident	4	1.8

Nationality		
Swiss	163	73.8
German/ Austrian	16	7.2
South European countries	24	10.9
Balkanian countries	14	6.3
Others	4	1.8
Language		
Non German	31	14.5

*Mean (standard deviation)

Table 2| Injury related characteristics of injured accident victims (N=221)

Variable	Mean	Standard Deviation	Minimum	Maximum
Injury Severity Score	12.1	10.1	1	66
Glasgow Coma Scale	14.8	0.7	9	15
Length of stay (days) at the intensive care unit*	4.0	3.7	1	19
Length of stay (days) at the University Hospital†,‡	15.8	16.9	2	110
Length of stay (days) at the University Hospital and Rehabilitation†,‡	23.1	28.8	2	163
Time off work at T2‡	95.7	58.1	6	183

*n=41 cases at the intensive care unit

† n=220

‡Subsumes the row above it

Table 3| Bivariate correlations (Pearson correlation coefficients) between potential predictor variables (assessed 3-28 days after the accident) to each other and to the dependent variable time off work due to the unitentional injury (assessed 6 months after the accident) (N=221).

Variable	TOW	ISS	Sex*	Age	TRAFF	WORK	SPORT	IESIN	AAS
ISS	0.35***								
Sex	-0.08	-0.17*							
Age	0.09	-0.19**	0.09						
TRAFF	-0.01	0.27***	0.01	-0.22***					
WORK	0.23***	0.01	-0.23***	0.16*	-0.21**				
SPORT	-0.28***	-0.21**	0.04	-0.06	-0.26***	-0.23***			
IESIN	0.21**	0.23***	0.11	0.03	0.10	-0.08	-0.04		
AAS	0.40***	0.34***	-0.06	-0.02	0.12	0.13	-0.13	0.27***	
ACA	-0.29***	-0.08	-0.01	-0.01	-0.01	-0.09	0.06	-0.15*	-0.19**

TOW=time off work (days) due to the unintentional injury; ISS=Injury Severity Score; TRAFF=traffic accident; SPORT=sports or leisure accident; WORK=workplace accident; IESIN=Impact of Event Scale–intrusion subscale; AAS=appraisal of accident severity; ACA=appraisal of coping abilities.

