The impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma

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Statement of Authentication

This thesis is submitted to the University of Sydney in fulfilment of the requirement for the Doctor of Philosophy. The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

In addition, ethical approvals from the South Western Sydney Local Health District, South Eastern Sydney Local Health District, and The University of Sydney, Human Research Ethics Committees were granted for the analyses presented in this thesis. Participants were required to read a participant information document and informed consent was gained prior to data collection.

Signed: Darnell Murgatroyd
Date: 3/12/15

As supervisor of Darnell Murgatroyd’s doctoral work, I certify consider her thesis entitled ‘The impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma’ to be suitable for examination.

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Date: 3 December 2015
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Abstract

Introduction

There is substantial evidence of an association between seeking financial compensation and poor injury recovery and Return to Work (RTW). The causal nature of this relationship remains complex and imprecise. Many compensation related measures are generic and do not encompass the complexity of scheme design or the socio-political environment in which they operate. This is particularly relevant in Australia where all states and territories provide access to financial compensation following motor vehicle related trauma.

In addition, motor vehicle related trauma is a significant contributor to the burden of injury and work disability. Early identification of predictors (including compensation related factors) is essential for developing efficacious interventions and purposeful scheme policy and design to facilitate injury recovery and RTW. Accordingly, the overarching aim of this thesis is to explore the impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma.

Initially, Chapter 1 provides the background and historical context of how compensation schemes were thought to influence physical and psychological health. It includes an overview of the current burden of injury, and relevant scheme design. Given the background to this relatively new field of research, mixed methods were employed across three areas: a systematic review (Chapter 2); qualitative studies (Chapters 3 and 4); and an inception cohort study (Chapters 5-7).
Methods and results

In Chapter 2, the aim of the systematic review is to identify associations between specific compensation related factors and health outcomes following musculoskeletal injury from prognostic and/or intervention studies. Searches were conducted using electronic medical journal databases. Selection criteria included: prognostic factors associated with validated health outcomes; six or more months follow up; and multivariate statistical analysis.

Twenty nine articles were assessed using Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology to determine evidence levels. The results are mixed. There is strong evidence of an association between compensation status and poorer psychological function; and legal representation and poorer physical function. There is moderate evidence of an association between compensation status and poorer physical function; and legal representation and poorer psychological function. There is limited evidence of an association between compensation status and increased pain. No studies reported positive associations between compensation status and a health or functional outcome.

In Chapters 3 and 4, qualitative methods are used to examine the impact of seeking financial compensation with greater granularity. The aims are: firstly, to explore the factors that influence recovery from serious injuries, particularly differences between people with compensable and non-compensable injuries; and secondly, to understand people’s perceptions and experiences of the claims process after sustaining mild-moderate compensable injuries, and to explore ways to assist and improve those experiences.

The first eight focus groups (34 attendees, 21 compensable) were conducted two to seven years post injury within the trauma service of a University Teaching Hospital. The second five focus groups (32 attendees) were conducted one year post injury within a single
Compulsory Third Party (CTP) personal injury scheme. All were audio-recorded and transcribed. The methodology was based on a grounded theory approach using thematic analysis and constant comparison to generate coding categories for themes. Data saturation was reached. Analyst triangulation was used to ensure credibility of results.

Key themes for the first series are: a strong sense of entitlement and injustice; a difficult claims and settlement process; an inability to move on with life during the claims process, an extreme dislike of medico-legal assessments; the necessity of legal representation to assist with the claims process; and a perceived lack of trust about having to prove an injury or disability (Chapter 3).

Key themes for the second series are: complexity of the claims process; requirement of legal representation; injury recovery expectations; importance of timely healthcare decision making; and improvements for injury recovery. To assist with injury recovery, access to objective information about the claims process using online technology and social media was considered paramount (Chapter 4).

In Chapters 5-7, an inception cohort study was conducted following moderate-severe injuries. The aims are: firstly, to investigate the predictors of seeking financial compensation, namely making a claim and seeking legal representation at six months (Chapter 5); secondly, to determine the predictors (including compensation related factors) of time to RTW (Chapter 6); and thirdly, to investigate the influence of seeking financial compensation (i.e. making a claim) on injury recovery.

Admitted patients were recruited prospectively from two trauma hospitals with upper and/or lower extremity fractures following a motor vehicle crash. Baseline data were collected within two weeks of injury, follow up data at six, 12 and 24 months (by written questionnaire). Additional demographic and injury-related information was retrieved from
hospital databases. Main outcomes were: time to RTW (number of days); Short Form-36 Version 2.0 (SF36v2), Physical/Mental Component Scores (PCS/MCS); Post Traumatic Stress Disorder (PTSD) Checklist Civilian Version (PCL-C); and Global Rating of Change (GRC) scale. Analysis involved: descriptive statistics for baseline characteristics; comparison of compensable and non-compensable participants with Analysis of Variance (ANOVA) and chi-squared tests; for predictors, logistic regression, Cox proportional hazards regression models, and linear mixed models were used.

There were 452 participants. Baseline characteristics showed: mean age 40 years; 75% male; 74% working pre-injury; 30% in excellent pre-injury health; 56% sustained serious injuries (Injury Severity Score [ISS] 9-15); 61% had a low-middle range household income; 35% self-reported at-fault in the crash; and 61% made a claim at six months. Participant follow up data was available at six, 12 and 24 months for 301(67%), 271(60%), and 230(51%) respectively.

Results showed that there are no significant differences in pre-injury or baseline health status between those who made a claim and those who did not, but these measures largely related to physical health. As an outcome, seeking financial compensation at six months is associated with a higher pre-injury Body Mass Index (BMI) rather than injury-related factors, and seeking legal representation at six months is solely related to socio-economic factors (Chapter 5).

For those working pre-injury (n=334, 74%), a longer time to RTW is associated with greater injury severity and lower occupational skill levels; while a shorter time to RTW is associated with recovery expectations for usual activities within 90 days, full-time pre-injury work hours, and very good self-assessed pre-injury health status. Legal representation (analysed at six months only) is not associated with time to RTW (Chapter 6).
As a predictor, seeking financial compensation is associated with poor injury recovery, mainly for mental health status (MCS) and PTSD (PCL-C). However, the differences are of marginal clinical significance. Irrespective of compensation status, the majority have poor injury recovery on all measures over time, especially for mental health (Chapter 7).

**Conclusions**

In summary, these results contribute to existing evidence that seeking financial compensation is associated with poor injury recovery, particularly mental health status. The causal nature of the relationship remains complex but it is posited that part of the explanation lies in scheme policy and design including legislative framework. Background pre-injury factors, namely pre-existing physical and mental health status, psychosocial and socioeconomic factors also play a role.

There are opportunities to trial interventions that could improve injury recovery and/or decrease work disability. Collectively, these include screening for risk factors of poor recovery and/or RTW, access to early appropriate treatment and rehabilitation, and vocational rehabilitation for those most vulnerable. None of these are novel but they can be problematic to implement in a compensable environment. Reducing the adversarial aspects of the claims process is important and could possibly alleviate the need to seek legal representation. Some initiatives are likely to require legislative change but others could be implemented with moderate resources. Ongoing mixed methods and interdisciplinary research with an emphasis on modifiable factors is recommended.
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Abbreviations

AIS  Abbreviated Injury Scale
ABS  Australian Bureau of Statistics
ADF  Australian Defence Force
ANF  Accident Notification Form
ANOVA Analysis of variance
ASCED Australian Standard Classification of Education
ASCO Australian Standard Classification of Occupations
AUD/AU Australian dollar
AUDIT-C Alcohol Use Disorders Identification Test: Self-Report Version
BEACH Bettering the Evaluation of Care and Health
BMI  Body Mass Index
CALD Culturally and Linguistically Diverse Backgrounds
CI  Confidence Interval
CBT  Cognitive Behavioural Therapy
CTP  Compulsory Third Party
DF  Degrees of Freedom
DVA  Department of Veteran Affairs
GCS  Glasgow Coma Scale
GDP  Gross Domestic Product
GRADE Grading of Recommendations Assessment, Development and Evaluation
GRC  Global Rating of Change scale
HHR  Hazard Rate Ratio
HILDA Household, Income and Labour Dynamics in Australia Survey
IRSD  Index of Relative Socioeconomic Disadvantage
ISS  Injury Severity Score
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>MAA</td>
<td>Motor Accidents Authority</td>
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<tr>
<td>MAIC</td>
<td>Motor Accidents Insurance Commission</td>
</tr>
<tr>
<td>MAIR</td>
<td>Motor Accidents Insurance Regulation</td>
</tr>
<tr>
<td>MBC</td>
<td>Motor Bike Crash</td>
</tr>
<tr>
<td>MCS</td>
<td>Mental Component Summary score (SF36v2)</td>
</tr>
<tr>
<td>MD</td>
<td>Mean Difference</td>
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<tr>
<td>MTBI</td>
<td>Mild Traumatic Brain Injury</td>
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<tr>
<td>MVC</td>
<td>Motor Vehicle Crash</td>
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<tr>
<td>NISS</td>
<td>New Injury Severity Score</td>
</tr>
<tr>
<td>NESB</td>
<td>Non English Speaking Background</td>
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<tr>
<td>NDI</td>
<td>Neck Disability Index</td>
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<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<tr>
<td>NSW</td>
<td>New South Wales</td>
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<tr>
<td>OR</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>PCS</td>
<td>Physical Component Summary score (SF36v2)</td>
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<tr>
<td>PCL-C</td>
<td>Post-Traumatic Stress Disorder Checklist - Civilian Version</td>
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<tr>
<td>PTSD</td>
<td>Post-Traumatic Stress Disorder</td>
</tr>
<tr>
<td>RSI</td>
<td>Repetitive Strain Injury</td>
</tr>
<tr>
<td>RTW</td>
<td>Return to Work</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SEIFA</td>
<td>Socio-Economic Indexes for Areas</td>
</tr>
<tr>
<td>SF36v2</td>
<td>Short-Form 36 version 2</td>
</tr>
<tr>
<td>SIRA</td>
<td>State Insurance Regulatory Authority</td>
</tr>
<tr>
<td>TBI</td>
<td>Traumatic Brain Injury</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analogue Scale</td>
</tr>
<tr>
<td>VBA</td>
<td>Veterans Benefits Association</td>
</tr>
<tr>
<td>WAD</td>
<td>Whiplash Associated Disorder</td>
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<tr>
<td>-----------</td>
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<tr>
<td>WC</td>
<td>Workers Compensation</td>
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Chapter 1: Introduction

The main aim of this thesis is to explore the impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma.

It has been reported that there is strong evidence of an association between seeking financial compensation (i.e. compensation related factors) and poorer health outcomes following injury including greater disability, poorer physical and psychological health, and poorer return to work (1-5) but whether that association is causal is unclear.(6, 7) To introduce this topic the following is provided:

- a historical context of how compensation systems were thought to influence physical and psychological health;
- an overview of the current environment and recent relevant research;
- a summary of the burden of injury;
- compensation scheme design and setting;
- a brief description of the study design;
- definitions; and
- specific aims for each chapter.

Historical context

In the 1860’s one of the earliest forewarnings about the possible influence of financial compensation on health status was ‘railway spine’, where people involved in railway crashes reported symptoms of a back injury without evidence of a physical injury. Some in the medical profession attributed the symptoms to a post-traumatic neurosis.(8) However, this
was criticised due to the discord between the absence an organic injury and the associated levels of disability, and/or whether there was an element of fabrication or exaggeration.(9) This laid the foundation for railway companies to be sued for personal injury compensation.(10) Furthermore, it pioneered the introduction of psychological injury and its sequelae into what had previously been the realm of solely physical organic disorders.(9, 11) Later in World War I and II, early data collection led to the identification of psychiatric casualties such as ‘shell-shock’ and ‘combat stress.’ The incidence of these casualties appeared largely dependent on battle intensity, troop quality and morale.(12) ‘Shell shock’ was originally perceived as a wound or neurological lesion, but in 1917 it was discredited by the military and became a controversial diagnosis.(13) In 1980, following the Vietnam and Korean wars, Post-Traumatic Stress Disorder (PTSD) first appeared as a legitimate diagnosis in the *American Psychiatric Association. (1980). Diagnostic and Statistical Manual of Mental Disorders (3rd ed., text rev).* (14) This disorder firmly established a link between the physical exposure to trauma, namely battle, and disability, albeit without organic injury. As with railway injuries, battlefield injuries were awarded personal injury compensation based on the extent of functional loss and the principles of social justice that: ‘society should provide fair treatment and a just share of the benefits (wealth and resources) to individuals and groups’ when they cannot work (at partial or full capacity).(15) Closer to home (in Australia), Repetitive Strain Injury (RSI) was initially observed in the 1970’s in electrical process workers (16) but grew into epidemic proportions in the 1980’s with an over 200% increase in claim numbers.(17) Typically it presented as non-specific forearm/arm pain with or without neck pain, but no objective clinical signs or symptoms.(18) Although contentious, it was opined that these injuries were related to socio-political and psychosocial factors as opposed to physical factors.(19, 20)
Over more recent decades there has been an increasing focus in epidemiological research on whether personal injury compensation could lead to poorer health outcomes. Some studies investigating Whiplash Associated Disorders (WAD) were particularly challenging. It has been suggested that in the absence of a compensation scheme, there were no ongoing symptoms (21); and post legislative change - altering financial entitlements, there was a marked improvement in symptoms.(22) Once again, these results were not without criticism (23-25) but they added weight to the debate particularly when common compensable injuries such as WAD and low back pain were associated with chronicity, ongoing disability and poor return to work outcomes.(26-31)

In 2001, an Australian report entitled ‘Compensable Injuries and Health Outcomes’ was published (32); this drew attention to some of the aforementioned research and concluded there was ‘good evidence’ of an association between compensation related factors and poorer health outcomes with the caveat that this research was ‘fragmented and inconclusive’. It noted the importance of psychosocial factors and their relationship with prolonged disability. A number of recommendations were made including the need for further research to: identify features of scheme design which could impact on outcomes; determine those impacts; and to develop options for scheme design that could positively impact on health outcomes and be cost effective. This report generated considerable attention and spearheaded the beginning of many investigations.
Current environment

Australian and international studies began to include compensation related factors as predictors (33-43) but only a few focused on the impact of financial compensation.(44-48) Most showed a negative association between compensation related factors (e.g. compensation status, legal representation, litigation, legislative change) and general health or disability (33, 34, 38, 44-46), and/or return work.(49, 50) Only a few showed no association.(42, 48) In some studies, the associations varied depending on the measures used.(37, 43, 46) No studies showed a positive association.

Not surprisingly, this pattern also applied to systematic reviews where most found a negative association between compensation related factors and health outcomes in clusters such as: post-surgery; mental health; Traumatic Brain Injury (TBI); orthopaedic trauma; and low back pain.(1, 2, 5, 51, 52) Several found no association or insufficient evidence to draw any conclusions.(53, 54) Other systematic reviews raised the possibility of measurement error, for example: when the timing of exposure to a compensation related factor is not at baseline (55); or when the direction of cause and effect is contrary to what is presumed or is a two-way causal relationship (i.e. reverse causality bias).(6, 7, 56) In the context of reverse causality this could mean poorer health leads people to claim compensation or claiming compensation causes poorer health. These issues have yet to be fully explored.

