The effect of compensation on health care utilisation in a trauma cohort

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ABSTRACT

Objective: To determine whether there is an association between compensation factors and health care utilisation following major trauma.

Design and setting: Retrospective cohort study within a major metropolitan trauma centre in New South Wales.

Participants: Major trauma patients aged ⩾ 18 years, admitted between May 1999 and April 2004. Patients were included if they had an accidental injury and an Injury Severity Score > 15. In total, 355 of 582 potentially contactable patients returned completed questionnaires (response rate, 61%).

Main outcome measure: Health care utilisation, defined as the number of times patients visited specified health care professionals (general practitioners, medical specialists, psychiatrists, physiotherapists, chiropractors and massage therapists) in the previous 3 months. For statistical analysis, health care utilisation was dichotomised into low and high (0–3 or ⩾ 4 health care visits over the previous 3 months).

Results: Health care utilisation was significantly higher for patients engaging the services of a lawyer (odds ratio, 3.3; 95% CI, 2.0–5.5; $P < 0.001$) after allowing for time since injury, chronic illness, presence of a head injury and employment status. Having a head injury and increased time since injury were significantly associated with lower health care utilisation, whereas being unemployed and having a chronic illness were associated with higher health care utilisation.

Conclusion: Compensation-related factors are significant predictors of health care utilisation in a major trauma population.

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Since the 1970s, a number of studies have examined the influence of compensation factors on health care utilisation.[1-3] However, there has been limited research on this topic in Australia.

Traditionally, the focus for examining heath care utilisation has been to investigate the impact of particular services, such as length of hospital stay and doctor visits, on cost. This type of research often relies on the use of large administrative datasets or national health surveys. Although these studies have large sample sizes, they can be limited by the methods of data collection.[1,3,4]

International comparison of health care utilisation is difficult due to the differences in health care systems, insurance schemes and methods of payment that exist between countries, and even between jurisdictions within countries. However, studies that have compared different jurisdictions point to compensation as a factor influencing health care utilisation.[3,5]

The effects of compensation, demographic and injury factors on health care utilisation have not been studied in a trauma cohort. Given the increasing evidence that compensation affects health outcomes,[6-9] we aimed to explore whether there was an association between compensation factors and health care utilisation following major trauma.

METHODS

Study population

The study population was a retrospective cohort of trauma patients admitted to a major metropolitan trauma centre in New South Wales. Major trauma patients aged 18 years and over who were admitted to the hospital between 1 May 1999 and 30 April 2004 were identified from the hospital's trauma database. Patients were included in the study if they had an accidental injury and an Injury Severity Score (ISS) greater than 15. Patients who sustained non-accidental injuries (attempted suicide or assault) were excluded.

Potential participants who were eligible for the study were sent a questionnaire with a reply-paid envelope by mail in May 2005. Reminder letters were sent to non-responders at 2 and 4 weeks. At 4 weeks, this included a second copy of the questionnaire and a second reply-paid envelope. Any remaining non-responders were contacted by telephone.

The questionnaire addressed demographic, socioeconomic and compensation factors, and health care utilisation. It also included questions about physical and mental health status, such as the Short Form 36 General Health Survey. The questionnaire has been described in detail elsewhere.[10]

The sample size calculation was based on allowing 10–20 participants per explanatory variable used in the multivariate analysis. As there were about 13 explanatory variables, a minimum sample size of 200 was set. It was estimated that 200 patients per year would meet the inclusion criteria for the study. Previous postal surveys from the hospital indicated that a 30% return rate could be expected, so a 5-year recruitment period (about 1000 patients) was used.

Data collection and definitions

Demographic data (eg, date of birth and sex) and injury-related information were retrieved from the trauma database and hospital records. Injury measures used were: ISS, intensive care unit (ICU) admission, days spent in ICU, presence of a head injury, and mechanism of injury. The ISS is a measure of injury severity that has been previously used as an indicator of mortality after traumatic injury.[11] It is calculated from the Abbreviated Injury Scale (AIS)[12] by summing the squares of the three highest AIS scores from the different body regions. The AIS rates the injury to particular body regions on a scale from zero to five. Therefore, the highest possible ISS is 75.