*Sex: 1=male, 2=female

Return to work 32

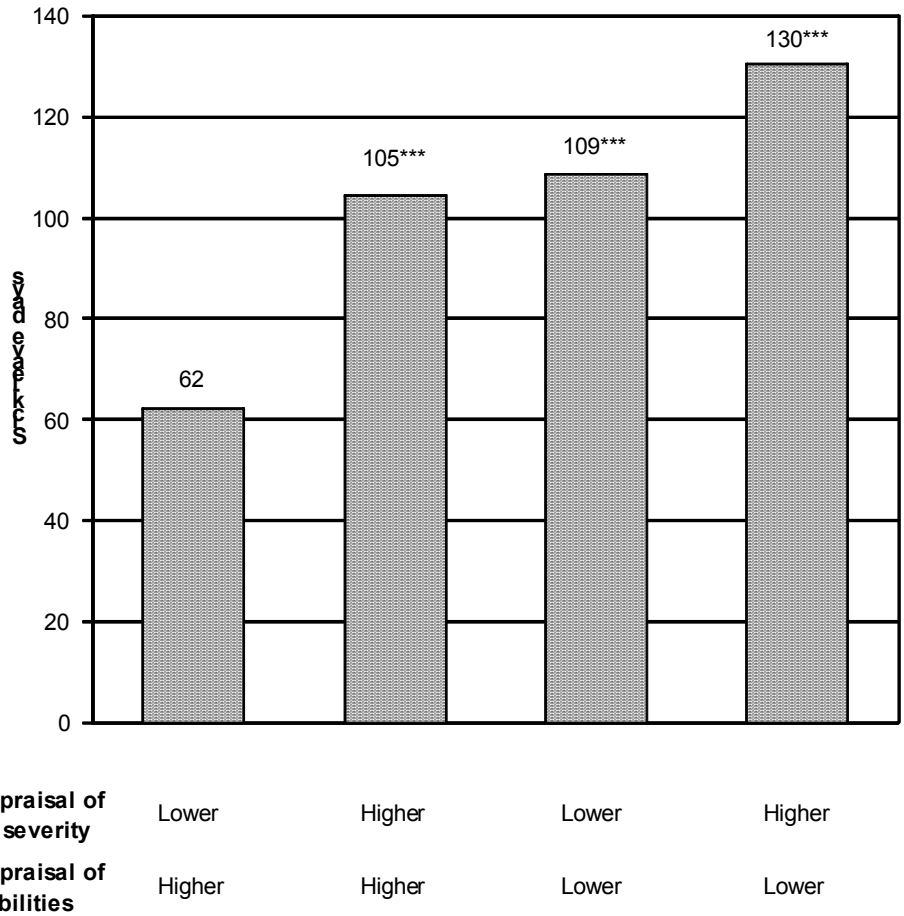
*p≤0.05, **p≤0.01, ***p≤0.001

Table 4| Prediction of time off work over 6 months after the accident

Predictor variable	Beta	95%-CI for Beta		p
Injury Severity Score	.25	0.12	0.37	<.001
Female gender	-.01	-0.13	0.11	.893
Age	.09	-0.03	0.21	.140
Type of accident:				
Traffic	-.12	-0.24	0.01	.062
Workplace	.10	-0.02	0.23	.112
Sports/leisure	-.18	-0.31	-0.06	.003
IES intrusion subscale	.07	-0.05	0.19	.261
Appraisal of accident severity	.24	0.12	0.36	<.001
Appraisal of coping abilities	-.19	-0.31	-0.08	.001

Multiple Regression: N=221; R=0.58; R^2=0.34; F=11.93, df=9, 211; P<0.001.

Figure 1


140
120
100
80
60
40
20
0
62
105***
109***
130***
Initial appraisal of accident severity
Lower
Higher
Lower
Higher
Initial appraisal of coping abilities
Higher
Higher
Lower
Lower

Return to work following unintentional injury: a prospective follow-up study

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Abstract

Objective

The aim of this study was to predict ~~return to~~time off work following unintentional injuries due to accidents leading to hospital admission.

Design

Prospective 6 months follow-up study.

Setting

Department of trauma surgery of a university hospital.

Participants

Consecutively recruited victims of unintentional injuries (n=221) hospitalised for a minimum of 32 hours including two consecutive nights. All participants were aged 18-65 years and able to participate in an assessment within 30 days of the accident.

Main outcome measures

Interview-assessed number of days off work during the 6 months immediately following the accident.

Results

The patients' subjective appraisals of a) accident severity and b) their ability to cope with the resulting injury and its job-related consequences predicted time off work following the accident beyond the impact of the objective severity of their injury and the type of accident involved.

Conclusions

Patients' subjective appraisals of the accident severity and of their ability to cope with its consequences are highly relevant for return to work after accidents. Extending findings from

previous studies in severely injured and otherwise pre-selected accident victims, this seems to apply to the whole spectrum of patients hospitalised with unintentional injuries.

Article summary

Strengths and limitations of the study

- The application of very few exclusion criteria may have strengthened the study's external validity (generalisability), but at the same time may have limited its internal validity (i.e., factors other than the unintentional, accident-related injury might have influenced time off work).
- There were 68 (23.5%) drop-outs from baseline to follow-up, which however did not differ from the completers with respect to available patient and accident-related characteristics.
- Sick leave after unintentional injuries due to accidents was assessed in terms of time off work during the follow-up period, which provided a more accurate estimation of work-related consequences of accidents than the mere assessment whether the accident victim had returned to work or not at a particular point in time.
- However, the number of days off work was assessed by means of self-reports by the patients due to strict data privacy protection laws in Switzerland.

Introduction

In the EU every year 6.5 million people are admitted to hospitals following unintentional injuries due to accidents.[1] This figure corresponds to more than 1% of the 500 million inhabitants in the EU. In addition to the direct costs of the treatment, unintentional injuries cause even higher indirect costs. Sick-leave following unintentional injuries is one of the most important contributors to these indirect costs.[2 3] Return to work is one of the most relevant measures of functional outcome of injuries,[4] and there is a growing body of literature on return to work after chronic injuries such as low-back pain.[5] However, there are still relatively few studies on return to work after unintentional injuries due to accidents.[2 6-14]

Generally, return to work is not only predicted by injury related or medical factors. Job related factors,[2 12 15 16] socioeconomic factors,[2 7 9 12 17] psychological distress,[9 11 12] causal attribution,[18] and compensation eligibility[10 19] become increasingly important factors for return to work the longer the medical condition lasts. How patients' expectations of recovery affect their health and vocational outcome is insufficiently researched.[20 21] Compared to those remaining on sick-leave, patients returning to work after injury had stronger internal health beliefs, i.e. they believed they had an influence on their own health and considered themselves powerful.[7] In several studies involving various medical conditions, patients' own expectations and predictions of their future work ability predicted return to work.[22-24] There are relatively few studies examining the role of the subjectively experienced accident severity and the subjectively experienced ability to cope with the unintentional injury regarding return to work.[7-9 13 25] The findings from these studies cannot be generalised as they are compromised by their highly selective samples: the studies were either restricted to severely injured patients without pre-existing mental disorders,[7 8 13 26] and/or they excluded foreign-language patients.[7]