To date, researchers have investigated a plethora of injuries (e.g. WAD, orthopaedic trauma, TBI, low back pain, and psychological injury) in different study populations, across different compensation schemes. The evidence remains complex (57-60) and often controversial.(6, 7, 61) There is ongoing advocacy for methodologically sound research involving comparisons
between and within different jurisdictions. (6, 7, 58, 60, 61) In 2011, at an international summit, researchers concluded there was the need to clarify ‘complex causal pathways and mechanisms of effects’ in compensation related research and recommended the use of sophisticated mixed methodology to achieve this.(58)

In another sphere, relevant qualitative research in the realm of Workers Compensation (WC) jurisdictions has focused on the people’s experiences of claims and legal process following work related injuries.(62-65) Results from two contemporary systematic reviews indicate a largely negative influence on injury recovery due to: adversarial claims processes; difficulty accessing reasonable financial entitlements; perceived illegitimacy of injuries; and poor communication and/or administrative issues between insurers and injured workers.(59, 66) Very few studies have investigated people’s claims experiences following motor vehicle related trauma. However, similar themes emerge of financial hardship, and difficulties accessing and delays receiving financial entitlements; which hindered recovery and return to work.(67)

Lastly, psychosocial factors seem entwined with seeking financial compensation. If malingering or secondary gain are added (i.e. pretending to be ill or gaining advantage as a result of having an illness), things become more convoluted.(68) These concepts appear in other guises such as accident neurosis (69) or compensation neurosis (70), all of which are continually debated, especially in legal and psychiatric circles.(61, 70-72) Some suggest that it is these factors that could complicate recovery alongside co-morbidities, pain and psychological distress.(3, 27, 73)
Yet there are possible explanations, researchers have found that people who are exposed to the compensation process and have poorer outcomes also have: poorer baseline mental health (2); greater vulnerability to stress (74); and/or there is a poor biopsychosocial approach to accommodating return to work (27); which could partly explain why they appear to be malingering. Injuries with a non-organic component such as WAD or Mild Traumatic Brain Injury (MTBI) and no discernible changes on x-ray or Computed Tomography (CT) imaging are often reported as malingering.(3, 21, 73) This is in contrast to the majority of fractures, penetrating injuries, or organ lacerations where there is clear evidence of injury on imaging. For the purposes of this study: to avoid the argument about whether or not a person had sustained an organic versus non-organic injury; and any hypothetical contributions of malingering based on a non-organic injury; fractures were selected as a key inclusion criterion.

**The burden of injury**

Motor vehicle related orthopaedic trauma is a major contributor to the burden of disease and injury.(75, 76) Fractures, particularly of the upper and lower extremity, are often sustained in a motor vehicle crash, and are the most common reason for admission to hospital.(77) Many continue to having ongoing pain, disability and poor return to work following such injuries.(33, 34, 36, 37, 39, 44, 49, 50) This places considerable strain on health systems as the population ages and injured people are living longer with disabilities.(78)

There is also a major economic burden. In Australia, the annual cost of motor vehicle crashes is estimated to be approximately AUD$17b or 2.3% of Gross Domestic Product (GDP) with significant variance across the states and territories. The greatest absolute economic burden is
in NSW, where the total cost of motor vehicle crashes is AUD$5.7b per annum (in 2003).(79) Recently, an evaluation of the Victorian trauma system from 2001-2011 found that although road trauma fatalities and the burden of serious injury had decreased, the incidence of hospitalised major trauma had increased, as had years lived with disability.(80) More injured people are surviving road trauma and identifying early predictors for poor recovery and/or return to work could assist to reduce the associated health, economic and social costs. Ongoing high quality research is critical in this regard.

Thus far, research evidence (excluding compensation related factors) demonstrates that socio-demographic and socio-economic factors (e.g. age, gender, education, occupation, income) often have conflicting associations across studies that could be dependent on societal and population differences. (34, 36, 43, 46) Injury related factors also produce mixed results.(5, 81) However, psychosocial factors (e.g. depression, anxiety, low self-efficacy, high initial pain scores) are more frequently associated with poorer outcomes. (27, 33, 36-38, 40, 42, 46, 82, 83) This research was taken into account when determining which study factors were included. However, prior to outlining the study design and setting, it is important to complete the scene by describing the jurisdictional landscape for personal injury in Australia, namely NSW, where this study was located.

**Compensation scheme design and setting**

In Australia, compensation schemes are a principal means to: provide medical intervention; activate return to work initiatives; and compensate for disability and/or pain and suffering (non-economic loss) following a motor vehicle (or work) related injury. The two main schemes – Compulsory Third Party (CTP) and WC; operate in a complex socio-political
environment and the jurisdictional landscape differs remarkably. CTP schemes tend to be
fault-based, that is: an injured person can only claim compensation if there was negligent use
of a motor vehicle by another, or they are no-fault.(84, 85) They include: common law
(Queensland); statutory modified common law (NSW); fault-based common law (South
Australia, Western Australia); no-fault with common law rights (Tasmania); and a no-fault
monopoly with limited common law rights (Victoria).(86) WC schemes are not dissimilar
with eight separate state and territory schemes and three Commonwealth schemes (Australian
government employees, certain seafarers, and Australian Defence Force personnel).(87, 88)
WC schemes are no-fault, that is: an injured worker does not need to prove negligence on the
part of the employer, and they include private and self-insurers. This landscape dictates by
law who can access financial compensation and under what conditions.

In respect to NSW, a large proportion of injured people are eligible to claim in the two
different compensation schemes. For example, in 2013/14 there were 4,955,776 registered
motor vehicles on the road, 17,270 motor vehicle crashes that resulted in an injury (89), and
14,360 CTP claim notifications.(90) The following sections provide a history and summary
of those compensation schemes namely: CTP and WC insurance.

**NSW Compulsory Third Party personal injury scheme**

In NSW, the first *Motor Vehicles (Third Party Insurance) Act (NSW)* was introduced in
1942.(91) Post World War II, increased vehicle ownership and public road usage resulted
more motor vehicle crashes. Various legislative reforms were introduced to control rising
costs of premiums.(85, 92, 93) Over this time, reports have reassessed scheme design
examining financial entitlements and whether a no-fault scheme would be beneficial and cost
effective. On 1 September 2015, the State Insurance Regulatory Authority (SIRA) assumed the functions of the Motor Accidents Authority (MAA) as the government insurance regulator of this privately underwritten scheme with seven commercial insurers.

The current NSW Motor Accidents Compensation Scheme is a largely fault-based statutory modified common law scheme. Since April 2010, regardless of who was at fault, anyone injured in a motor vehicle crash can access limited entitlements (i.e. medical expenses and lost wages up to AUD $5,000). In addition, motor vehicles travelling on public roads must be registered, and to make a CTP claim a motor vehicle must be registered. The objectives of the Motor Accidents Compensation Act 1999 (NSW), Chapter 1, Part 1.1, Section 5, Objects of Act, encompass fair compensation and scheme affordability. Specifically in relation to injury recovery it states:

‘to encourage early and appropriate treatment and rehabilitation to achieve optimum recovery from injuries sustained in motor accidents, and to provide appropriately for the future needs of those with ongoing disabilities.’

NSW Workers Compensation scheme

The first WC scheme was introduced in NSW as the Workmen’s Compensation Act 1910 (NSW) originally applying to personal injuries that arose from dangerous occupations. In 1926, it was expanded to include compulsory insurance for employers and a specialised workers’ compensation tribunal. A series of legislative amendments began in the 1980’s to reduce budget deficits, expand benefits and introduce competition and choice for employers. These restructures have continued up to the present day. On 1 September 2015, the SIRA assumed the functions of WorkCover as the government insurance regulator of the WC
scheme; it is a publically underwritten statutory benefit scheme where five private scheme agents (insurers) and 58 self-insurers manage claims on behalf of SIRA. (96, 99)

The current NSW WC Scheme is a ‘no-fault’ defined benefits scheme based on personal injury that arises out of or in the course of employment, where employment is a substantial contributing factor. (87) To make a journey claim, the motor vehicle crash must have occurred during travel between place of employment, home and/or any work-related place and a person injured (regardless of fault). (96, 99) Part of this legislation was repealed in April 2010, but it was in place for the majority recruitment phase of this study. Previously, a person could make a WC or CTP claim for a motor vehicle crash that occurred when travelling between place of employment and home, now the only option is to make a CTP claim. (99)

The objectives of the Workplace Injury Management and Workers Compensation Act 1998 (NSW), Chapter 1, Section 3, System objectives, are similar to the Motor Accidents Compensation Act 1999 (NSW). Specifically in relation to injury recovery it states:

‘to provide: prompt treatment of injuries, and effective and proactive management of injuries, and necessary medical and vocational rehabilitation following injuries, in order to assist injured workers and promote their return to work as soon as possible.’ (100)

For both schemes, claims must be lodged within six months of injury and insurers have three months to determine final liability (i.e. accept or deny the claim). Provisional liability, which can be declared earlier, allows the insurer to make payments without admitting or incurring liability under the legislation and enables earlier payment of medical expenses and WC weekly wage benefits. In WC, the insurer must be notified of an injury within 48 hours. (99)
Financial entitlements include lump sum compensation for pain and suffering, economic loss and medical expenses. Legal representation can also be obtained at any time in either scheme.

**Study design and setting**

Various studies have documented injury recovery and the impact of seeking financial compensation following motor vehicle related orthopaedic trauma in NSW and other Australian states. These studies tended to: have short follow up periods (six months) (34, 37); recruit participants with minor – moderate injuries (42, 45, 46, 82, 101, 102), include mechanisms of injury other than a motor vehicle crash (43, 44); and/or be set in other compensable jurisdictions.(37, 42-44, 46, 82) To date, there have been no prospective studies investigating the impact of seeking financial compensation (including other predictors) on injury recovery following motor vehicle related orthopaedic trauma in a moderate – severely injured cohort in NSW, Australia, with a two year follow up period.

It is not feasible or ethical to randomise people to a specific compensation scheme; hence a prospective study design was chosen as the best source of evidence available to investigate predictors of injury recovery.(103) The study population selected people driving or being a passenger of motor vehicles, motorcycles, bicycles, and pedestrians in the a geographical region serviced by two major trauma hospitals in Sydney, NSW (Sydney South West Area Health Service [SSWAHS] and South Eastern Sydney and Illawarra Area Health Service [SESIAHS]). These regions allowed access to a representative sample of motor vehicle related orthopaedic trauma patients admitted to hospital and provided a greater opportunity for generalisability of study results. For this inception cohort study, baseline data were collected in person within two weeks of injury (see Appendix 4: Baseline questionnaire), then
six, 12 and 24 months questionnaires were collected by post or telephone (see Appendix 4: 6, 12 and 24 month follow up questionnaires).

The two qualitative studies were designed, firstly to inform the compensation related data collection for the prospective study and secondly, to provide a more nuanced understanding of the impact of seeking financial compensation following motor vehicle related trauma in NSW. The study methodology was based on a grounded theory approach.(104, 105) Hence, purposeful sampling technique was employed to gain access to injured people following motor vehicle related trauma that is: those with moderate-severe injuries both compensable and non-compensable at Liverpool Hospital, and those with minor compensable injuries via the SIRA claims database.

The benefit of this sequential mixed methods (quantitative and qualitative) approach allowed for a robust and comprehensive analysis of the impact of seeking financial compensation on injury recovery. Qualitative approaches – considering individual experiences of injury recovery including that of the claims process, and quantitative approaches – measuring study factors and outcomes of a larger cohort, to provide a detailed examination of the two compensation schemes (NSW CTP and WC).

Definitions

Due to the ambiguity in measuring compensation related factors and to assist with the interpretation of these factors pertaining to this thesis, the following definitions are provided:

- At fault: self-reported driver considered him/herself as causing the motor vehicle crash
• Compensation status: self-reported making or lodging a claim regardless of whether or not the claim has been accepted
• Claim type: a claim made or lodged under a specific jurisdiction (e.g. CTP or WC)
• Claim acceptance: liability has been determined and a claim is accepted
• Eligibility: permitted to make a claim under the governing legislation
• Financial entitlement: guaranteed access to a particular benefit by legislation
• Legal representation: self-reported seeking or retaining legal representation
• Litigation: to prosecute or defend a lawsuit in court

Aims for each Chapter

The structure of this thesis generally has a chronological approach and each chapter provides context for the next topic. As stated previously, the main aim of this thesis is to explore the impact of financial compensation on injury recovery following motor vehicle related orthopaedic trauma. In addition, an overview is provided in the form of a flow chart (see Figure 1) to outline key aspects of the thesis and a conceptual framework.

Chapter 1
The introduction provides a background to the thesis and sets the scene for the following chapters.

Chapter 2
The systematic review is designed to tease apart which specific compensation related factors are or are not associated with specific health outcomes. The aim is to:
• identify associations between compensation related factors and health outcomes following musculoskeletal injury from prognostic and/or intervention studies.

The specific aims of each section (Chapters 3-8) are listed below:

Chapter 3

Chapter 3 involves a study using qualitative research methods to examine how compensation systems may or may not impact on recovery in a group with moderate-severe orthopaedic injuries. This study was designed to inform how compensation related factors would be collected in the inception cohort study. The aims are to:

• explore factors that influence recovery from serious injuries sustained in motor vehicle crashes including whether there would be differences between people with compensable and non-compensable injuries; and
• investigate the factors involved in the claims and legal processes that might affect outcomes, in those patients’ eligible for compensation.

Chapter 4

Chapter 4 has similar aims to Chapter 3, also using qualitative methods, but this study involved only compensable participants with minor injuries. The aims are to explore:

• people’s perceptions and experiences of the claims process after sustaining a compensable injury in a motor vehicle crash;
• why people sought legal representation; and
• how people can be assisted following a compensable injury and their experience with the claims process improved.
Chapter 5
Chapter 5 is the first paper of the inception cohort study. Prior to reporting on return to work and injury recovery outcomes, it is pertinent to consider whether there are any factors associated with claiming financial compensation and seeking legal representation. The aim is to:

- investigate the predictors of seeking financial compensation, namely making a claim and seeking legal representation, following motor vehicle related orthopaedic trauma.

Chapter 6
Chapter 6 uses the cohort study to explore the association between individual worker and injury characteristics, compensation related factors, and return to work over time. Of particular interest are predictors that could be amenable to change. Thus, the aim is to:

- determine the predictors (including compensation related factors) of time to RTW.

Chapter 7
Chapter 7 illustrates the impact of compensation status (i.e. making a claim) on injury recovery specifically physical and mental health status, PTSD, and Global Rating of Change (GRC) over time at six, 12 and 24 months. The aim is to:

- investigate the influence of seeking financial compensation (i.e. making a claim) on injury recovery following motor vehicle related moderate-severe orthopaedic trauma.

Chapter 8
Initially, the discussion summarises the main findings from each Chapter, followed by delivering several key messages. Implications are described to provide opportunities for future research, strategies to address adversarial scheme policy and design, and interventions
that could improve injury recovery in a compensable environment. Finally, concluding statements are presented.

Figure 1: Thesis conceptual framework

Existing knowledge
Disparate evidence about the influence of compensation related factors on injury recovery

Quantitative research
An inception cohort study to investigate the impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma with two year follow up

Existing knowledge
Limited granularity of evidence for compensation related factors

Qualitative research
A series of focus groups to investigate what aspects of the claims and legal process impact on injury recovery
Inform compensation related data collection items for inception cohort study at 1 and 2 year follow up

Systematic review
To identify any associations between specific compensation related factors and specific health outcomes following musculoskeletal injury

Interpretation
Results from quantitative and qualitative research, and systematic review add to existing evidence
Discussion presents an analysis of research evidence with recommendations for compensation scheme design and public health policy
References


77. Bradley C Harrison J. Descriptive epidemiology of traumatic fractures in Australia. Injury Research and Statistics Series Number 17 Adelaide: AIHW (AIHW cat no. INJCAT


Chapter 2: The Effect of Financial Compensation on Health Outcomes Following Musculoskeletal Injury: A Systematic Review

Journal Article 1

The systematic review is designed to tease apart which specific compensation related factors are or are not associated with specific health outcomes. The aim is to:

- identify associations between compensation related factors and health outcomes following musculoskeletal injury from prognostic and/or intervention studies.