The presence of a head injury was defined as an AIS score of three or higher for the head region. Scores less than three are associated with minor injuries such as abrasions and lacerations, whereas a score of three or higher indicates a complex skull fracture or a brain injury. Mechanism of injury was recorded as motor vehicle accident, fall or other.

Annual household income and highest education level were used as possible socioeconomic predictors. Participants were asked whether they were employed before their injury, and whether they were

1 Characteristics of 355 trauma patients who responded to the questionnaire*

Variable		Variable	
Age in years, mean (range)	47.8 (19–91)	Days in intensive care unit, mean (range)	5.5 (0–227)
Sex		Head injury	
Male	256 (72.1%)	No	173 (48.7%)
Female	99 (27.9%)	Yes	182 (51.3%)
Education (n = 348)		Mechanism of injury	
Primary school	31 (8.9%)	Motor vehicle accident	225 (63.4%)
Secondary school	189 (54.3%)	Other (including falls)	130 (36.6%)
Certificate/diploma	98 (28.2%)	Compensation claim made (n = 354)	
Bachelor degree or higher	30 (8.6%)	No	200 (56.5%)
Annual household income (n = 345)		Yes — settled	70 (19.8%)
$0–$30 000	159 (46.1%)	Yes — not settled	84 (23.7%)
$30 001–$50 000	83 (24.1%)	Compensation claim type (n = 153)	
$50 001–$75 000	55 (15.9%)	Workers Compensation	48 (31.4%)
$75 001+	48 (13.9%)	Motor vehicle Compulsory Third Party insurance	82 (53.6%)
Employed before injury (n = 354)		Both	23 (15.0%)
Yes	247 (69.8%)	Engaged a lawyer (n = 353)	
No	107 (30.2%)	No	225 (63.7%)
Employed currently (n = 354)		Yes	128 (36.3%)
Yes	161 (45.5%)	Blame (n = 352)	
No	193 (54.5%)	Others	113 (32.1%)
History of chronic illness		Self	128 (36.4%)
No	146 (41.1%)	Don't know	110 (31.3%)
Yes (⩾ 1 illnesses)	209 (58.9%)	Health care utilisation, no. of visits in previous 3 months (%)	
Months since injury, mean (range)	41.0 (12–74)	None	54 (15.2%)
Injury Severity Score, mean (range)	24.3 (16–66)	One	38 (10.7%)
Intensive care unit admission		Two	37 (10.4%)
No	140 (39.4%)	Three	39 (11.0%)
Yes	215 (60.6%)	Four or more	187 (52.7%)

* Figures are no. (%) unless otherwise specified. Some respondents did not answer all questions. ◆

employed at the time of follow-up. To obtain information regarding comorbidity, participants were asked to indicate whether they had been diagnosed with any of 10 illnesses (chronic bronchitis, asthma, heart disease, kidney disease, stroke, high blood pressure, diabetes, cancer, liver disease and arthritis).

Compensation schemes in NSW include Workers Compensation, which is no-fault with weekly benefits and lump-sum compensation, and motor vehicle Compulsory Third Party (CTP) insurance, which is predominantly fault-based with lump-sum compensation. Determination of liability can take up to 12 weeks for Workers Compensation and 3 months for CTP. A claim can be made up to 6 months after injury, and claimants are entitled to legal representation under both schemes. Questions pertaining to compensation status included whether a claim had been made, the type of claim, whether the claim had settled, who the patient blamed for the injury, and if the patient had engaged a lawyer for the claim.

The outcome variable was health care utilisation. To ascertain a measure of health care utilisation, patients were asked how many times they had visited particular health care professionals in the previous 3 months. The relevant health care professionals were: general practitioners, medical specialists (including surgeons and physicians), psychiatrists, physiotherapists, chiropractors, massage therapists, and other. These groups were combined to provide a measure of overall health care utilisation.