[8 12 13 19 26 27] In a previous study of severely injured accident victims we found that time off work was best predicted by the patients' own appraisals of accident severity and by the patients' own expectations regarding their ability to cope with the unintentional injury and its job-related consequences.[13] Whereas at the one-year follow-up, injury severity measured by the injury severity score (ISS)[28] and type of accident (traffic, workplace, sporting/leisure) were also predictive of time off work,[8] at the three-years follow-up only the self-reported appraisals of accident severity and the patients' ability to cope with the unintentional injury remained predictive of days absent from the workplace.[13] However, the sample in this previous study was highly selective. We included only severely injured (ISS≥10), German-speaking patients and excluded patients who had been under treatment for any mental disorders and/or serious somatic illnesses at the time of the accident. By doing this we may have excluded patients at a higher risk for sick-leave and the results may therefore not be generalised to apply to all accident survivors.

The aim of this study was to predict ~~return to~~time off work (i.e., the number of sick-leave days) during the first 6 months following unintentional, accident-related injuries in an independent, larger and less selective sample of patients with any unintentional injury requiring hospital admission.

Methods

Sample

Participants were recruited from the Department of Trauma Surgery at the Zurich University Hospital. All the patients qualifying for the study had sustained unintentional injuries that required hospitalisation for a minimum of 32 hours including two consecutive nights (the latter guaranteed exclusion of patients who were treated in the emergency room overnight but who were not really hospitalised on a ward of the Department of Trauma Surgery). Further inclusion criteria were: age between 18 to 65 years; ability to participate in an extensive assessment within 30 days of the accident; and sufficient proficiency in one of the study languages (German, Italian, Spanish, Portuguese, Serbo-Croatian, Turkish, or Albanian) to participate in the interview and to complete the self-report questionnaires. Non-German speaking participants were assessed using interpreters and professionally translated psychometric instruments. Exclusion criteria were: a Glasgow Coma Scale score (GCS)[29] below 9; unconsciousness for more than 15 minutes after the accident; pathological findings in the cranial CT; attempted suicide.

In contrast to our previous study,[8 13] neither serious somatic illness, nor being in treatment for a mental disorder prior to the accident was an exclusion criterion in the present study.[30] Note that the sample of the previous study[8 13] and the sample of the present study on time off work were completely independent from each other (recruitment of the second sample started 18 months after the end of recruitment for the first sample). With regard to the possibility of generalising the present study's findings, we also retained patients for the present study who showed marked clinical signs or symptoms of mental disorders that were obviously unrelated to the unintentional injury.

Patients were recruited over a period of 12 months. During this time period 787 patients aged between 18 and 65 years were admitted with unintentional injuries. Of these patients 253 did not meet the inclusion criteria due to early discharge (104; 41.1%), poor clinical condition (74; 29.2%), GCS score below 9 (46; 18.2%), insufficient proficiency in one of the study languages (21; 8.3%) or other reasons (29; 11.5%) (multiple reasons possible). As a result, 534 patients fulfilled all criteria and were eligible for the study. Due to a restricted interviewing capacity, not all the eligible patients could be assessed. The following procedure was applied to ensure the recruitment of a representative sample and to control for potential bias attributable to the time of admission: on day 1, every other consecutive patient (i.e. patient 1, 3, 5, etc.) was interviewed. On day 2 the order of the list of admissions was reversed so that the last patient admitted was interviewed first, the third last patient was interviewed second and so forth. On day 3, the order was reversed again, etc. The 148 patients who could not be contacted due to our limited interviewing capacity did not differ from the participating patients with regard to age (mean difference=-0.40 years; 95%-CI=-2.93 to 2.12; t=-0.31; df=481; P=0.754) and gender (Pearson's χ^2=0.77, df=1, P=0.375). Of the 386 patients who were contacted, 335 gave their written consent to participate. The 51 (13.2%) who declined participation did not differ significantly from the participating patients with regard to age (mean difference=3.75 years; 95%-CI=-0.12 to 7.61; t=-1.91; df=384; P=0.057) and gender (Pearson's χ^2=0.07; df=1; P=0.792).

After the exclusion of a small number of victims of physical violence (n=12), the sample consisted of 323 patients who all attended the interview at T1. On average the T1 interview was performed 5 days after the referral to the hospital (SD 4.2 days; range: 2 to 28 days). 34

patients had no regular work and were excluded from further analyses regarding time off work. However, four patients who were receiving unemployment compensation at the time of the accident were retained for further analyses. For these patients accident-related time off work was traceable since they needed a doctor's certificate to continue to be eligible for unemployment compensation. In all, valid data regarding time off work were obtainable from 289 patients.