This chapter is reprinted from:

Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper “The Effect of Financial Compensation on Health Outcomes following Musculoskeletal Injury: Systematic Review”, we confirm that Darnel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Analysis and data synthesis
- Manuscript preparation and critical review

Petrina Casey
Signed: .................................................................
Date: 23/11/15

Professor Ian Cameron
Signed: .................................................................
Date: 23/11/15

Professor Ian Harris
Signed: .................................................................
Date: 23/11/15

This paper has been published as:

RESEARCH ARTICLE

The Effect of Financial Compensation on Health Outcomes following Musculoskeletal Injury: Systematic Review

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Abstract

The effect of financial compensation on health outcomes following musculoskeletal injury requires further exploration because results to date are varied and controversial. This systematic review identifies compensation related factors associated with poorer health outcomes following musculoskeletal injury. Searches were conducted using electronic medical journal databases (Medline, CINAHL, Embase, Informit, Web of Science) for prospective studies published up to October 2012. Selection criteria included: prognostic factors associated with validated health outcomes; six or more months follow up; and multivariate statistical analysis. Studies solely measuring return to work outcomes were excluded. Twenty nine articles were synthesised and then assessed using GRADE (Grading of Recommendations Assessment, Development and Evaluation) methodology to determine evidence levels. The results were mixed. There was strong evidence of an association between compensation status and poorer psychological function; and legal representation and poorer physical function. There was moderate evidence of an association between compensation status and poorer psychological function; and legal representation and poorer psychological function. There was limited evidence of an association between compensation status and increased pain. In seven studies the association depended on the outcome measured. No studies reported an association between compensation related factors and improved health outcomes. Further research is needed to find plausible reasons why compensation related factors are associated with poorer health following musculoskeletal injury.

Introduction

Injury is a leading cause of disability worldwide and musculoskeletal injuries commonly occur within compensation systems for road traffic crashes and work place incidents [1, 2]. In previous studies associations have been found between: legal representation and poor general health, and greater disability [3, 4]; litigation and psychological distress [5]; legislative change and increased pain [6, 7]; and claim lodgement and poor general health [8, 9].
Identifying predictors of poor health outcomes following injury provides valuable information for risk assessments, targeted interventions, policy initiatives and future research to improve recovery. Furthermore, determining whether compensation related factors are associated with specific health outcomes particularly those including the constructs of pain, disability, physical and mental health is important given the prevalence of injury, societal concern with ongoing disability, and associated costs. Therefore, we considered a comprehensive literature review was required to determine whether the association between compensation related factors and poorer health outcomes is reported across a wide range of musculoskeletal injuries, prognostic factors and health related outcomes.

Compensation systems operate in a highly contextual environment. Policy relevant research that provides information to assist scheme administrators, regulators and researchers to promote injury recovery and improve scheme efficiency has merit, particularly if the association between a compensation related factor and health outcome is shown to be modifiable [10].

In previous studies, compensation tends to be classified as a single variable, rather than exploring separate elements of compensation such as scheme design, claim duration or legal representation. Further, compensation is not usually the primary focus of studies investigating injury recovery [11–13]. To the authors’ knowledge five reviews have focused on the association of compensation with poorer health following injury [15–18]. These reviews have disparate injury groups such as road trauma, post-surgery, traumatic brain injury, and whiplash. Health outcomes are also clustered under the umbrella of mental health, satisfaction, general health and disability. Most of these reviews conclude that compensation related factors are associated with poorer health [15–17], whilst one review cited reverse causality bias as a methodological issue (i.e. does exposure to compensation lead people to poorer health or does poorer health lead people to claim compensation) [18]. Another meta-review outlined additional biases including poor quality primary studies, use of proxy health outcomes and the heterogeneous nature of compensation related factors [19]. None evaluated the evidence by categorising compensation related factors and outcomes. Therefore, based on these reviews it is difficult to determine which compensation related factors are potentially associated with particular outcomes following injury.

Accordingly, the aims of this review are to identify associations between compensation related factors and health outcomes following musculoskeletal injury from prognostic and/or intervention studies. In this context, compensation related factors are those associated with compensable personal injury insurance schemes, including between or within scheme comparisons such as claim type or fault versus no fault.

Methods

We conducted a systematic review of prospective studies that investigated predictors of health outcomes following musculoskeletal injury in subjects exposed to a compensation related factor with an unexposed comparison group. The study aims and selection criteria were developed a priori.

The review included studies published in any language. The selection criteria were:

Inclusion and exclusion criteria

Inclusion criteria were:

- prospective study design;
- follow-up period of at least six months;
- musculoskeletal injury of any type (if mixed aetiology, the majority of participants has sustained a musculoskeletal injury);
• at least 18 years of age (for majority of participants);
• study aimed to determine prognostic factors associated with an outcome, or to assess the effect of an intervention with compensation related factors included as covariates;
• measurement of one or more compensation related factors associated with an outcome;
• at least one validated health related outcome measure was reported; and
• inclusion of a predictive model with multivariate statistical analysis.

Exclusion criteria were:
• participants with dementia or significant pre-existing cognitive impairments;
• participants with a moderate or severe traumatic brain injury, spinal cord injury, psychological or other organ and body system injuries;
• studies involving only children; and
• studies where the only outcome assessed is return to work with no other validated health related outcome.

Due to the diverse injury definitions, three approaches were used: definition and context (mechanism or insidious onset); diagnosis; and/or duration (acute or chronic). Only prospective studies were included to reduce the risk of bias [20]. A follow up period of six months was given to allow for injury recovery. Return to work was excluded because there is no standardised measure although it is recognised that return to work is correlated with health status.

Search strategy
Searches were conducted using Medline, CINAHL, Embase, Informit and Web of Science for studies published up to October 2012. Complete search strategies are available in **S1 Appendix**. The strategy was based on recommended guidelines to maximise search sensitivity [21]. Key elements involved exploding terms related to cohort studies, compensation and musculoskeletal injury. MeSH headings and text words were used in conjunction with Boolean operators and wildcards. For Informit health, law and social science subjects with key words (compensation, health and outcome) were used. Web of Science and Informit provided access to grey literature.

A medical librarian was consulted to assist in developing the search strategies, which were reviewed by the authors.

Articles were initially screened by two authors (DM and PC) based on title and abstract. The full text of short listed papers was retrieved. Three investigators (DM, PC and IM) conducted a two stage screening process with two authors reviewing all papers in the second stage. Articles were not excluded based on methodological quality: this was taken into account in the quality assessment.

Data extraction, quality assessment and synthesis
The characteristics of each study were tabulated to address the aims of the review [22-24]. Statistical information, including reported effect sizes, for all compensation related factors associated with outcome(s) was recorded. Associations were considered significant if the 95% confidence intervals of the odds, hazard or relative risk ratios did not include 1 and/or the p-value was less than 0.05. Compensation related factors were categorised as follows:
• compensation (Yes/No)—having an open claim or having made a claim versus no open claim or no claim made;
- lawyer involved (Yes/No)—having sought or obtained legal representation versus having none;
- claim type—having an open claim or having made a claim under a specific scheme jurisdiction (Workers Compensation (WC), traffic injury (including Compulsory Third Party (CTP)), public health coverage, private health insurance, other (such as disability insurance, public liability, victims compensation));
- number of sick days in prior three years;
- prior claim (Yes/No);
- fault (Yes/No)—making a claim under tort (fault) or no fault insurance arrangements; and
- compensation at two years (Yes/No)—whether the claim was open or closed/settled at two years.

Outcomes were categorised based on measurement constructs. Similar classifications have been used in previous publications [12, 13, 25]. The categories were:
- physical function—generic and specific measures including recovery and disability, and physical health components of health related quality of life measures;
- psychological function—diagnostic based measures and mental health components of health related quality of life measures; and
- pain.

Unlike intervention studies there is no agreed quality assessment methodology for systematic reviews of prognostic studies [24, 26–28]. However, there is some guidance on assessing study quality and risk of bias [21–23, 26, 27, 29]. Aspects such as scoring remain controversial, especially for assessing the effect size of an intervention [23, 30–32]. For pragmatic purposes and to provide a meaningful conclusion we followed the methodology used in similar prognostic systematic reviews where a summary score was used [11, 14].

The quality assessment criteria address six areas of potential bias: study participation; study attrition; prognostic factor measurement; outcome measurement; confounding measurement; and analysis [23]. Each criterion in Table 1 specifies a bias and is assigned "Yes" or "No" with "Yes" scores being totalled (maximum score is 18). Further details are available in S2 Appendix. All papers were reviewed by two authors (DM and PC) independently. Discrepancies were resolved by consensus and/or consultation with two other authors (IC and IH). A score of 15 or over was deemed high quality, moderate quality was 12 to 14, and low was 11 or below. Although arbitrary, this division provided a fairly even distribution of scores and reflected the study quality.

Grading quality of evidence

Data analysis was based on recommendations from the GRADE (Grading of Recommendations Assessment, Development and Evaluation) working group. GRADE classifies strong, moderate and limited evidence based on: the number of papers; study design and quality; and the consistency and directness of results [26]. The levels are illustrated in Table 2. This methodology has been used in similar systematic reviews [11, 12, 14, 33]. Inconsistency or quality evidence refers to the negative effect of a factor in one study with a positive effect in another study regardless of study quality. For example if high quality studies showed findings in one direction and low quality studies in another; this would be considered inconsistent. In setting out this paper the authors referred to the PRISMA statement to ensure reference to all relevant reporting items [24].
Table 1. Quality assessment criteria.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Score</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Study provided clearly defined inclusion and exclusion criteria.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>The stage where initial measures were applied was clearly stated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>The study used representative sampling techniques.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>The setting and study site were clearly described.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prognostic factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Clearly defined constructs for what is measured were provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Justification of the measures used was given.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Standardised or validated measures were used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcome measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O1</td>
<td>Clearly defined constructs for what is measured were provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2</td>
<td>Justification of the measures used was given.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3</td>
<td>Standardised or validated measures were used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F1</td>
<td>The data was complete for at least 80% of the sample measured at baseline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>Clearly described loss to follow up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>There were no important differences between key characteristics and outcomes in participants who completed the study and those who did not</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>The analysis was sufficiently powered to test the study hypotheses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Multivariate techniques were used to adjust for potential confounding variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>Sufficient information was provided to determine that the appropriate multivariate technique was used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>Sufficient information was provided to interpret the results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>There was no selective reporting of results.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

do:10.1371/journal.pone.0117597.t001

Results

Study selection

The search results and study selection process are illustrated in Fig. 1. Initially, 391 papers were independently reviewed by one investigator (DM, PC or IM). Full texts of the remaining 89 papers were independently examined by two investigators (DM, PC or IM). Reasons for exclusions are explained in SI Appendix. In summary, they were: no predictive statistical model and/or multivariate analysis (n = 30); compensation related factor not measured as a predictor

Table 2. Levels of evidence.

<table>
<thead>
<tr>
<th>Evidence level</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong evidence</td>
<td>At least 2 high quality cohort studies with consistent results</td>
</tr>
<tr>
<td>Moderate evidence</td>
<td>At least 1 high quality cohort study or at least 2 moderate quality cohort studies with consistent results</td>
</tr>
<tr>
<td>Limited evidence</td>
<td>At least 1 moderate quality cohort study or 1 or more low quality cohorts with consistent results</td>
</tr>
<tr>
<td>Inconsistent evidence</td>
<td>Irrespective of study quality, inconsistent results</td>
</tr>
</tbody>
</table>

do:10.1371/journal.pone.0117597.t002
Search Results: (n=4079)
  Medicine: (n=2606)
  Case: (n=262)
  Enduro: (n=713)
  Web of Science: InMScrit: (n=190)

Duplicates removed (n=275)

Excluded on the basis of title/abstract (n=2032)

Excluded following review: (n=382)
  Retrospective and/or non cohort studies
  Not measured return to usual
  No validated health outcome
  Compensation only cohorts without an unexposed comparison group

Excluded following review (n=59), see Appendix 3 for reasons

Included: (n=30)
  Method independently reviewed by 2 reviewers (OSA and FO)

Hand searching of reference lists identified (n=3)
  Personal communication with experts (n=2)

Excluded: (n=12)
  Overlapping cohorts following agreement by authors (n=6), see text for reason

Final paper included in the review for qualitative assessment and scoring (n=29)

Fig 1. Retrieval of studies for the systematic review.

(n = 15): retrospective studies (n = 22): compensation only cohort without additional compensation related factor for comparison (n = 4); no validated health outcome (n = 9); and/or majority of cohort without musculoskeletal injuries (n = 2). Often "prospectively collected data" were used but the study hypothesis and design were initiated post hoc after routine baseline data collection during the follow up period; these were by definition retrospective. Hand
searching of reference lists and personal communication with experts minimized the potential for missing papers. Ultimately, 29 papers met the inclusion criteria.

In addition, ten papers reported results from overlapping cohorts. Only one paper from each cohort was included to avoid over-representation of one population by taking into account: the range of compensation related factors and outcomes measured; injury type/s; sample size; and study quality. The studies all measured compensation status [4, 8, 9, 34–40] but the included ones measured a greater range of outcomes and/or with more applicable and comprehensive results [4, 9, 35, 36].

Quality assessment
Following independent assessment, two authors (DM and PC) scored in agreement 91% of the time for each criterion. To resolve discrepancies: reasons for individual scores; consistent criterion interpretation; test explanations; and other referenced papers were considered. Areas of disagreement were: study participation—potential baseline measurement error and poor representative sampling (criteria S2, S3); and prognosis factor and outcome measurement—inadequate justification for each measure (criteria P2, O2). The grading of the evidence was primarily conducted by the first author (DM) with consensus review by the remaining authors (PC, IC and IH).

There were seven papers referred to other authors (IC and IH) to reach consensus. Those were intervention studies, and/or had complex statistical analysis [41–47]. Statistical pooling was not possible due to heterogeneity of compensation related factors and outcome definitions including constructs, and follow up time periods.

Overall, 11 studies rated as high quality, 10 as moderate and eight as low. Complete scoring can be obtained from the first author.

Summary of included studies
Key study characteristics are illustrated in Table 3. Of the 29 included studies 13 were from a primary care setting or surgical clinic and 10 involved hospital recruitment. Several included both settings [44, 45, 48]. A further three recruited via administrative databases [43, 49, 50]. Injury definitions were often incomplete. Acute trauma with a hospital inception source were best described, with baseline data often collected within two weeks [3, 4, 9, 35, 44, 45, 48, 51–53]; Soft tissue injuries with an outpatient inception source were not always clearly documented [42, 47, 54–57]. Furthermore, even if the inception time was stated it was not always obvious when baseline measures were conducted [46, 47, 58, 59]. This was taken into account in the quality assessment (criteria S1, S2). However, if researchers had followed their own criteria it was difficult not to score this positively. Scores are shown in Table 4.

Sample size ranged from 65 to 3,323 [43, 45]. Age range was not always explicit. In 19 studies the starting age was 14–18 years, whilst in 10 studies no range was stated or it was ambiguous. There were 13 intervention studies, seven surgical and the remaining offering rehabilitation or physiotherapy services.

Follow up was a minimum of six months and a maximum of 10 years [46], the majority (15/29) being 12 months. Loss to follow up ranged from 0% to 52% from baseline [43, 45]; this was difficult to interpret because the periods varied and/or were not reported for each outcome. Only 14 studies achieved less than 20% attrition. Most studies (n = 23) did not account for missing data but recorded loss to follow up (criterion F2). In 22 studies there was a significant difference in baseline variables between participants and those lost to follow up, or it was not explained. This was the lowest scoring criterion (F3).
Table 3. Characteristics of included studies.