Due to the lack of normality in the distribution of health care utilisation, and to allow easier interpretation, health care utilisation was dichotomised into "high" and "low" using the midpoint as a cutoff (0–3 or ⩾ 4 health care visits over the previous 3 months).

Statistical analysis and ethics approval

The association between each explanatory variable and health care utilisation was tested. The χ^2 test was used for the dichotomous explanatory variables of sex, employment status, history of chronic illness, ICU admission, head injury, mechanism of injury and engagement of a lawyer. The Mantel–Haenszel χ^2 test was used for the categorical explanatory variables of more than two groups. For the continuous explanatory variables (age, time since injury, days in ICU, and ISS), means were compared using Student's t test.

History of chronic illness was dichotomised to either a history of no chronic

2 Univariate (unadjusted) analysis of factors affecting health care utilisation

Variable	Effect on health care utilisation	*P*
Compensation claim type	CTP higher than Workers Compensation	0.08
Compensation claim made	Increase	< 0.001
Compensation claim settled	Decrease	< 0.001
Engaged a lawyer	Increase	< 0.001
Blame others	Increase	0.96
Increasing age	Increase	0.10
Sex	Higher in females	0.33
Time since injury	Decrease	0.02
History of chronic illness	Increase	< 0.001
Injury Severity Score	Increase	0.45
Intensive care unit admission	Increase	0.11
Days in intensive care unit	Increase	0.04
Head injury	Decrease	0.03
Mechanism of injury	Car occupants higher than non-car occupants	0.17
Education	No trend	0.39
Annual household income	No trend	0.50
Employed before injury	Decrease	0.48
Currently unemployed	Increase	< 0.001

CTP = Compulsory Third Party. ◆

illnesses or one or more chronic illnesses. Univariate analysis was initially performed with chronic illness as an ordered categorical variable (one, two, or three or more illnesses). However, as this provided similar results, the dichotomised variable was used in the reported analyses.

All variables with significance of 0.25 or less were included in the multivariate model. Backward stepwise logistic regression was used to eliminate non-significant ($P \geq 0.05$) variables until the final model was reached. A regression model was used to identify significant predictors of the outcome variable, namely, visits to any health professional.

The study protocol was approved by the University of Sydney and the Sydney South West Area Health Service Human Research Ethics Committees.

RESULTS

A total of 1156 patients with an ISS greater than 15 were recorded on the hospital trauma database as being admitted between 1 May 1999 and 30 April 2004. Of these, 160 patients had died in hospital and 205 were excluded because their injuries were listed as non-accidental (164 assaults, 41 attempted suicides). According to the NSW Registry of Births Deaths and Marriages, a further 60 had died since their discharge from hospital. Three patients had no contact details. Thus, 728 questionnaires were mailed out to potential participants.

Of the 728 potential participants, 10 patients were reported as deceased, 46 were unable to complete the questionnaire (mainly due to language difficulties), 90 were non-contactable, 134 did not respond and 93 refused. There was a response rate of 61% of contactable eligible participants (355/582).

Compared with non-respondents, respondents were slightly older (mean, 47.8 v 44.5 years), and less time had passed since their injury (mean, 41.0 v 45.2 months). Respondents were also more likely to be drivers or passengers of motor vehicles than non-respondents. These differences were all statistically significant.

Characteristics of respondents are shown in Box 1. The mechanism of injury was documented as a motor vehicle accident for 63.4% (including drivers, passengers and pedestrians), falls for 27.3%, and other for 9.3%.

The median number of health care visits was four (interquartile range, 1–9; range, 0–180). Overall, 168/355 patients (47.3%) visited a health care provider from zero to three times in the previous 3 months, and 187 patients (52.7%) visited four or more times.

Box 2 shows the significance levels of the unadjusted association between each variable and health care utilisation.