On average the follow-up interview (T2) took place 188 (SD 16.2; range 155 to 257) days after the unintentional injury. 68 (23.5%) dropped out during the follow-up period; these 68 drop-outs did not differ significantly from the final sample with regard to age (mean difference=-2.78 years; 95%-CI=-6.13 to 0.57; t=-1.63; df=287; P=0.104), gender (Pearson's χ^2=3.3; df=1; P=0.069), type of accident (Pearson's χ^2=6.5; df=1; P=0.088), clinician-rated Injury Severity Score[28] (mean difference=-0.77; 95%-CI=-3.54 to 1.99; t=-0.55; df=287; P=0.582), and patient-rated subjective accident severity (t=1.19; df=287; P=0.237), appraisal of coping abilities (mean difference=-0.16; 95%-CI=-0.37 to 0.04; t=-1.58; df=283; P=0.115), and intrusions as measured by the Impact of Event Scale[31] (mean difference=0.87; 95%-CI=-1.14 to 2.28; t=0.86; df=276; P=0.393). The final sample consisted of 221 patients.

Measures

The Injury Severity Score (ISS)[28] and the Glasgow Coma Scale (GCS)[29] were routinely assessed by the surgeons immediately after admission to the emergency room. The ISS permits an evaluation of the severity of injuries by a trauma surgeon: Each part or area of the body affected is given a score (1=minimum to 6=fatal injury). If the score is 6 in one area, the ISS is assigned a sum score of 75. Otherwise, the scores for the three most severely injured

areas of the body are squared and then summed, producing a maximum score of 75. Patients with a score of 10 or more are generally considered severely injured. The GCS is an observer-rated scale for the clinical appraisal of the gravity of coma after injury to the skull and brain. Patients with severe traumatic brain injuries generally have a score under 9.

The semi-structured interview at T1 covered socio-demographic data, a detailed work record and information about the accident. Existing pre-accident psychiatric disorders were assessed using the Primary Care Evaluation of Mental Disorders.[32] The patients rated their appraisal of the injury severity on a Likert scale ranging from "1=very slight" to "5=very severe". They also rated their ability to cope with the unintentional injury and its job-related consequences on a Likert scale ranging from "1=very poor" to "5=very good".[8 13] Posttraumatic psychological symptoms were assessed by the Impact of Event Scale (IES),[31] a 15 item self-rating questionnaire comprising two subscales (intrusion and avoidance) with high reliability and validity.[33] Time off work, assessed at 6 months (T2) post-accident, was defined as the patient-reported number of sick-leave days attributable to the unintentional injury and its consequences including time of hospitalisation. To record their sick-leave days the patients used a specified journal they received at T1. A week off work was set to equal seven days of leave. Where subjects ~~who had previously been full-time employees~~ returned to work on a part-time basis, the days on which they worked less were added to the ~~total~~ days of leave on a pro rata basis.[13] The interviews were performed by two medical doctors (SHB and JFP). Each patient was interviewed by the same interviewer at T1 and T2. Detailed information on the study design and the interrater reliability is described in an earlier publication on the incidence of PTSD in that sample.[34]

Statistical analysis

Hierarchical linear multiple regression analyses were performed to predict the number of sick-leave days. They allowed for highlighting the relevance of patient's appraisal among the selected potential predictor variables. To enable us to enter the type of accident (road traffic, workplace, household, or leisure-time accidents) as a predictor into the multiple regression analysis, this categorical variable was converted into a set of three new variables so that a deviation contrast resulted. In this way the effect of each accident category was compared to the mean effect of all accident categories. Since there was one new variable for each degree of freedom, one accident category (household) had to be omitted in the regression analysis. In the final regression model including all potential predictors multi-collinearity was low (tolerance >0.75) and the distribution of regression standardised residuals was normal (Kolmogorov-Smirnov Z=0.63, P=0.827). Group comparisons of dimensional variables were performed with t-tests.

Ethical approval

Ethical approval was granted by the Ethics Committee of the Canton of Zurich. Written informed consent was obtained from all participants.

Results

The socio-demographic characteristics are presented in table 1. 35 (15.8%) of the 221 patients suffered from one or multiple pre-existing mental disorders immediately prior to the accident, and 31 patients (14.0%) did not speak German. Characteristics related to the unintentional injury of the 221 patients are found in table 2. The types of accident were as follows: 72 (32.6%) traffic accidents, 66 (29.9%) workplace accidents, 6 (2.7%) household accidents, and 77 (34.8%) sports/leisure activity-related accidents. The mean ISS differed significantly between the types of accident (traffic: M 16.0, SD 12.4; workplace or household: M 11.8, SD 8.2; sporting/leisure activity: M 8.7, SD 7.7; ANOVA: F=10.7; df=2, 218; P<0.001).