<table>
<thead>
<tr>
<th>First Author</th>
<th>Country</th>
<th>Inception Source and Time</th>
<th>Injury</th>
<th>Baseline Sample Size</th>
<th>Age Range (Years)*</th>
<th>Follow Up Periods*</th>
<th>Intervention</th>
<th>Significant Covariates in multivariate analysis with outcomes extracted, p&lt;.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amerasinghe [52]</td>
<td>New Zealand</td>
<td>Emergency/ hospital, Medical 2.7 days</td>
<td>Nek (chronic neck pain)</td>
<td>388</td>
<td>&gt;16</td>
<td>5, 18 months</td>
<td>N/A</td>
<td>Psychological symptoms at 5 months</td>
</tr>
<tr>
<td>Anderson [55]</td>
<td>USA</td>
<td>Surgical clinic, &gt; 6 months</td>
<td>Lower Back Pain</td>
<td>105</td>
<td>Working age</td>
<td>3.6, 12, 24 months</td>
<td>Lumbar interbody fusion</td>
<td>Pre-operative work status</td>
</tr>
<tr>
<td>Asch [56]</td>
<td>USA</td>
<td>Surgical clinic, referral following weeks or months of conservative treatment</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>212</td>
<td>18-75</td>
<td>6 Weeks, 6, 12 months</td>
<td>Outpatient lumbar microdiscectomy</td>
<td>Age</td>
</tr>
<tr>
<td>Atlas [46]</td>
<td>USA</td>
<td>Surgical clinic, &lt; 6 months</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>507</td>
<td>Mean 42.2 in 3.6, 12 months, then yearly through 10 years</td>
<td>Lumbar discectomy versus non-operative treatment</td>
<td>Education status, marital status, abdominal findings at physical examination, high initial pain, general health</td>
<td></td>
</tr>
<tr>
<td>Atlas [47]</td>
<td>USA</td>
<td>Surgical clinic, &gt; 6 weeks</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>924</td>
<td>Mean 40.7 in 12, 24 months</td>
<td>Open discectomy versus non-operative treatment</td>
<td>Age, gender, ethnicity, marital status, work status, BMI, smoking status, joint disorders or migraines, neurologic deficit, herniation levels (type, location, level), baseline global QoL score, baseline outcome score, self-rated health</td>
<td></td>
</tr>
<tr>
<td>Balogh [52]</td>
<td>Canada</td>
<td>Surgical clinic, not stated</td>
<td>Shoulder (rotator cuff tear)</td>
<td>141</td>
<td>Mean 54</td>
<td>3, 6 months</td>
<td>Rotator cuff repair, plus 6 weeks physical therapy, 2 weeks, self-exercise program</td>
<td>Initial physical function, smoking status</td>
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<tr>
<td>Bendix [52]</td>
<td>Denmark</td>
<td>Primary care, &gt; 6 months</td>
<td>Lower Back Pain</td>
<td>816</td>
<td>Mean 49 in 18-51, 12 months</td>
<td>Functional restoration program—physical exercise, psychological counseling, patient education</td>
<td>Physically demanding job, high initial pain, activities of daily living</td>
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<tr>
<td>Bosse [51]</td>
<td>USA</td>
<td>Emergency/ hospital, prior to hospital discharge</td>
<td>Lower extremity (high energy trauma below the distal femur)</td>
<td>545</td>
<td>16-69</td>
<td>3, 6, 12, 24 months</td>
<td>Reconstructive versus amputation</td>
<td>Major complication, education status, race, health insurance, smoking status, self efficacy, low social support</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>First Author</th>
<th>Country</th>
<th>Inception Source and Time</th>
<th>Injury</th>
<th>Baseline Sample Size</th>
<th>Age Range (Years)</th>
<th>Follow Up Periods</th>
<th>Intervention</th>
<th>Significant Covariates in multivariate analysis with outcomes extracted, p &lt; .05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buckley [58]</td>
<td>Canada</td>
<td>Emergency/hospital, &lt; 2 weeks</td>
<td>Foot/heel (displaced intra-articular calcaneal fracture)</td>
<td>424</td>
<td>15–68</td>
<td>2–4, 6 weeks, 3, 6, 12, 24 months</td>
<td>Open Reduction Internal Fixation ORIF versus non-operative treatment</td>
<td>Bother angle of 15–36 degrees, no subsequent orthodontics, unilateral injury</td>
</tr>
<tr>
<td>Cassidy [49]</td>
<td>Canada</td>
<td>Insurance database, &lt; 1 month</td>
<td>Lower Back Pain</td>
<td>3232</td>
<td>&gt;16, Mean 33.9*</td>
<td>6 weeks, 4, 8 and 12 months (prognostic model at claim closure—longest 3.8 years)</td>
<td>N/A</td>
<td>Age, female gender, marriage status, high initial pain intensity, extreme numbness, concentration problems, poorer health, healthcare provider involvement</td>
</tr>
<tr>
<td>Clay [53]</td>
<td>Australia</td>
<td>Emergency/hospital, &lt; 2 weeks</td>
<td>Multiple (acute orthopaedic trauma, predominantly upper and lower extremity)</td>
<td>168</td>
<td>18–64</td>
<td>6 months</td>
<td>N/A</td>
<td>Age, high initial pain intensity, psychological distress, external attributions of responsibility for the injury, being injured at work, lower extremity injury</td>
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<tr>
<td>Ehlers [50]</td>
<td>England</td>
<td>Emergency/hospital, &lt; 8 days</td>
<td>Multiple (soft tissue injury and bony injury)</td>
<td>907</td>
<td>17–69</td>
<td>3, 12 months</td>
<td>N/A</td>
<td>Admission to hospital, medical or financial problems at 3 months, prior emotional problems, psychosocial factors, interpretation of intrusive, nummation</td>
</tr>
<tr>
<td>Gun [48]</td>
<td>Australia</td>
<td>Emergency/hospital/primary care, &lt; 6 weeks</td>
<td>Neck (whiplash)</td>
<td>147</td>
<td>Mean 35.6</td>
<td>12 months</td>
<td>N/A</td>
<td>Age, high initial pain, mental health at baseline, treated by a physiotherapist or chiropractor</td>
</tr>
<tr>
<td>Hacker [41]</td>
<td>USA</td>
<td>Primary care, &lt; 10 weeks</td>
<td>Lower Back (acute backache)</td>
<td>1366</td>
<td>Mean 49.6*</td>
<td>2, 4, 8, 12, 24 months</td>
<td>N/A</td>
<td>Duration of illness, presence of sciatica, Roland Morris score difference at baseline of &gt; 10 points, annual income &gt; $20,000, education status</td>
</tr>
</tbody>
</table>
Table 3. (Continued)

<table>
<thead>
<tr>
<th>First Author</th>
<th>Country</th>
<th>Inception Source and Time</th>
<th>Injury</th>
<th>Baseline Sample Size</th>
<th>Age Range (Years)</th>
<th>Follow Up Periods</th>
<th>Intervention</th>
<th>Significant Covariates in multivariate analysis with outcomes extracted, p &lt; .05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harris [4]</td>
<td>Australia</td>
<td>Emergency/hospital, &lt; 1 week</td>
<td>Multiple (upper/lower limb, pelvic, patella, tarsus, calcaneal fracture)</td>
<td>306</td>
<td>18–85</td>
<td>6 months</td>
<td>N/A</td>
<td>Age, gender, more than 1 fracture, annual income &gt; $30,000</td>
</tr>
<tr>
<td>Hendriks [52]</td>
<td>The Netherlands</td>
<td>Primary care, &lt; 2 weeks</td>
<td>Neck (whiplash)</td>
<td>125</td>
<td>18–55, Mean 43.1</td>
<td>12 months</td>
<td>Physiotherapy (education, advice, guided activity, exercise therapy), versus GP care (education, advice)</td>
<td>Gender, education status, high initial pain intensity, work activities, somatisation</td>
</tr>
<tr>
<td>Henschke [61]</td>
<td>Australia</td>
<td>Primary care, 24 hours—2 weeks</td>
<td>Lower Back Pain</td>
<td>969</td>
<td>&gt; 14, Mean 43.3</td>
<td>6 weeks, 3, 12 months</td>
<td>N/A</td>
<td>Age, initial pain intensity, feelings of depression, risk of persistence, days of reduced activity due to pain, duration of episodes</td>
</tr>
<tr>
<td>Jensen [53]</td>
<td>Denmark</td>
<td>Primary care, 4–12 weeks</td>
<td>Lower Back Pain</td>
<td>325</td>
<td>16–60</td>
<td>12 months</td>
<td>Brief intervention versus Multidisciplinary intervention</td>
<td>High initial pain intensity, duration of pain, fear avoidance, worrying and health anxiety, low level exercise, in leisure time, forward flexion</td>
</tr>
<tr>
<td>Kastbelski [59]</td>
<td>USA</td>
<td>Emergency/hospital, not stated</td>
<td>Finger (isolated finger injury)</td>
<td>98</td>
<td>&gt; 18, Mean 42</td>
<td>6 months</td>
<td>N/A</td>
<td>Pain, mental health, additional surgery</td>
</tr>
<tr>
<td>Littleton [6]</td>
<td>Australia</td>
<td>Emergency/hospital, &lt; 1 week</td>
<td>Multiple (musculoskeletal injury)</td>
<td>95</td>
<td>18–70, Mean 43.7</td>
<td>6, 12 months</td>
<td>N/A</td>
<td>Age, anxiety, mental health, female gender</td>
</tr>
<tr>
<td>MacDermid [60]</td>
<td>Canada</td>
<td>Surgical clinic, not stated</td>
<td>Wrist (distal radial fracture)</td>
<td>120</td>
<td>Mean 52</td>
<td>6 months</td>
<td>Surgical (closed reduction, ORIF, ORIF with bone graft and non-surgical intervention)</td>
<td>Education status, pre-reduction radial shortening</td>
</tr>
<tr>
<td>Mack [61]</td>
<td>USA</td>
<td>Emergency/hospital, admission or within 12 hours of transfer from another hospital</td>
<td>Lower extremity fracture</td>
<td>444</td>
<td>18–63</td>
<td>3, 6, 12 months</td>
<td>N/A</td>
<td>Percentage impairment, high pain score, preinjury GIP score, being poor, low social support</td>
</tr>
<tr>
<td>Poberskin [60]</td>
<td>England</td>
<td>Police database, &lt; 2 weeks</td>
<td>Neck (whiplash)</td>
<td>391</td>
<td>&gt; 18, Median 43</td>
<td>6, 12, 24 months</td>
<td>N/A</td>
<td>Initial pain score, trucker's car, stationary, initial pain intensity, duration of pain</td>
</tr>
</tbody>
</table>

(Continued)
Table 3. (Continued)

| First Author | Country | Inception Source and Time | Injury or Lower Back Pain | Baseline Sample Size | Age Range (Years)a | Follow Up Periodsb | Intervention | Significant Covariates in multivariate analysis with outcomes extracted, p < .05 |
|---------------|---------|----------------------------|---------------------------|----------------------|-------------------|-------------------|-------------|-------------------------------------------------------------------------------------------------
| Rasmussen     | Denmark | Primary care, 4–12 weeks   | Neck or Lower Back Pain   | 1446                 | Mean 46 ± 14      | 12 months         | Physiotherapy—exercise, McKenzie method and cognitive principles | High initial pain intensity, pain duration, initial level of disability |
| Rebeck        | Australia| Insurance database, < 3 months | Neck (whiplash) | 250                  | >16, Mean 39.4    | 6, 24 months      | N/A         | Initial disability level |  
| Shamsa        | USA     | Primary care, acute < 7 weeks, chronic ≥ 7 weeks | Lower Back Pain | 2872                 | >16, Mean 59.8 ± 14 | 3, 12, 24 months | Chiropractor (DC) and Medical doctors (MD) | Age, high initial pain severity, physical health |
| Sterling      | Australia| Emergency/hospital/ primary care, < 1 month | Neck (whiplash) | 65                   | Mean 36.27        | 2, 3, 6 months, 2–3 years | N/A | Age, initial disability levels, cold pain threshold |  
| Sterling      | Australia| Emergency/hospital/ primary care, < 1 month | Neck (whiplash) | 155                  | Mean 38.9         | 1, 3, 12 months | N/A | No other predictors in this model. Group-based trajectory analytical technique used |  
| Yang          | Australia| Emergency/hospital, on admission to hospital | Multiple (predominantly traumatic thoracic and lumbar vertebral body fractures) | 344                  | >16, Median 38    | 12 months          | N/A | Age, female gender, injury cause, education status, pre injury disability, injury mechanism, diagnosis and management |  

aMean age of majority group shown (applies if there was an intervention group or two groups i.e. compensation versus no compensation).
bBold in follow up column is the follow up timeframe used for outcomes extracted.

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Summary of compensation related factors

The studies were mostly from the United States of America (nine studies including 16 states) and Australia (nine studies from five states). There were four Canadian studies from five provinces, three Danish, two English, and one each from New Zealand and The Netherlands. The compensation schemes were predominantly WC (11/29) or a combination of WC and road traffic injury schemes (6/29). Only five studies were a road traffic injury scheme alone and one paper was for a universal accident compensation scheme. In six studies it was not stated.