After logistic regression analysis, the final model included data on 351 patients and showed 74% concordance between predicted and observed responses (Box 3). The two variables of engaging a lawyer and making a compensation claim were correlated but not collinear ($r = 0.73$). The effect of a compensation claim was not significant after allowing for use of a lawyer; however, the effect of using a lawyer remained significant after allowing for a compensation claim.

The direction of the associations was such that the presence of a head injury and a longer time since injury were associated with decreased health care utilisation; current unemployment, retaining the services of a lawyer, and a history of chronic illness were associated with increased health care utilisation. Interaction terms were tested in the final model and were not found to be significant.

Due to its potential importance, injury severity was tested in the final model; however, the addition of this variable did not change the odds ratio of any variable by more than 3%. Therefore, injury severity was not retained in the final model.

DISCUSSION

We found that health care utilisation in a major trauma population was affected by compensation. Most notably, we found a

3 Final logistic regression model of predictors of health care utilisation

Variable	AOR (95% CI)	*P*
Head injury	0.52 (0.33–0.83)	0.006
Time since injury	0.99 (0.97–1.00)	0.02
Currently unemployed	1.91 (1.19–3.06)	0.008
Engaged a lawyer	3.28 (1.98–5.46)	< 0.001
History of chronic illness	3.33 (2.02–5.50)	< 0.001

AOR = adjusted odds ratio. ◆

significantly higher rate of utilisation among patients using a lawyer, allowing for the effects of time since injury, other compensation factors, injury severity, demographic factors, and socioeconomic factors.

The influence of comorbidity on health care utilisation is well defined in the literature,[13-15] and factors such as income, age and sex have been associated with health care utilisation in non-trauma populations.[1,2]

Previous studies have also shown a strong association between compensation factors and health care utilisation.[1-3,5] This has been primarily linked to changes in cost structure and policy. However, the diversity of insurance schemes makes further comparison difficult.

A number of studies have found that engaging the services of a lawyer is a significant predictor of outcome,[16,17] but there has been limited research into the use of a lawyer in relation to health care utilisation. One Australian study of patients with whiplash neck injuries showed that consulting a lawyer increased health care utilisation after injury.[18]

Our study found that, after allowing for time and other variables, the use of a lawyer was strongly associated with health care utilisation. The reason for this effect is uncertain. Univariate analysis showed that use of a lawyer and claiming compensation both had a strong effect, but the effect of a compensation claim was not significant after allowing for use of a lawyer. The effect of using a lawyer remained significant after allowing for a compensation claim. This indicates that the effect of having a compensation claim was due to confounding, and could be explained by the high proportion of claimants who had used a lawyer.

It is possible that patients with more severe conditions required more health care visits, and were more likely to have a complex claim (involving a lawyer and delayed settlement); however, we did not find that injury severity was a significant predictor of health care utilisation. Similarly, previous research on this cohort showed poor health in patients with unsettled claims and who used a lawyer, regardless of injury severity.[10] This indicates that there may be a direct association between health care utilisation and use of a lawyer or having an unsettled claim.

This study is limited by a retrospective design, increasing the potential for recall bias when participants report their health care utilisation over the previous 3 months. The retrospective design also resulted in a variable time to follow-up — the effect of time since injury would have been better measured in a prospective study following individual participants over time. There was also some inequality between responders and non-responders, which may have biased the results. Furthermore, not all variables known to be associated with health care utilisation, such as health risk factors (eg, alcohol consumption, marital status, smoking and body mass index) and treatment procedures, were measured.[14,19]

In Australia, there has been very limited research to indicate whether the method of payment, type of insurance scheme or engaging the services of a lawyer affect health care utilisation. Although our study suggests that health care utilisation is associated with compensation factors, prospective studies across jurisdictions are needed to determine whether a causal association exists between compensation-related factors and health care utilisation.

It has been suggested that two main factors affect health care utilisation — predisposing factors (eg, age, sex and social structure) and enabling factors (eg, income and insurance).[20] Our study provides evidence that supports both predisposing factors (eg, chronic illness) and enabling factors (eg, compensation factors) as significant predictors of health care utilisation.

COMPETING INTERESTS

None identified.

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