According to the surgeons' files, 44 (19.9%) patients sustained a mild or moderate traumatic brain injury (MTBI). 41 (18.6%) patients were first referred to the intensive care unit (ICU), with a mean duration of ICU stay of 4.0 days (SD 3.7; range 1-19). The mean length of stay at the acute hospital including the ICU was 15.8 days (SD 16.9; range 2-110). 46 patients had a further stay in a rehabilitation hospital, with a mean length of stay of 35.0 days (SD 25.0; range 3-141). The mean number of sick-leave days was 95.7 (SD 58.1; range 6-183). Patients suffering from pre-existing mental disorders did not differ significantly from the rest of the sample with regard to the number of sick-leave days (mean difference=2.7 days; 95%-CI=-18.4 to 23.8; t=0.25; df=219; P=0.801).

Bivariate correlations of all variables included in the regression analyses are presented in table 3. The objective injury severity (ISS) and the patients' subjective appraisals of the accident severity were positively correlated. Subjective appraisals of the accident severity (but not the objective injury severity scores) were negatively related with self-rated coping abilities.

Time off work was significantly correlated with the injury severity (ISS), IES intrusion scores, and the patients' own appraisals of both their injury severity and their coping abilities. Finally, time off work was longer after workplace related accidents and shorter after sports/leisure accidents.

In a simultaneous regression analysis the variables injury severity (ISS), sex, age, type of accident (road traffic, workplace, or leisure-time accidents), and IES intrusion were entered as potential predictors of time off work. Combined, these predictors explained 24.3% of the variance of time off work ($F=9.75$; $df=7, 213$; $P<0.001$). When in a series of hierarchical regressions each of these predictors was examined when added last to this first set, ISS (8.3%, $F=23.38$; $df=1, 213$; $P<0.001$), type of accident (7.6%; F change=7.14; $df=3, 213$; $P<0.001$), and IES intrusion added unique variance (2.0%; $F=5.63$; $df=1, 213$; $P=0.019$). These five variables were then treated as the first set added in hierarchical regressions focusing on two additional predictors, patients' appraisals of accident severity and of their coping abilities. These two variables were entered in the second step accounting for an additional 9.4% of the variance of the time off work 6 months post accident (F change=15.04; $df=2, 211$; $P<0.001$). Self-reported appraisal of accident severity added 6.0% (F change=18.14; $df=1, 212$, $P<0.001$), and self reported appraisal of their coping abilities added 4.7% (F change=14.17; $df=1, 212$; $P<0.001$). Finally, each of the seven predictors in table 4 was evaluated for unique variance contributed with the other six predictors already in the model. The severity of the injury (ISS), type of accident, and the two appraisals variables remained significant, whereas age, gender, and IES intrusion did not contribute significantly to the prediction of time off work.

In order to visualize the effects of appraisals on sick-leave days, the sample was divided into four groups based on median-splits in the two variables appraisal of accident severity and appraisal of coping abilities (fig. 1). The median was 4 Likert points in the subjective accident severity scale, and 5 Likert points in the self-rated coping abilities scale. Patients with values equal or higher than the median were grouped as 'higher' in the respective characteristic, patients with values lower than the median were grouped as 'lower' concerning subjective injury severity or self-rated coping abilities, respectively. Regarding the two groups of particular interest, namely patients who assessed the accident severity as higher and their coping abilities as lower, compared with patients who estimated the accident severity as lower and their coping abilities as higher, there were twice as many sick-leave days for the former group (mean difference=-68.1 days; 95%-CI=-85.7 to -50.5; t=-7.67; df=124; P<0.001).

Discussion

How patients perceive the severity of their accident and their ability to cope with the resulting injury and its job-related consequences are crucial predictors for return to work after unintentional injuries which lead to hospital admission. The current study demonstrated that the patients' own appraisals of the severity of their accident and of their coping resources predict time off work after accidents leading to hospital admission beyond the impact of the objective injury severity (ISS).