A description of compensation related factors and outcomes including statistics are shown in Table 4. The most common prognostic factor was compensable status (compensation Y/N) measured in 22 studies followed by legal representation (lawyer involved Y/N) measured in six. Claim type was only measured distinctly three times. The least common measures were sick leave, fault and prior claim. Compensation at two years (Y/N) is more akin to claim duration than compensable status that is: making or having made a claim, therefore it was listed separately [39].
<table>
<thead>
<tr>
<th>First Author</th>
<th>Compensation Scheme</th>
<th>Quality Score</th>
<th>Injury</th>
<th>Compensation Factor</th>
<th>Outcome Measured</th>
<th>Association Reported</th>
<th>Results</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arendtunga</td>
<td>No fault universal government funded accident compensation scheme</td>
<td>0</td>
<td>Neck (chronic neck pain)</td>
<td>Compensation (yes/no): Workers' Compensation status at time of surgery</td>
<td>Pain. Describe pain/stiffness now (no discomfort, pain or stiffness/very uncomfortable/had to stop work or recreational activities)</td>
<td>No Association</td>
<td>Not Reported</td>
<td></td>
</tr>
<tr>
<td>Anderson</td>
<td>Workers' Compensation</td>
<td>12</td>
<td>Lower Back Pain</td>
<td>Compensation (yes/no): Workers' Compensation status at time of surgery</td>
<td>Physical function: Ability to carry out Activities of Daily Living (ADLs) Measured by 30% improvement Roland Morris Questionnaire</td>
<td>No Association</td>
<td>OR: 1.61, 95% CI: (0.58–4.39)</td>
<td>p = 0.35</td>
</tr>
<tr>
<td>Aich</td>
<td>Workers' Compensation</td>
<td>10</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>Compensation (yes/no): Workers' Compensation status at time of surgery</td>
<td>Pain: Measured by 30% improvement in Visual Analogue Pain Score (VAS)</td>
<td>No Association</td>
<td>OR: 2.07, 95% CI: (0.75–5.75)</td>
<td>p = 0.16</td>
</tr>
<tr>
<td>Atlas</td>
<td>Workers' Compensation</td>
<td>12</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>Compensation (yes/no): Receiving or applying for workers' compensation status at baseline</td>
<td>Pain: Improvement in predominant symptom (back or leg pain) measured by response to 'much better' or 'completely gone' on 7 point scale (regardless of having surgery or not)</td>
<td>Association</td>
<td>RR: 3.83, p &lt; 0.002</td>
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<tr>
<td>Atlas</td>
<td>Workers' Compensation</td>
<td>14</td>
<td>Lower Back (lumbar disc herniation)</td>
<td>Compensation (yes/no): Compensation status yes if 2 years which is the difference in mean change from baseline between surgical and non-surgical groups</td>
<td>Pain: Bodily Pain measured by SF36 (by treatment effect of 2 years which is the difference in mean change from baseline between surgical and non-surgical groups)</td>
<td>Association</td>
<td>Treatment Effect: 5.9, 95% CI: (-16.7–4.8)</td>
<td>p = 0.003</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>First Author</th>
<th>Compensation Scheme</th>
<th>Quality Score</th>
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<th>Outcome Measured</th>
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<th>Results</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical function.</td>
<td>Association</td>
<td>Treatment Effect: -0.2, 95% CI (-1.2, -0.3)</td>
<td>p = 0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shoulder (rotator cuff tear)</td>
<td></td>
<td></td>
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<tr>
<td>Dalyk (65)</td>
<td>Workmen’s Compensation</td>
<td>14</td>
<td>Shoulder (rotator cuff tear)</td>
<td>Compensation (yes/no)</td>
<td>Physical function.</td>
<td>Association</td>
<td>B = -1.4, 95% CI (-4.4, -3)</td>
<td>p = 0.002</td>
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<tr>
<td></td>
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<td></td>
<td>Shoulder pain and function measured by Western Ontario Rotator Cuff Index (WORC)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical function.</td>
<td>Association</td>
<td>B = -6.6 (SE 3.3)</td>
<td>p = 0.05</td>
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<tr>
<td></td>
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<td>Shoulder pain and function measured by American Shoulder and Elbow Surgeons questionnaire (ASES)</td>
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<tr>
<td>Benner (42)</td>
<td>Not Stated</td>
<td>5</td>
<td>Lower Back Pain</td>
<td>Number of sick leave days in prior 3 years</td>
<td>Pain. Change in back pain severity measured scale 0–10 (for functional restoration program group)</td>
<td>Association</td>
<td>B = -0.001</td>
<td>p = 0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pain. Change in back pain severity measured scale 0–10 (for control group)</td>
<td>Association</td>
<td>B = -0.001</td>
<td>p = 0.08</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Pain. Change in leg pain severity measured scale 0–10 (for functional restoration program group)</td>
<td>Association</td>
<td>B = -0.1</td>
<td>p = 0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pain. Change in leg pain severity measured scale 0–10 (for control group)</td>
<td>Association</td>
<td>B = -0.01</td>
<td>p = 0.04</td>
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</tr>
</thead>
<tbody>
<tr>
<td>Bosee [11]</td>
<td>Legal system involving injury compensation</td>
<td>17</td>
<td>Lower extremity injury (high-energy trauma, below the distal femur)</td>
<td>Lawyer involved (yes/no)</td>
<td>Physiological function. Functional Outcome measured by The Sickness Impact Profile (SIP) (measured by % difference in SIP)</td>
<td>Association</td>
<td>23.1%</td>
<td>p &lt; 0.01</td>
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<td></td>
<td>Physical function. Physical Health measured by the physical health sub-scale of The Sickness Impact Profile (SIP) (measured by % difference in physical health sub-score)</td>
<td>Association</td>
<td>17.7%</td>
<td>p &lt; 0.01</td>
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<tr>
<td></td>
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<td></td>
<td>Psychological function. Psychosocial Health measured by the psychosocial health sub-scale of The Sickness Impact Profile (SIP) (measured by % difference in psychosocial health sub-score)</td>
<td>Association</td>
<td>35%</td>
<td>p &lt; 0.01</td>
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</tr>
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<tbody>
<tr>
<td>Buckley [58]</td>
<td>Workers' Compensation</td>
<td>11</td>
<td>Foot (displaced intra-articular calcaneal fracture)</td>
<td>Compensation (yes/no)</td>
<td>Physical function, General Health</td>
<td>Odds Ratio: 4.06, 95% CI: 14.8–14.60</td>
<td>p = 0.06</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Pain (Satisfaction) measured by likely increase in the Visual Analogue Scale (VAS) (score above the mean) regardless of intervention</td>
<td>Odds Ratio: 6.12, 95% CI: 3.71–10.11</td>
<td>p = 0.06</td>
<td></td>
</tr>
<tr>
<td>Cassidy [43]</td>
<td>Compulsory Traffic Injury Scheme</td>
<td>16</td>
<td>Lower Back Pain</td>
<td>Fault (yes/no)</td>
<td>Physical function, Recovery in Tort Scheme</td>
<td>Hazard Ratio: 0.63, 95% CI: 0.53–0.75</td>
<td>p = 0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lawyer involved (yes/no)</td>
<td>Physical function, Recovery in Tort Scheme</td>
<td>Hazard Ratio: 0.63, 95% CI: 0.59–0.73</td>
<td>p = 0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>Physical function, Recovery in No-Fault Scheme</td>
<td>Hazard Ratio: 0.61, 95% CI: 0.47–0.71</td>
<td>p = 0.05</td>
<td></td>
</tr>
<tr>
<td>Clay [53]</td>
<td>Workers' Compensation, Compulsory Traffic Injury Scheme</td>
<td>17</td>
<td>Multiple (acute orthopaedic trauma, predominantly upper and lower extremity)</td>
<td>Compensation (yes/no)</td>
<td>Pain: Presence of pain (measured by answering yes to pain in previous week)</td>
<td>Odds Ratio: 0.35, 95% CI: 0.12–0.99</td>
<td>p = 0.049</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Pain: Severity of pain (measured by the short-form McIall Pain Questionnaire)</td>
<td>Not Association</td>
<td>p = 1.00</td>
<td></td>
</tr>
<tr>
<td>Ethiers [36]</td>
<td>Not Stated</td>
<td>17</td>
<td>Multiple (soft tissue injury and bony injury)</td>
<td>Compensation (yes/no)</td>
<td>Psychological function, Post Traumatic Stress Syndrome (PTSD)</td>
<td>Wilks Lambda: 0.29</td>
<td>p = 0.002</td>
<td></td>
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</table>

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</tr>
</thead>
<tbody>
<tr>
<td>Gun [40]</td>
<td>Workers' Compensation, Compulsory Traffic Injury Scheme</td>
<td>13</td>
<td>Neck (whiplash)</td>
<td>Prior Claim (yes/no)</td>
<td><strong>Physical function.</strong> Measured by Neck Pain Outcome Score</td>
<td>Wilcoxon Lambda = 0.23</td>
<td>B = -10.5</td>
<td>p &lt; 0.01</td>
</tr>
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<td></td>
<td>Lawyer evolved (yes/no)</td>
<td><strong>Physical function.</strong> Measured by Neck Pain Outcome Score</td>
<td></td>
<td>B = -7.1</td>
<td>p &lt; 0.01</td>
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<td></td>
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<td></td>
<td>Pain measured by Visual Analogue Pain Score (VAS)</td>
<td>No Association</td>
<td></td>
<td>B = -0.82</td>
<td>p &lt; 0.19</td>
</tr>
<tr>
<td>Hadler [41]</td>
<td>Workers' Compensation</td>
<td>10</td>
<td>Lower Back (acute backache)</td>
<td>Compensation (yes/no)</td>
<td><strong>Physical function.</strong> General Health (Well Being and function) measured by Time to return to level of work being enjoyed prior to this episode of back pain</td>
<td>HRR: 0.82, 95% CI (0.73–0.92)</td>
<td></td>
<td>p &lt; 0.001</td>
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<tr>
<td>Harris [4]</td>
<td>Workers' Compensation, Compulsory Traffic Injury Scheme</td>
<td>14</td>
<td>Multiple upper/lower limb, pelvis, patella, tibia, clavicular fracture</td>
<td>Lawyer evolved (yes/no)</td>
<td><strong>Physical function.</strong> Measured by change in mean PCS SF36 score</td>
<td>-7.63 (change in PCS score)</td>
<td></td>
<td>p &lt; 0.0001</td>
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<td></td>
<td>Compensation (yes/no)</td>
<td><strong>Physical function.</strong> Measured by change in mean SF36 PCS score</td>
<td>-7.68 (change in PCS score)</td>
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<td>p &lt; 0.0001</td>
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<td></td>
<td>Physical function. Measured by change in mean SF36 MOS score</td>
<td>No Association</td>
<td>Not Reported</td>
<td></td>
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<td>Psychological function. Measured by change in mean SF36 MOS score</td>
<td>No Association</td>
<td>Not Reported</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Claim type (worker's compensation, compulsory traffic injury scheme, other)</td>
<td>Physical function. Measured by change in mean SF36 PCS score</td>
<td>No Association</td>
<td>Not Reported</td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
Table 4. (Continued)

<table>
<thead>
<tr>
<th>First Author</th>
<th>Compensation Scheme</th>
<th>Quality Score</th>
<th>Injury</th>
<th>Compensation Factor</th>
<th>Outcome Measured</th>
<th>Association</th>
<th>Results</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hendricks</td>
<td>Not Stated</td>
<td>14</td>
<td>Neck (whiplash)</td>
<td>Claim type (private health insurance)</td>
<td>Physical function. Measured by Visual Analogue Pain Score (VAS) (0-100mm for neck pain intensity, 78mm for activities and no pain medication)</td>
<td>No Association</td>
<td>Not Reported</td>
<td></td>
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<tr>
<td>Hendrikse</td>
<td>Workers’ Compensation, Compulsory Traffic Injury Scheme</td>
<td>18</td>
<td>Lower Back Pain</td>
<td>Compensation (yes/no)</td>
<td>Physical function. Measured by: Recovery (pain free (0-3 points scale), without disability (5 point scale) and return to work sustained for a month for those working. For those not working the first two dimensions considered only</td>
<td>Association</td>
<td>HR: 0.59, 95% CI: (0.47-0.74)</td>
<td>p &lt; 0.001</td>
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<td>Jensen</td>
<td>Not Stated</td>
<td>15</td>
<td>Lower Back Pain</td>
<td>Compensation (yes/no)</td>
<td>Physical function. Measured by Roland Morris Questionnaire</td>
<td>Association</td>
<td>B = 0.82, 95% CI: (0.44-1.60)</td>
<td>p = 0.035</td>
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<td>Kasicielko</td>
<td>Workers’ Compensation</td>
<td>11</td>
<td>Finger (isolated finger injury)</td>
<td>Compensation (yes/no)</td>
<td>Physical function. Arm specific disability measured by the DASH</td>
<td>Association</td>
<td>p &lt; 0.001</td>
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<td></td>
<td>Physical function. Measured by SF36 PCS</td>
<td>No Association</td>
<td>Not Reported</td>
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<td></td>
<td>Psychological function. Measured by SF36 MCS</td>
<td>Association</td>
<td>p = 0.009</td>
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<thead>
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<th>Injury</th>
<th>Compensation Factor</th>
<th>Outcome Measured</th>
<th>Association Reported</th>
<th>Results</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Littleton et al. [6]</td>
<td>Compulsory Traffic Injury Scheme</td>
<td>17</td>
<td>Multiple (musculoskeletal injury)</td>
<td>Compensation (yes/no)</td>
<td>Physical function, Measured by SF-36 PCS score</td>
<td>Association B = -1.59, p = 0.09</td>
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<td>Psychological function, Measured by SF-36 MCS score</td>
<td>No, Not Reported</td>
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<td>Physical function, Measured by Functional Rating Index (FRI)</td>
<td>No, Not Reported</td>
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<td>Lawyer involved (yes/no)</td>
<td>Physical function, Measured by SF-36 PCS score</td>
<td>Association B = -6.46, p = 0.03</td>
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<td>Psychological function, Measured by Functional Rating Index (FRI)</td>
<td>Association</td>
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<tr>
<td>MacDermid [60]</td>
<td>Workers' Compensation and legal case relating to fracture</td>
<td>8</td>
<td>Wrist (distal radial fracture)</td>
<td>Compensation (yes/no)</td>
<td>Physical function, Pain and disability measured by the Patient Rated Wrist Evaluation (PRWE)</td>
<td>Association</td>
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<td>p = 0.05</td>
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<td>Compensation (yes/no) (workers' compensation or none)</td>
<td>Physical function, Measured by the Sickness Impact Profile (SIP)</td>
<td>Association</td>
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<tr>
<td></td>
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<td></td>
<td>Skeletal pain (self report of neck pain for at least 1 day)</td>
<td>Physical function, Measured by the Sickness Impact Profile (SIP)</td>
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<tr>
<td>Poberski et al. [60]</td>
<td>Not Stated</td>
<td>14</td>
<td>Neck (whiplash)</td>
<td>Compensation (yes/no)</td>
<td>Pain, Late Whiplash (self report of neck pain for at least 1 day)</td>
<td>Association OR: 4.05, 95% CI: (1.63-10.32)</td>
<td></td>
<td>p = 0.03</td>
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<tr>
<td>Rasmussen et al. [67]</td>
<td>Workers' Compensation, Disability Pension Scheme</td>
<td>10</td>
<td>Neck or Lower Back Pain</td>
<td>Compensation (yes/no)</td>
<td>Pain, Improved neck pain (measured by &gt; 30% improvement 0–10 box scale)</td>
<td>Association AOR: 17.4, 95% CI: (8.1–60.1)</td>
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<td>p &lt; 0.001</td>
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<td></td>
<td>Pain, Improved neck pain (measured by &gt; 30% improvement 0–10 box scale)</td>
<td>Association AOR: 4.2, 95% CI: (2.8–9.2)</td>
<td></td>
<td>p &lt; 0.001</td>
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<table>
<thead>
<tr>
<th>First Author</th>
<th>Compensation Scheme</th>
<th>Quality Score</th>
<th>Injury</th>
<th>Compensation Factor</th>
<th>Outcome Measured</th>
<th>Association Reported</th>
<th>Results</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Rebeck [49]</td>
<td>Compulsory Traffic Injury Scheme</td>
<td>15</td>
<td>Neck (whiplash)</td>
<td>Prior Claim (yes/no)</td>
<td>Physical function. Measured by the Cumberland Whiplash Outcome Measure (CROM)</td>
<td>No Association</td>
<td>B = -0.75</td>
<td>p = 0.48</td>
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<tr>
<td>Sharma [54]</td>
<td>Various Insurance Arrangements</td>
<td>12</td>
<td>Lower Back Pain</td>
<td>Claim type Self pay or workers' compensation insurance coverage</td>
<td>Pain. Improvement in Medical Doctor care patients (measured by baseline VAS minus VAS at follow-up)</td>
<td>No Association</td>
<td>B = -7.0, 95% CI (-17.4–3.4)</td>
<td>p = 0.185</td>
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<td>Pain. Improvement in Chiropractor care patients measured by baseline Visual Analog Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = -1.8, 95% CI (-2.9–6.5)</td>
<td>p = 0.488</td>
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<td>Pain. Improvement in Medical Doctor care patients measured by baseline Visual Analog Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = -13.6, 95% CI (-23.7–3.5)</td>
<td>p = 0.009</td>
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<td></td>
<td>Pain. Improvement in Chiropractor care patients measured by baseline Visual Analog Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = -4.2, 95% CI (-16.2–7.7)</td>
<td>p = 0.488</td>
</tr>
<tr>
<td>Self pay or traffic injury insurance</td>
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<td></td>
<td>Pain. Improvement in Medical Doctor care patients measured by baseline Visual Analog Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = -7.0, 95% CI (-24.6–3.7)</td>
<td>p = 0.149</td>
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<td></td>
<td>Pain. Improvement in Chiropractor care patients measured by baseline Visual Analog Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = -2.7, 95% CI (-10.9–5.8)</td>
<td>p = 0.516</td>
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</table>

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### Table 4. (Continued)

<table>
<thead>
<tr>
<th>First Author</th>
<th>Compensation Scheme</th>
<th>Quality Score</th>
<th>Injury</th>
<th>Compensation Factor</th>
<th>Outcome Measured</th>
<th>Association Reported</th>
<th>Results</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell pay or private insurance/Medicare</td>
<td>Pain improvement in Medical Doctor care patients measured by baseline Visual Analogous Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = 1.9, 95% CI (-1.06–6.2)</td>
<td>p = 0.547</td>
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<tr>
<td>Sell pay or other insurance</td>
<td>Pain improvement in Medical Doctor care patients measured by baseline Visual Analogous Pain Score (VAS) minus VAS at follow-up</td>
<td>No Association</td>
<td>B = 1.4, 95% CI (-1.2–4.0)</td>
<td>p = 0.288</td>
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<tr>
<td>Sterling [42]</td>
<td>Compulsory Traffic Injury Scheme</td>
<td>15</td>
<td>Neck (yes/no)</td>
<td>Compensation (yes/no)</td>
<td>Physical function. Measured by Neck Disability Index (NDI)</td>
<td>No Association</td>
<td>Estimate 0.07, Standard Error 0.01, 95% CI 0.79</td>
<td>p = 0.44</td>
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<tr>
<td>Sterling [44]</td>
<td>Compulsory Traffic Injury Scheme</td>
<td>13</td>
<td>Neck (yes/no)</td>
<td>Compensation (yes/no)</td>
<td>Physical function. Pain and disability in the moderate group measured by Neck Disability Index (NDI estimate)</td>
<td>Association</td>
<td>12.7 (7.1–19.2)</td>
<td>p &lt; 0.001</td>
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<td>Physical function. Pain and disability in the moderate group measured by Neck Disability Index (NDI estimate)</td>
<td>Association</td>
<td>28.0 (23.8–32.0)</td>
<td>p &lt; 0.001</td>
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<td></td>
<td>Physical function. Pain and disability in the chronic-severe group measured by Neck Disability Index (NDI estimate)</td>
<td>Association</td>
<td>38.2 (33.7–52.0)</td>
<td>p = 0.098</td>
</tr>
</tbody>
</table>
Overall, compensation related factors were measured simply. Some specific constructs such as fault versus no fault, eligibility, entitlements, and/or any restrictions to access entitlements were rarely mentioned. The interpretation of compensation status is potentially ambiguous and may depend on scheme design. Does it mean claim lodged or claim lodged and accepted? Furthermore, claim lodgement with or without claim acceptance and litigation (meaning legal
proceedings are underway) are separate factors [36]. Finally, baseline measures of compensation related factors are likely to vary. In certain schemes legal representation can be retained at any time and/or six to 12 months is given to lodge a claim [4, 9, 35, 44, 45, 53, 61]. The timing and duration of exposure to compensation related factors was usually not documented. However, scoring for criteria (P1–3) was inclusive of compensation related and other prognostic factors. The latter were generally well justified, standardised measures with defined constructs; hence many studies (20/29) attained full scores.

Summary of health related outcome measures
Generally, studies selected more than one relevant health related outcome. Pain was the most common (14/29) usually the Visual Analogue Scale (VAS) or Numerical Rating Scale (NRS), although pain is an intrinsic component in many measures. Health related quality of life measures, namely the Short Form Medical Outcomes Study Questionnaires (SF/36/12), were next in frequency (6/29). Otherwise, there was a mixture of disability/functional recovery measures such as the Roland Morris Disability Questionnaire (RMDQ), Sickness Impact Profile (SIP) or Neck Disability Index (NDI). In addition, Post Traumatic Stress Disorder (PTSD) questionnaires were used in two studies [36, 44].

Time to claim closure was used as a proxy health outcome in one study with other health and compensation related measures as predictors [43]. This study was included because time to claim closure represented a measure of recovery. Further, incorporating this study did not alter any conclusions. Taking into account the inclusion criteria of a 'validated health related outcome measure', most studies scored well (criteria O1–3) with 22/29 studies receiving full marks. Although two studies measured outcomes with face validity, rather than construct and/or criterion validity [50, 57].

Summary of other prognostic factors
Our search strategy was designed to only include studies that measured compensation related factors alongside other prognostic factors, therefore it was beyond the scope to report on all significant prognostic factors (these are listed in Table 3). Nevertheless, it is pertinent to provide some commentary.

The most common were socio-demographic factors such as age, gender, education and occupation, which often had conflicting associations across studies. This could be dependent on societal and population differences [4, 9, 35, 43, 49, 51, 52]. Factors that were frequently associated with poorer outcomes were: psychological such as depression, anxiety, and low self-efficacy [9, 48, 51, 53, 56, 61–63]; and high initial pain scores [3, 36, 41–43, 45, 46, 48, 50, 52–54, 57, 59, 61, 63].

Blame was a potential compensation related factor but it was described as 'external attribution of responsibility' or 'blaming' someone including themselves or work for their injury, which would not automatically mean access to compensation [4, 53, 64]. Hence, blame was excluded.

Summary of statistical analysis
All studies used a multivariate statistical model to adjust for confounding, and mostly (n = 22) the model was appropriate (criticism A3). Only seven papers received full scores for analysis (criteria A1–5) [3, 35, 36, 43, 47, 51, 61]. Many failed to provide an explanation of their power calculation [9, 42, 45, 49, 52, 55, 56, 62, 63]. On occasion this could be determined from sample size; number of variables in the multivariate model; and/or loss to follow up [41, 46, 48, 57, 65]. Limited explanations were often given for the final model (criteria A4, A5). For example:
which baseline variables were in the univariate analysis, significance level of each variable, and why variables were included/excluded [41, 42, 46, 52, 54-60, 62, 63]. In addition, not all studies reported measures of association and/or p-values [59, 60] especially when there was no association [4, 9, 35, 36, 47, 52, 62, 63]. Other studies mentioned significant results without reporting statistics; these were excluded [56, 61]. Relevant statistics are shown in Table 4.

Grading of evidence
The association between each compensation related factor and health outcome is presented in Table 5. There was either a negative association or no association between a compensation related factor and the outcome measured. There were no reported positive associations, that is no studies reported that compensation related factors were associated with improved health outcomes. The grades of evidence are determined with reference to Table 2.

A number of studies measured the association between two compensation related factors and an outcome in most cases one predictor was significant and the other not significant [4, 9, 48, 49, 51]. Compensation related factors have the potential to be highly correlated. One of main objectives of this review was to determine the effect of each compensation related factor independently on an outcome. To avoid collinearity the non-statistically significant predictors were not considered and excluded from Table 5. Furthermore, the association varied depending on the outcome measured in seven studies [9, 35, 44, 47, 53, 54, 59, 61]

Compensation related factors
Compensation status. The association between compensation status (Y/N) and poorer physical function was statistically significant in eleven studies (four high quality studies, three moderate quality studies and four low quality studies), and not statistically significant in seven studies (three high quality studies, three moderate quality studies and one low quality study).

The association between compensation status (Y/N) and poorer psychological function was statistically significant in four studies (two high quality studies, one moderate quality study and one low quality study). The association between compensation status (Y/N) and increased pain was statistically significant in eight studies (two high quality studies, three moderate quality studies and three low quality studies), and not statistically significant in four studies (two high quality studies, one moderate quality study and one low quality study).

Legal representation. The association between lawyer involved (Y/N) and poorer physical function was statistically significant in five studies (three high quality studies and two moderate quality studies), and not statistically significant in two studies (one high quality study and one moderate quality study). The association between lawyer involved (Y/N) and poorer psychological function was statistically significant in three studies (two high quality studies and one moderate quality study).

Other compensation related factors. The association between receiving compensation at two years and poorer physical function was statistically significant in one high quality study.

The association between number of sick days in the three years prior to injury and poorer physical function was statistically significant in one low quality study. The association between number of sick days in prior three years and increased pain was statistically significant in one low quality study.

The association between claim type (having a claim under a specific scheme jurisdiction) and poorer physical function was not statistically significant in one moderate quality study. The association between claim type and increased pain was statistically significant in one moderate quality study and not statistically significant in one moderate quality study.
<table>
<thead>
<tr>
<th>Compensation factor</th>
<th>Outcome</th>
<th>Associated with poor outcome</th>
<th>Quality of study</th>
<th>Net associated with an outcome</th>
<th>Quality of study</th>
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<tr>
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<td>Physical function</td>
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<tr>
<td></td>
<td>Henschke (Roosveld scale) [81]</td>
<td>High</td>
<td>Littlton (FRI) [9]</td>
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<td></td>
<td>Jensen (Roland Morris) [83]</td>
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<td>Sterling (ND) [44]</td>
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<td>Littlejohn (SF36, PCS) [8]</td>
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<td>Yang (Global outcome questions) [35]</td>
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<td>Mock (SP) [3]</td>
<td>High</td>
<td>Yang (SF12, PCS) [35]</td>
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<td></td>
<td>Baliys (WCHRC) [65]</td>
<td>Moderate</td>
<td>Anderson (Roland Morris) [53]</td>
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<td>Bolyk (AES) [85]</td>
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<td>Hendrikas (VAS) [82]</td>
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<td>Sterling (ND) [44]</td>
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<td>Kastriotski (SF36, PCS) [69]</td>
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<td>Buckley (SF36) [88]</td>
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<td>Hadler (return to wellbeing/function) [11]</td>
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<tr>
<td></td>
<td>MacDermid (PRIWBI) [60]</td>
<td>Low</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Ehlers (PTSD Severity, PSS) [36]</td>
<td>High</td>
<td>Ehlers (PTSD Diagnosis DSM-IV criteria) [36]</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yang (SF12, MCS) [83]</td>
<td>High</td>
<td></td>
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<tr>
<td></td>
<td>Kastriotski (SF36, MCS) [59]</td>
<td>Low</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Clay (presence of pain) [83]</td>
<td>High</td>
<td>Clay (McGill PC) [53]</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>Clay (Numerical Rating Scale) [35]</td>
<td>High</td>
<td>Jensen (LBP Rating Scale) [69]</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atlas (7-point scale) [46]</td>
<td>Moderate</td>
<td>Anderson (VAS) [65]</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atlas (SF36) [47]</td>
<td>Moderate</td>
<td>Amoranthanga (VAS) [62]</td>
<td>Low</td>
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<tr>
<td></td>
<td>Atlas (Sciatica Bittarsonse Index) [46]</td>
<td>Moderate</td>
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<tr>
<td></td>
<td>Pobeserskin (self report) [50]</td>
<td>Moderate</td>
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<tr>
<td></td>
<td>Aschi (VAS) [56]</td>
<td>Low</td>
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<tr>
<td></td>
<td>Buckley (VAS) [57]</td>
<td>Low</td>
<td></td>
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<tr>
<td></td>
<td>Rasmussen (0-10 pain improvement scale) [57]</td>
<td>Low</td>
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<tr>
<td>Lawyer involved (yes/no)</td>
<td>Physical function</td>
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<tr>
<td></td>
<td>Bossis (SP) [81]</td>
<td>High</td>
<td>Littlton (FRI) [9]</td>
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<td></td>
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<tr>
<td></td>
<td>Cassidy (Time to Claim Closure) [45]</td>
<td>High</td>
<td>Hendrikas (VAS) [82]</td>
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<td></td>
<td>Mock (SP) [5]</td>
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<tr>
<td>Psychological function</td>
<td>Gun (Neck Pain Outcome Score) [48]</td>
<td>Moderate</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Harris (SF36, PCS) [8]</td>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bossis (SPD, psychosocial health sub scale) [55]</td>
<td>High</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Littlton (SF36, MCS) [9]</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harris (SF36, MCS) [8]</td>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compensation at 2 years (yes/no)</td>
<td>Physical function</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Rebbenck (CFROM) [49]</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of sick days in prior 5 years</td>
<td>Physical function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bendix (LBP Rating Scale) [42]</td>
<td>Low</td>
<td></td>
<td></td>
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</tbody>
</table>

(Continued)
Table 5. (Continued)

<table>
<thead>
<tr>
<th>Compensation factor</th>
<th>Outcome</th>
<th>Associated with poor outcome</th>
<th>Quality of study</th>
<th>Not associated with an outcome</th>
<th>Quality of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>Box (0–10 Pain Scale) [42]</td>
<td>Low</td>
<td>Hendrikx (VAS) [32]</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Claim type</td>
<td>Physical function</td>
<td>Sharma (VAS – Medicaid or Self Pay) [54]</td>
<td>Moderate</td>
<td>Sharma (VAS – WC or Self Pay) [58]</td>
<td>Moderate</td>
</tr>
<tr>
<td>Prior claim (yes/no)</td>
<td>Physical function</td>
<td>Gun (Neck Pain Outcome Score) [46]</td>
<td>Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault (yes/no)</td>
<td>Physical function</td>
<td>Capacity (Time to Claim Closure) [43]</td>
<td>High</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*only significant with interaction of external attributions of responsibility (claime). See Table 4.

Other insurance arrangements (Traffic injury insurance, private health insurance) also reported no associations. See Table 4.

SF36, P25, Medical Outcomes Study Short Form 36, Physical Component Score; FRI, Functional Rating Index; SF12, Short Form 12; WCORC, Western Ontario Rotator Cuff index; ASESS, American Shoulder and Elbow Surgeons questionnaire; NDI, Neck Disability Index; VAS, Visual Analogue Pain Scale; DASH, Disabilities of the Arm, Shoulder and Hand; PRWE, Patient Rated Wrist Evaluation; PSS, Post Traumatic Stress Symptom Scale; SF12, MICS, Medical Outcomes Study Short Form 12, Mental Component Score; PDD, Post Traumatic Stress Disorder Scale; SF36, MICS, Medical Outcomes Study Short Form 36, Mental Component Score; McIl PJ, McIl PJ Questionnaire; LBP, Low Back Pain; CROM, Cumberlind Whiplash Outcome Measure. 

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The association between prior claim and poorer physical function was statistically significant in one moderate quality study. The association between prior claim and increased pain was statistically significant in one moderate quality study.

The association between test insurance arrangements (as compared to no fault arrangements) and poorer physical function was statistically significant in one high quality study.

Strength of evidence recommendations

There is limited guidance to interpret these mixed results. GRADE refers to the inconsistency of relative treatment effects in binary/dichotomous outcomes following qualitative analysis. Inconsistency is described as a combination of negative and positive associations [66]. Following a review of the literature and consultation with experts, the level of evidence was downgraded for compensation related factors that showed both associations with poorer outcomes and no associations with an outcome [26, 27, 66]. Therefore, the evidence was downgraded for compensation status and poorer physical function and compensation status and increased pain.

There is moderate evidence of an association between compensation status (having a claim) and poorer physical function. There is strong evidence of an association between compensation status and poorer psychological function. There is limited evidence of an association between compensation status and increased pain.

There is strong evidence of an association between legal representation (having a lawyer) and poorer physical function. There is moderate evidence of an association between legal representation and poorer psychological function.

There is moderate evidence of an association between receiving compensation at two years and poorer physical function. There is limited evidence of an association between number of sick days in prior three years, prior claim, and poorer physical function. There is limited evidence of an association between number of sick days in prior three years, prior claim, and
increased pain. There is moderate evidence of an association between tort insurance arrangements and poorer physical function.

There is limited evidence of no association between claim type and poorer physical function. There is inconsistent evidence between claim type and increased pain. The evidence levels are summarised in Table 6.

Discussion
This systematic review has focussed on identifying compensation related factors associated with health outcomes following musculoskeletal injury. A total of 29 studies were assessed with explicit categories for prognostic factors and health outcomes. Our results show that there is evidence of an association between different compensation related factors, predominantly compensation status (having a claim) and legal representation (having a lawyer), and poorer physical function; poorer psychological function; and increased pain following injury.

The strength of evidence varied according which compensation related factor and outcome were measured. This has been found by others when categorising results [25]. Mostly reviews focus on one outcome such as return to work or pain, or combine outcomes into functional recovery [11, 13, 14, 33, 67, 68]. It is less common to separately classify outcomes. Nevertheless, we believe this provides more comprehensive results, and offers greater potential for comparison with future studies.