Some limitations of this study have to be addressed. To enable the findings from this current study to be better generalised to all hospitalised accident victims, we applied very few exclusion criteria. For example, we did not exclude patients with pre-existing somatic and psychiatric morbidity or non-ICU patients. While this may have strengthened the external validity of our findings, factors other than the unintentional injury might have influenced outcomes. By including patients with pre-existing somatic and psychiatric morbidity we possibly included patients who were at higher risk for sick-leave following unintentional injury. However, patients suffering from pre-existing mental disorders did not differ from other patients with regard to the number of sick-leave days. The inclusion criterion of being hospitalised for at least 32 hours including two consecutive nights may limit the generalisability of the study's findings, but guaranteed that all patients in the sample were really hospitalised and not only received an overnight treatment in the emergency room (which formally is an instance of hospitalisation but in fact is an outpatient treatment). Another factor that may affect return to work is compensation eligibility.[10 19] In Switzerland all inhabitants receive compensation in the case of work incapacity or disability independent of the type of accident. For employees there is a mandatory accident insurance that covers

both work- and non-work-related injuries due to accidents Thus, it is unlikely that different compensation rules related to different types of accidents biased our results. Nevertheless, the very generous compensation system in Switzerland may limit the generalisability of our findings to other countries with other or less generous compensation systems. Furthermore, there were 68 (23.5%) drop-outs from T1 to T2 in our study. It is unlikely that these drop-outs affected the results substantially as they did not differ significantly from the final sample. Finally, the number of days off work was assessed by means of self-report by the patients. Strict data privacy protection laws in Switzerland prevent the use of health insurance companies' data for the purpose of research projects. Such data would have been more reliable.

The relevance of psychosocial and subjective factors for a successful return to work after accidents has been increasingly recognised in literature.[7 11 20 26 27 35] The total amount of explained variance in the present study was moderate (R^2=.34) but within the range of comparable studies.[8 9 12-14 26] Nevertheless, this suggests that other factors than the ones we examined are also important regarding return to work. Extending the findings from previous studies among severely injured accident victims,[7 8 13] the current study confirmed the predictive value of patients' subjective appraisals of the accident severity for the whole spectrum of patients admitted to hospitals with unintentional injuries. In contrast to our previous study in severely injured accident victims who were hospitalised at the ICU,[8 13] the completely independent sample of the current study included all unintentional injuries leading to hospital admission, with only 18.6% of the patients requiring ICU treatment. In an effort to enable the findings from this current study to be better generalised, unlike in our previous study with another sample,[8 13] we did not exclude foreign language patients and patients with

pre-existing somatic illnesses and mental disorders. In some cases these particular patients may be less well socially integrated or have greater difficulties dealing with the consequences of unintentional injuries; both being risk factors for work disability. In our heterogeneous sample including moderately injured and foreign language accident victims with pre-existing somatic and psychiatric morbidity, the subjectively experienced accident severity predicted time off work after the accidents to the same degree as the objective injury severity (regression weights: Betas = .24 vs. .25). The role of the objective injury severity regarding time off work after unintentional injuries is ambiguous. In keeping with some previous studies,[2 7 8] we found the more severe injuries to be related to more days off work. However, some other studies could not find that association.[9 11 12 36] These inconsistent findings might be explained by the different ranges of injury severities and by the different follow-up intervals used in different studies. The wider the range of injury severities in a study, the higher the chance that the severity of the physical impairment predicts subsequent time off work. The more time that has elapsed since the accident, the less impact the objective injury severity is expected to have on time off work. The physical condition may play a more important role immediately following the accident because hospitalisation and rehabilitation directly contribute to the time off work, whereas in the longer term other factors might gain in importance regarding sick-leave. In our previous study among severely injured accident victims, the objective injury severity predicted time off work during the first year after the accident but was no longer predictive for the number of days off work at the three year follow-up.[8 13] In a longer term perspective, factors other than the objective physical impairment, e.g. psychosocial or subjective factors, might gain in importance regarding return to work.

Concerning subjective factors predicting return to work, the patients' appraisals of the ability to cope with the unintentional injury and its job-related consequences turned out to be another important predictor of sick-leave after hospital admissions due to unintentional, accident-related injuries. The more coping resources patients perceived themselves to have at their disposal immediately after the accident, the better his or her chances for vocational rehabilitation actually were. The significance of subjectively perceived coping abilities for return to work has already been found in earlier studies.[8 12 13] The predictive value of the patients' appraisals of the accident severity and of the coping abilities regarding time off work after unintentional injuries may be explained by Lazarus' theories on stress, appraisal and coping.[37 38] Lazarus emphasized the significance of primary and secondary appraisal of a stressful situation or event. In a primary appraisal the same situation can be judged as harmful, as a threat or as a challenge by different individuals. In a secondary appraisal the individual judges the ability to cope with the situation depending on his or her individual coping strategies. If a stressful situation is appraised as controllable by action, problem-focused coping will predominate. In a situation viewed as refractory to change, however, emotion-focused coping is more likely to predominate. Among accident victims these two steps of appraisals seem to be related. In our sample, the more threatening the patients judged their accident to have been, the fewer resources they perceived themselves to have at their disposal for coping with the unintentional injury and its job-related consequences. However, the subjective appraisal of the coping abilities was not correlated with the objective injury severity. This further emphasizes the importance of considering not only the patient's objective injury severity but also their own appraisal of the accident severity and the coping abilities when predicting the chances of return to work. Coping with stressful events is increasingly viewed as a process rather than an inert (personality) style. If coping is open to

change over time in accordance with the situational context,[30 37] this may be promising for preventive and therapeutic interventions.