Our findings are consistent with other reviews that investigated the association between compensation related factors and health outcomes following whiplash and acute orthopaedic trauma [11, 67, 69]. Poorer outcomes have also been found for compensable patients following surgery [16]. All these reviews classified compensation related factors separately. Reviews with a generic classification tended to find no association [12, 14]. In other research adversarial scheme design; fault versus no-fault; lack of early intervention; and longer claims duration were linked to poorer outcomes [6, 7, 20].

In a systematic meta-review, the authors concluded that evidence of an association between compensation related factors and health was unclear [19]. They referred to poor quality

Table 6. Evidence levels*.

<table>
<thead>
<tr>
<th>Factors associated with poor outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical function</td>
</tr>
<tr>
<td>Strong evidence</td>
</tr>
<tr>
<td>Moderate evidence</td>
</tr>
<tr>
<td>Compensation at 2 years</td>
</tr>
<tr>
<td>Fault</td>
</tr>
<tr>
<td>Limited evidence</td>
</tr>
<tr>
<td>Prior claim</td>
</tr>
<tr>
<td>Number of sick days in prior 3 years</td>
</tr>
<tr>
<td>Factors not associated with an outcome</td>
</tr>
<tr>
<td>Physical function</td>
</tr>
<tr>
<td>Limited evidence</td>
</tr>
<tr>
<td>Inconsistent evidence</td>
</tr>
</tbody>
</table>

*This table is adapted from the Guidelines for the Management of Acute Whiplash Associated Disorders, 2nd Edition 2007, published by Motor Accidents Authority of NSW [15]

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primary studies; proxy health outcomes; and heterogeneous compensation related factors. We have endeavoured to address these issues in our review.

Comparable results were found in a whiplash review where over half the studies (9/16) reported an association between compensation related factors and poorer health outcomes, the remaining studies showed no association [16]. Studies finding an association between compensation related factors and poorer health outcomes were of similar quality to those that reported no association. Although the assessment methods were similar to ours; only whiplash injuries were selected; retrospective studies were included; outcome measures were not separated; and no scores were calculated. In addition, the authors questioned the validity of the results due to the potential for bias due to reverse causality.

There were two key factors, compensation status and legal representation, with a similar proportion of high and moderate quality studies that did and did not find a statistically significant difference in the association between these factors and the outcomes of physical function and pain. It is difficult to determine the reason for the disparate findings between studies. Study characteristics, including population, sample size, outcome measures and compensation scheme design were comparable in studies with a significant association and those with a non-significant association. The evidence for compensation status was downgraded when there was evidence of inconsistency, and data extraction and quality assessment methods were based on recommended criteria [21–23, 28].

The strong and moderate levels of evidence between the compensation related factors of compensation status and legal representation, and poor psychological function following musculoskeletal injury, is not surprising. There has been growing evidence that involvement in a compensation process is stressful [71–73]. Recently, researchers found that many participants experienced high levels of stress during the claims process, and although poor health and vulnerability to stress played a role, it did not entirely explain the high levels of disability and poor psychological function post injury [74]. Similarly, these results were mirrored in a meta-analysis investigating the effect of compensation on mental health, which concluded that despite poorer mental health at baseline compensable participants did not improve as readily as non-compensable [15]. These findings lend weight to the apparent influence of compensation systems on poor psychological function, particularly in the presence of poor baseline health measures.

In respect of reverse causality bias, although evidence exists of a correlation between claiming compensation and poor health, it is difficult to determine to what extent this is a causal relationship. Does claiming compensation cause poor health or does poor health lead people to claim compensation? Evidence to date suggests it occurs in tandem [15, 74]. In our review two studies tested this hypothesis and found a difference in general health status between compensable and non-compensable participants at baseline and follow up [9, 47]. Of the studies (13/29) that measured pre-injury and/or general baseline general health, six found that these variables were predictive of injury recovery [3, 35, 48, 49, 54, 63]. We cannot refute the possibility of bias due to reverse causality based on our results.

Limitations
An important strength of this review was its conduct according to current guidelines and recommended methods of reporting [22–24, 26–28]. Notwithstanding that, potential studies could have been missed because our search strategy focused on compensation wording in the abstracts. This was mitigated by hand searching of references, personal communication with experts, plus the authors’ existing knowledge of papers to increase the likelihood of including all relevant papers.
Another limitation was potential measurement error, which is likely when the timing of exposure to a compensation related factor does not occur at baseline. Possible reasons for this include: legislated time periods to lodge a claim; people choosing to submit a claim only if they are not recovering; timing of legal representation; and the interaction between eligibility to claim and different follow up periods. Some authors have chosen not to include compensation status because of the difficulty defining it as a baseline measure [13]. We felt it was impractical to exclude certain compensation related factors and/or studies on this basis. Moreover, definitions of baseline tend to vary between studies.

Interpretation of statistical results was also hindered by selective reporting, particularly poor explanations for final predictive models. Although this would not have changed our conclusions we were not able to explore the reasons behind particular associations.

Implications for policy and future research
Considering the number of studies investigating outcomes following musculoskeletal injury it is of concern that many do not include compensation related factors as a potential confounder given the evidence available. Compensation schemes are diverse and contextual which makes interpreting the evidence based on existing data classifications challenging. The development of a compensable reporting framework would be valuable and has been recommended by others [16, 18, 73, 76]. Minimum reporting should include claim lodgement, claim acceptance, claim type, legal representation, entitlements, claim duration, litigation, sick leave, and weekly benefits paid for time off work if applicable. The timing of measures should be documented. For example: when legal representation or claim acceptance was obtained. A description should be provided of the legislative framework. Collaboration between researchers and the legal profession may also assist in untangle the complexities of scheme design particularly for future policy relevant research between and within jurisdictions [75, 77].

It is imperative for researchers to consider reverse causality bias [18, 78]. If present, this could be mitigated by risk assessments to identify triggers for poor recovery and facilitate early intervention; furthermore, reducing compensation related psychological stressors such as poor claims information and management; claim delays; perceived injustice; and numerous medico-legal assessments could improve injury recovery [74, 79, 80]. These stressors have also been linked to increased legal representation, delayed claim settlement and increased health care utilisation [18, 71, 73, 81].

Conclusion
This systematic review demonstrates that there is evidence of an association between compensation related factors and poorer health following musculoskeletal injury. The evidence of whether this association is causal is less certain and further research is required. There is a definite need to compare baseline characteristics of compensable and non-compensable study populations and identify plausible reasons why compensation related factors are associated with poorer health.

Supporting Information
S1 Checklist. Prisma Checklist.
(DOC)

S1 Appendix. Search strategies for databases—Medline, Embase, CINAHL and Web of Science.
(DOC)
S2 Appendix. Description and justification of quality assessment criteria.

DOC

S3 Appendix. Excluded papers.

DOC

Acknowledgments

We would like to thank Dr. Fiona Clay, Monash Injury Research Institute, Monash University for her assistance with the assessment criteria and Ms Isa Mu, Rehabilitation Studies Unit, The University of Sydney, for her assistance with the screening of articles for the systematic review.

Author Contributions

Conceived and designed the experiments: DFM FPC IDC IAH. Performed the experiments: DFM FPC IDC IAH. Analyzed the data: DFM FPC IDC IAH. Contributed reagents/materials/analysis tools: DFM FPC IDC IAH. Wrote the paper: DFM FPC IDC IAH.

References


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Chapter 3: Understanding the Effect of Compensation on Recovery from Severe Motor Vehicle Crashes: A Qualitative Study

Journal Article 2

Chapter 3 involves a study using qualitative research methods to examine how compensation systems may or may not impact on recovery in a group with moderate-severe orthopaedic injuries. This study was designed to inform how compensation related factors would be collected in the inception cohort study. The aims are to:

- explore factors that influence recovery from serious injuries sustained in motor vehicle crashes including whether there would be differences between people with compensable and non-compensable injuries; and

- investigate the factors involved in the claims and legal processes that might affect outcomes, in those patients’ eligible for compensation.

Declaration

At the time of this study the first author was employed by the State Insurance Regulatory Authority (SIRA). To reduce the potential for interviewer bias accepted qualitative methods were used (grounded theory approach) including: standardised open-ended questions developed a priori by all authors; focus groups were recorded and transcribed; neutral feedback and non-directive probing was provided; and the first two authors independently conducted content analysis.
This chapter is reprinted from:

Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper ‘Understanding the effect of compensation on recovery from severe motor vehicle crash injuries: a qualitative study’ we confirm that Darnel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Data collection, analysis and data synthesis
- Manuscript preparation and critical review

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<th>Date</th>
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<tr>
<td>Professor Ian Cameron</td>
<td></td>
<td>23.11.15</td>
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<tr>
<td>Professor Ian Harris</td>
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<td>23.11.15</td>
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</tbody>
</table>

This paper has been published as:

Understanding the effect of compensation on recovery from severe motor vehicle crash injuries: a qualitative study

Danel F Murgatroyd,1 Ian D Cameron,1 Ian A Harris2

ABSTRACT

Objective To explore the factors that influence recovery from severe injuries sustained in motor vehicle crashes, particularly differences between those with compensable and non-compensable injuries.

Design and setting Qualitative study using grounded theory and focus group methods within the trauma service of a university teaching hospital.

Participants 34 subjects (27 male, 7 female), all with severe injuries, were interviewed, 30 of whom were involved in crashes within the previous year. The other four were interviewed between 1 and 2 years previously.

Main outcome measure Themes identified from transcripts of the focus groups.

Results The themes identified from participants claiming compensation were a strong sense of entitlement and injustice, a difficult claims process, and a perceived lack of support. The themes of those who did not claim compensation were a sense of unfairness and a lack of support from friends and family.

Conclusions The injury recovery experience was difficult for all subjects, but it was particularly stressful for those claiming compensation. Based on this study, the claims process, particularly medical-legal examinations, and other factors that could impact on injury recovery, are targets for further research, policy review, or legislative change.

INTRODUCTION

The dearth of evidence showing the impact of factors relating to financial compensation on people's health following injury is growing but disparate. Compensation factors are usually described as claim type, duration, and cost, and although quantifiable, do not provide information about what aspects of claims and legal processes might influence people's health following injury. Although studies have shown that legal representation, litigation, and perceived injustice affect outcomes, these are other aspects that remain unknown. Furthermore, comparison between compensation schemes remains problematic because they differ so widely.

Our aim was to explore factors that influence recovery from serious injuries sustained in motor vehicle crashes, in particular, whether there would be differences between people with compensable and non-compensable injuries. In patients eligible for compensation, we wished to investigate the factors involved in the claims and legal processes that might affect outcomes.

METHODS

Study population and design

Stratified purposive sampling was undertaken for recruitment. Patients aged 18 years and over who were admitted to a major metropolitan trauma and teaching hospital between 2002 and 2009 were selected from its trauma database. Liverpool Hospital provides services to South Western Sydney and the surrounding region. The catchment area has a strongly multicultural population and below average household income. Patients were selected if they had been involved in a motor vehicle or motorcycle crash and had sustained an upper and/or lower limb fracture. The exclusion criteria were to reduce heterogeneity in the sample and eliminate those who could not logistically attend or be contacted. These included patients with a spinal cord injury, Glasgow Coma Score (GCS) <12 on admission, serious peripheral fracture or significant pre-existing cognitive impairment, and over one hour's travelling time to the hospital or no contact address and telephone number. The study was approved by the hospital and university human research ethics committees.

Potential participants were mailed an invitation letter with the selection criteria, aims, and practical information, including time, date, and location for the focus groups. There was no payment to attend but catering was provided. Transport and parking payments were offered.

The mid-block occurred in two phases, in September 2008 and July 2009. Potential participants were contacted by telephone within two weeks and consent was obtained. Potential participants were allocated to a focus group based on whether they were claiming financial compensation, and their availability to attend specific sessions. We anticipated five to eight attendees in each group, based on our aims we stratified by compensation status. A participation letter was sent confirming their attendance, and all potential participants received a reminder phone call the evening before their session.

Data collection

Demographic data such as date of birth and gender, and injury data including type, severity, date, and crash type, were retrieved from the trauma database. Injury severity was measured using the Injury Severity Score (ISS).
Additional socio-demographic details obtained by telephone were level of education, occupation, claim (yes/no), and claim type (Workers Compensation, Compulsory Third Party (CTP), or other). In the state of New South Wales (NSW), CTIP can provide lump sum compensation for pain and suffering, economic loss, and medical expenses, but no weekly benefits for wages. During the period studied it was fault-based—that is, the injured person must establish that a vehicle driver or owner, or someone (other than themselves), partially or completely caused the injury in order to make a claim. Workers Compensation is no-fault with similar entitlements, and regardless of who caused the accident a claim can be made; it includes weekly benefits. Claimants are entitled to legal representation in both schemes, with limited access to the court system unless liability is denied.

Each focus group was facilitated by an investigator (IDM), who had previously spoken with participants to arrange their attendance. A script, including information on confidentiality and protocol, was followed for the introduction. We declared our interest in compensation factors to participants.

Four previously unexplored open ended questions were asked. They were intended to explore injury recovery with specific reference to the claims and legal process without providing an opinion or direction. Questions 3 and 4 were only addressed to the compensable group. The questions were as follows:

1. What were your experiences following your injury?
2. How do you think your experiences would have been different if you did/did not have a compensation claim?
3. What was/is it like having a compensation claim?
4. Let’s talk about having a lawyer; what are your thoughts on this?

All participants were asked to comment on each question and elaborate if appropriate. No directive feedback was provided. The focus groups were recorded and transcribed with consent. Another investigator (IC) took additional notes for four groups (2, 4, 6, 8). The attending investigators had no prior relationship with any of the participants and there was no contact after the focus groups.

Data analysis
Content analysis of the transcripts was conducted independently by two of the researchers (DM and IC). The content was categorized into themes according to grounded theory methodology. This is where data collection begins around a topic without predetermining a research question; it can become more focused as the study evolves. Following data collection, content analysis occurs and themes are developed that lead to a hypothesis.15 This can be tested in further qualitative or quantitative research. We selected this methodology because it gave us the opportunity to explore potential compensation factors based on participants’ responses.

A coding frame for themes was derived from the transcripts based on common topics, patterns, relationships, and the level of importance as rated by participants.15 All transcripts were re-read to ensure that the identified themes were inclusive of all collected data. Following the second phase of focus group data, saturation was reached—that is, no new themes emerged in the second phase.

RESULTS
From a total sample of 709 injured people, there were 381 potentially eligible participants following exclusions for inadequate contact details and geographical location. Based on the selection criteria, all potentially eligible participants were extracted from the trauma database; no further sampling was possible.

Of the 212 potential participants contacted by telephone, 54 agreed to attend (169 could not be contacted or had disconnected numbers). There were two main reasons for refusal: lack of interest or inability to attend because of other commitments. There were 54 participants who attended (21 compensable and 13 non-compensable). Of the 20 non-attenders, 6 were unable to attend due to other commitments; usually work, and 12 gave no reason. There were eight focus groups, four with compensable participants (3, 4, 5, 6) and four without (2, 3, 6, 7). The compensable group size varied from 7 to 4, while the non-compensable group ranged from 4 to 2.

Table 1 illustrates the participant profile. There was incomplete data for education (S4/3) and employment (S4/3) because some participants did not answer these questions.

The scales to measure occupation and education were taken from the Australian Standard Classification of Occupations (ASCO), 2nd edition and the Australian Standard Classification of Education (ASCED) 2001.13,14 Both scales are used widely throughout Australia and have international comparability. For data analysis there was agreement between the investigators for all themes. The primary themes were identified in the compensable groups, while the secondary themes were identified in both the compensable and non-compensable groups. The secondary themes did not specifically relate to compensation. Participants also had different views about compensation, depending on whether or not they had a claim. The themes are illustrated in table 2, and with anonymous quotes from participants.