Conclusion

A patient's own appraisal of the severity of their accident and of their ability to cope with the unintentional injury and its job-related consequences, are highly relevant for return to work after accidents leading to hospital admission. Both subjective appraisals predict time off work beyond the impact of the objective injury severity in the whole spectrum of patients hospitalised due to unintentional injuries.

In Western countries the quality of surgical care of accident victims has reached a high standard. In patients hospitalised with unintentional injuries, even where acute surgical care is inevitable, from a less immediate standpoint and bearing in mind future rehabilitation, a patient's subjective assessment seems to gain in importance where their recovery is concerned. It appears that relevant prognostic information regarding return to work can be obtained by asking the patient two simple questions:

1.) How severe do you think your accident was?

2.) How well do you think you will be able to handle the consequences of the accident with regard to return to work?

Any comprehensive treatment following unintentional injuries should routinely be accompanied by a brief psychosocial assessment and should include information and practical advice.

Competing interests

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Author contributions

US and HM designed the study. HM, SHB and JFP were involved in the data collection. HM performed the statistical analyses. UH, HM, NS, US were involved in the interpretation of the data. NS, UH and HM drafted the manuscript. US reviewed the manuscript several times. All authors have read and approved the final version of the manuscript.

Data sharing

There is no additional data available.

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Figure captions

Figure 1

Sick-leave days of accident victims depending on appraisals of injury severity and coping abilities (N=221, n=31 to 78 per group). Comparison of the group „lower appraisal of injury severity and higher appraisal of coping abilities" with the three other groups: *** p≤.001.

Table 1| Socio-demographic characteristics of injured accident victims (N=221)

Variable	No	Percentage
Age (years)*	40.0 (12.1)	
Sex:		
Male	156	70.6
Marital status:		
Single	103	46.6
Married	87	39.4
Divorced/widowed	31	14.0
Living arrangements:		
Alone	65	29.4
With others (family, partner, friends)	156	70.6
Maximum educational level:		
No education	2	0.9
Obligatory school	33	14.9
Apprenticeship	121	54.8
College	13	5.9
Technical or commercial college/University	52	23.5
Employment status:		
Paid work (full-time)	159	71.9
Paid work (part-time)	37	16.7
In education/ student (part-time paid work)	21	9.5
Unemployed at time of accident	4	1.8

Nationality		
Swiss	163	73.8
German/ Austrian	16	7.2
South European countries	24	10.9
Balkanian countries	14	6.3
Others	4	1.8
Language		
Non German	31	14.5

*Mean (standard deviation)

Table 2| Injury related characteristics of injured accident victims (N=221)

Variable	Mean	Standard Deviation	Minimum	Maximum
Injury Severity Score	12.1	10.1	1	66
Glasgow Coma Scale	14.8	0.7	9	15
Length of stay (days) at the intensive care unit*	4.0	3.7	1	19
Length of stay (days) at the University Hospital†,‡	15.8	16.9	2	110
Length of stay (days) at the University Hospital and Rehabilitation†,‡	23.1	28.8	2	163
Time off work at T2‡	95.7	58.1	6	183

*n=41 cases at the intensive care unit

† n=220

‡Subsumes the row above it

Table 3| Bivariate correlations (Pearson correlation coefficients) between potential predictor variables (assessed 3-28 days after the accident) to each other and to the dependent variable time off work due to the unitentional injury (assessed 6 months after the accident) (N=221).

Variable	TOW	ISS	Sex*	Age	TRAFF	WORK	SPORT	IESIN	AAS
ISS	0.35***								
Sex	-0.08	-0.17*							
Age	0.09	-0.19**	0.09						
TRAFF	-0.01	0.27***	0.01	-0.22***					
WORK	0.23***	0.01	-0.23***	0.16*	-0.21**				
SPORT	-0.28***	-0.21**	0.04	-0.06	-0.26***	-0.23***			
IESIN	0.21**	0.23***	0.11	0.03	0.10	-0.08	-0.04		
AAS	0.40***	0.34***	-0.06	-0.02	0.12	0.13	-0.13	0.27***	
ACA	-0.29***	-0.08	-0.01	-0.01	-0.01	-0.09	0.06	-0.15*	-0.19**

TOW=time off work (days) due to the unintentional injury; ISS=Injury Severity Score; TRAFF=traffic accident; SPORT=sports or leisure accident; WORK=workplace accident; IESIN=Impact of Event Scale–intrusion subscale; AAS=appraisal of accident severity; ACA=appraisal of coping abilities.

*Sex: 1=male, 2=female

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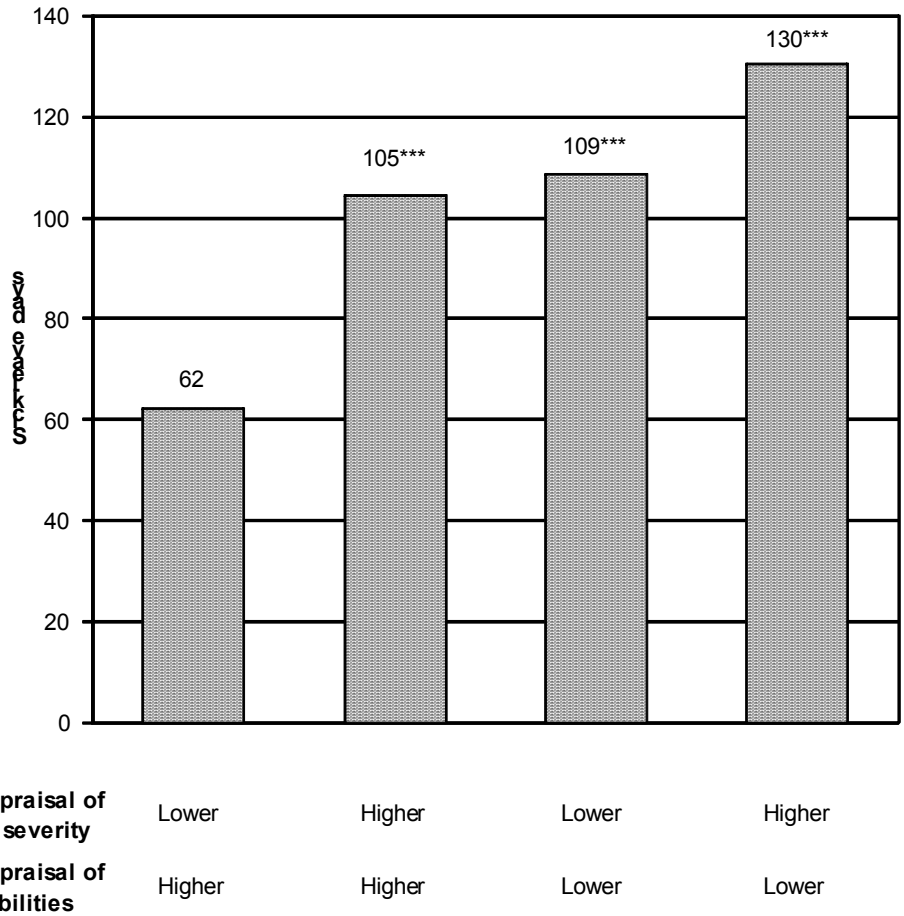
*p≤0.05, **p≤0.01, ***p≤0.001

Table 4| Prediction of time off work over 6 months after the accident

Predictor variable	Beta	95%-CI for Beta		p
Injury Severity Score	.25	0.12	0.37	<.001
Female gender	-.01	-0.13	0.11	.893
Age	.09	-0.03	0.21	.140
Type of accident:				
Traffic	-.12	-0.24	0.01	.062
Workplace	.10	-0.02	0.23	.112
Sports/leisure	-.18	-0.31	-0.06	.003
IES intrusion subscale	.07	-0.05	0.19	.261
Appraisal of accident severity	.24	0.12	0.36	<.001
Appraisal of coping abilities	-.19	-0.31	-0.08	.001

Multiple Regression: N=221; R=0.58; R^2=0.34; F=11.93, df=9, 211; P<0.001.

Figure 1


140
120
100
80
60
40
20
0
62
105***
109***
130***
Initial appraisal of accident severity
Lower
Higher
Lower
Higher
Initial appraisal of coping abilities
Higher
Higher
Lower
Lower

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	page(s)
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5-6
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	—
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	8-9
		(*c*) Explain how missing data were addressed	6-7
		(*d*) If applicable, explain how loss to follow-up was addressed	6-7
		(*e*) Describe any sensitivity analyses	—
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5-7
		(b) Give reasons for non-participation at each stage	5-7
		(c) Consider use of a flow diagram	—
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	6-7
		(c) Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	Report numbers of outcome events or summary measures over time	10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	~~12~~
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	—

			page(s)
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-11
Discussion			
Key results	18	Summarise key results with reference to study objectives	13/18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-16/17
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.