Injustice
Participants, particularly those at fault, were angry and upset about being involved in a crash:

“I was the not at fault party so it’s really turned my life inside out.” (Group 3)

“And what is upsetting also, the whole time that I was in hospital and the whole 15 months I was recovering, he was driving around.” (Group 1)

Table 1: Participant profile in the eight focus groups (n=38)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Compensable (n=21)</th>
<th>Non-compensable (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Injury severity score (moderate, range)</td>
<td>10, 6–13</td>
<td>9, 4–29</td>
</tr>
<tr>
<td>Time since injury (weeks, range)</td>
<td>3–1</td>
<td>2–6</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
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</tr>
<tr>
<td>Managers, administrators, and professionals</td>
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<td>1</td>
</tr>
<tr>
<td>Associates professionals</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Tradespeople, and advanced clinical and service workers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Intermediate clinical, sales, and service workers; and intermediate production and transport workers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Elementary clinical, sales, and service workers; and labourers</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Motor vehicle crash</td>
<td>15</td>
<td>9</td>
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<tr>
<td>Miscellaneous crash</td>
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<td>5</td>
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</table>
Table 2. Primary and secondary themes

<table>
<thead>
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<th>Theme</th>
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<td>Primary</td>
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<td>Secondary</td>
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</table>

"I was an innocent victim... doing absolutely nothing wrong and I was hit by someone who was drunk... the rest of my life is stuffed." (Group 4)

Entitlement
There was a strong sense of entitlement to financial compensation, which was influenced by perceived injury severity and disability:
"Like I'm hooked, I want money... that's it." (Group 4)
"They tried to give me $100,000 but my solicitor said no, you've lost my brain." (Group 1)
"They make lots of money and I get very little." (Group 5)

Claims process
Participants felt the claims process was adversarial and stressful, particularly communication and treatment approvals, and that the negotiating settlement was grueling:
"I was under the rock of communication against them... the big strain of trying to deal with them not talking to each other... it went through nine Workfronts Compensation managers in three and half years." (Group 5)
"I've had to see a lot of different doctors every time I needed something... it was like a fight." (Group 4)
"Dealing with the insurance company, they not only make you jump through hoops but they're on fire... just to get some medicare or something... it will take weeks to approve." (Group 8)
"They're at the first point of trying to settle and they're just procrastinating... dragging it out for as long as possible in order to maximise my financial hardship and to pressure me to take a lesser settlement." (Group 5)
"The settlement is a ridiculous amount... So low... you get stuck with it... just give me what you want, I just want to get out of here." (Group 8)

Although the cost burden was eased by access to paid treatment it didn't hasten injury recovery:
"You don't have to worry about bills." (Group 1)
"The money helped of course... it had nothing to do with my recovery." (Group 5)

Legal representation
Another consensus theme was the necessity of legal representation to navigate the claims process, receive reasonable compensation, and have awareness of changes to regulations or legislation:
"I thought there's no way I could do this on my own." (Group 6)
"The solicitor power negates everything you need... if you go to the insurance company yourself you get nothing because they know that you don't know what to say or what to do." (Group 6)
"Another pro with a solicitor is that you're up to date with... and in touch with any legislation change... So if I was doing it myself... I wouldn't have known." (Group 8)
"You don't know what you're entitled to... you don't know how to say things." (Group 1)
"Don't know who to tell about, the insurance company or the solicitor sometimes, but the good thing about having a lawyer is that they know the game the insurance companies play." (Group 8)

However, participants did see negative aspects, such as competency and high fees:
"It's a worry when you've got a solicitor and you're not working... you can see the solicitor's fees going up." (Group 1)
"I ditched my lawyer. I 100% percent believe that if I didn't ditch her she wasn't going to do anything for me." (Group 6)
"My solicitor would have been happy if I shut the doors of my business... that would have been the best outcome for my compensation because that's all he's thinking about." (Group 9)
"The solicitor has taken a lot of money... I had to pay the amount up front." (Group 8)

Medical-legal assessments
Medical-legal assessments were unanimously disliked. These assessments are arranged by insurers, defendant or plaintiff lawyers with medial professionals (usually medical practitioners) to provide an opinion about factors such as diagnosis or future treatments. Participants felt the value of such assessments was questionable:
"Then you start going forward, your doctors fast then you go to their doctors to discredit those doctors." (Group 8)
"I had one waiting 50% and even I know I've not 50% and another one waiting 10 or 11 months that's all within a month of each other." (Group 8)
"Their doctor says there is nothing wrong with you... my doctor says I'm stressed up, who's correct. Show me an honest doctor in this industry... It's all about the money, I can go and pay this doctor 1000 bucks and he'll tell me I'm stressed for life." (Group 4)
"I started this circus of going to see different doctors, first the doctors that actually cared... and then started the doctors that were in it for the industry... I've seen so many specialists that couldn't give a rat's about my condition, they're only there to write a report, and I find that extremely difficult... I know what genuine work is, it's a game that has been set up with perhaps good intentions, but a bad outcome." (Group 4)
"The lawyer comes... but I need you to answer this, this, this and this... So you've got to look through the same questions again. It's a $1000 every time you go." (Group 5)

In addition, the practicalities such as number, frequency, duration, and cost of assessments annoyed many participants.
Lack of trust
Participants perceived there was disbelief by insurers and some health professionals about their injuries. It was obligatory to prove you had an injury or disability:

"It’s one thing to try and cope with an injury; it’s another thing to cope with people who try to tell you it’s not real, it’s not real, you can do this...you can do that." (Group 4)

"Dealing with the insurance company...you’re on hold, you can’t do anything for fear they’re looking over your shoulder to see what you’re doing so they can interpret something as there’s nothing wrong with you." (Group 5)

"We’ve got to go through a different type of trauma, mentally and emotionally when you go through your life, being self-employed...you’re trying to get through all the records and look for the last seven years...if we don’t do it, it’s saying to the insurance company that we’re faking something." (Group 8)

"I’m working, so what are you doing following me around with a camera...it makes me feel like I’m doing something wrong, like I’m trying to get the system." (Group 8)

Inability to move on with life
There was consensus among participants that the claim process meant constantly being reminded about the injury and constrained their lives:

"It’s been so long...I’ve spoken about my case so many times, I’m getting to a point I’m sick of it." (Group 4)

"We settled because I didn’t want to put my life on hold anymore." (Group 5)

"You go to a doctor for your legal team and the doctor for the insurance company, and they question you about every aspect of your life and you have to relive the accident...and although I want to get on with it...it’s something that changes your whole life, and it will never be over in one way." (Group 8)

"They don’t even talk to you; you’ve gone through such a traumatic period with recovery...I’ve suffered depression and all sorts of problems like that. And you just start to get on top of that. I’ve had my claim denied three times." (Group 8)

Significance of trauma
Many participants had sustained severe injuries, and regardless of whether or not they had a compensation claim, they found the experience of the crash traumatic:

"I remember the chopper coming to take me away from the accident...I was in and out of consciousness." (Group 3)

"I probably shouldn’t be here because the worst thing about it all was I was completely abandoned, no one ever tried to come and help me." (Group 6)

"I lost the use of both hands for about six months...I was thinking all day and the only thing I wanted was to come back to work again...I knew how to do it." (Group 5)

"Immediately before the impact I knew that I was going to be killed. And it’s funny, at the moment, that didn’t stop the ongoing emotional effect that had on me, knowing that I was going to die, and I still haven’t got past that yet." (Group 6)

"When I was in the wrong, I felt a sense, a guilt...That is the thing I have got here for the rest of my life. Every second I wish I think about it." (Group 8)

"Psychologically it was all very exacting; all of a sudden I had to worry about income, the doctor telling me I would be a few months before I was able to walk and to work." (Group 9)

Family and social support
Strong family and social support was valued by all participants:

"My youngest took time off her studies and she looked after me...my family were excellent." (Group 1)

"I was probably very, very lucky that I had a partner because without her, yeah, probably wouldn’t have been able to do it myself." (Group 7)

"When you have that help, psychologically it makes things so much better and I think you feel better too." (Group 6)

"I am very lucky; I have very good neighbours and they helped me so much; I couldn’t have managed...I’m on my own." (Group 1)

Financial hardship if self-employed
All self-employed participants struggled physically and financially with return to work. They felt unsupported and either returned to work early given the severity of their injuries or sustained significant financial losses:

"I had to employ someone else to help me...I had to keep working no matter what." (Group 3)

"I was self-employed. I didn’t get back to my business for over 400 days." (Group 8)

"I have my own business...I had to get back and get things running. So I had an odd assortment of customers." (Group 4)

"I lost my business and didn’t have proper income protection, I was back to working for the house." (Group 5)

Other issues: comparison of claim and no claim
Although participants with a claim felt it was beneficial to have access to paid treatment, they felt it was an extremely stressful experience:

"They definitely would have less stress during that process that we go through...they would just miss out on some financial backing." (Group 4)

"You haven’t got the psychological pressure that the insurance company is putting you under. And that’s their game. Apply as much psychological pressure as we can to get you to settle." (Group 5)

"Making you out to be a liar even though they don’t say it, but basically that is what the report says when you read it...That’s difficult and so the person that’s not having a compensation claim, they don’t have that to face." (Group 4)

"I didn’t have to pay any of my bills." (Group 1)

"I don’t know if I didn’t have insurance I probably wouldn’t have ended up with some of the treatments I did." (Group 9)

Participants without a compensation claim felt it would not have affected their recovery but assisted with costs:

"It would have been nice to get the compensation." (Group 5)

"It would have taken away the stress...no money coming in while you were out." (Group 7)

"Financially it would have been more helpful because I was losing a couple of jobs as it was." (Group 6)
**Original article**

"I don't see how compensation would have made any difference to my recovery really," (Group 2)

"I don't think it would make much difference to me really. I was on a pension and I had no one to use." (Group 2)

**DISCUSSION**

This study explored the influence of claims and legal processes on injury recovery following a motor vehicle crash. We found that the injury, socio-legal experience was difficult for all people, but it was particularly stressful for people claiming compensation. These results provide additional insight into why compensation factors affect people's health following injury.7 4 12

Participants 'not at fault' felt a strong sense of injustice and entitlement linked to financial compensation, often as a reward. Other studies have reported the influence of perceived injustice on post-traumatic stress disorder (PTSD), pain, and disability.9 15 Findings from this study support the notion that perceived injustice is a multidimensional construct. We also found that people perceived blame, unfairness, injury severity, and perceptibility of loss were linked to a sense of entitlement.4 5

Compensable participants expressed the view that the claims process was adversarial, particularly for longer claims. Other studies have shown that having a compensation claim, legislative change, and negotiating settlement can alter psychological and physical outcomes.5 7 8

The difficulties reported by participants in communicating with insurers, high staff turnover, and obtaining treatment approvals have been less well documented in the literature. While this could relate specifically to New South Wales, it is likely to also apply to other compensation schemes. On the other hand, legal representation has been shown across a number of different jurisdictions and injuries to be an indicator of poorer outcomes.4 7 12 14 16 We found that participants believed they needed legal representation to negotiate with insurers and steer them through the claims process despite often disliking the involvement of a lawyer. It is difficult to know whether this is because of the claims process or personal choice because not all participants were legally represented. However, the importance of competent legal representation for many compensable claims indicates that the claims process is a factor when determining whether to engage a lawyer.

Similarly, non-legal assessments and complexity to the claims process. In this study, compensable participants disliked attending assessments for either party. Repeated attendance was also associated with anger and a lack of trust by others of a genuine injury or disability. This is an interesting finding and to the authors’ knowledge has not been reported previously. Studies examining non-legal assessments have focused on reporting standards or modified impairment rather than their impact on people’s health.5 7 20

This lack of trust led to distress and a sense of frustration, and when coupled with dissatisfaction of the claims process, meant many participants felt unable to move on with life. This is supported by other studies which show higher levels of disability and poor psychological health during the life of a claim.5 12 21

Despite having similar difficulties with injury recovery physically, people without a compensation claim did not report ongoing frustrations with limited life progress or increased psychological stress. Many returned to work and other activities out of necessity. This has also been shown in research where there is a non-compensable comparison group.3 8 12

In addition, there were several themes across both compensable and non-compensable groups. Self-employed participants declared financial hardship as a key motivator for seeking compensation. This could be partly because many participants were manual workers, or that financial hardship is worse for CTI claimants in New South Wales, where there is limited availability of financial assistance. However, research shows that return to work is influenced by multiple occupational, workplace, and compensation factors.

Other themes included that many participants found the trauma experience distressing, and strong family and social support aided their recovery. This is comparable to other research, which shows that a greater perceived threat to life and limited support networks are associated with poorer outcomes.9 12

Finally, comparing the two groups, the difference lay in their perception of the claims process and its impact on injury recovery, particularly access to financial compensation and treatment, and psychological stress.

These findings provide supporting evidence that compensation factors impact on injury recovery following a motor vehicle crash. The themes provide new information about what specific factors might affect people’s health beyond the broad indicators of claim type, duration, and cost. These themes support the notion that specific aspects of the claims and legal process could impact on people’s health following injury.

The findings provide potential opportunities to develop new policy and scheme design that aims to reduce the adversarial nature of the claims process and simplify the regulatory environment, particularly related to medical assessments, legal representation, and claims settlement. However, due to the diversity of compensable schemes, the applicability of these findings to other jurisdictions may vary depending on scheme design. Generalisability may also be limited as the participants sustained serious injuries and were treated by a single metropolitan trauma service in NSW. In addition, there was greater

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**What is already known about the subject**

- Compensation factors have been shown to affect the health status of people following injury.
- Currently, compensation factors are primarily sourced from administrative databases and provide limited insight into exactly how the claims and legal process influences injury recovery.

**What this study adds**

- Participants with a compensation claim often sought legal representation to assist in an adversarial and stressful claims and legal process and, if not at fault, felt entitled to recompense.
- Compensated participants perceived they were not trusted, and felt frustrated attending multiple medical and legal assessments, which contributed to an inability to progress with life.
- Researchers should consider a more complex assessment of compensation factors when investigating a compensable population, and policy makers have a responsibility to address the adversarial aspects of scheme design.

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recruitment of compensable participants, who possibly attended because of their negative experiences. Moreover, by using qualitative methods we gained valuable insight into compensation factors, which would not have been possible otherwise. Other strengths include careful conduct of the focus groups using established methodology and similar themes being identified by each group. Additional research is needed to explore the injury recovery experience with different injuries and socio-demographic background, and in other compensable schemes, to identify any shared themes. Furthermore, these findings need to be explored in larger quantitative studies.

In conclusion, people in this study with a compensation claim reported a more complex and stressful injury recovery experience than people without a compensation claim.

Acknowledgements We acknowledge Idea Caldwell for assistance with trauma registry data.

Competing interests None.

Ethics approval This study was conducted with the approval of the Sydney South West Area Health Service Human Research Ethics Committee and University of Sydney Human Research Ethics Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES
Understanding the effect of compensation on recovery from severe motor vehicle crash injuries: a qualitative study

Darnel F Murgatroyd, Ian D Cameron and Ian A Harris

Inj Prev 2011 17: 222-227 originally published online November 11, 2010
doi: 10.1136/ip.2010.029546

Updated information and services can be found at:
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Chapter 4: The Perceptions and Experiences of People Injured in Motor Vehicle Crashes in a Compensation Scheme Setting: A Qualitative Study

Journal Article 3

Chapter 4 has similar aims to Chapter 3, also using qualitative methods, but this study involved only compensable participants with minor injuries. The aims are to explore:

- people’s perceptions and experiences of the claims process after sustaining a compensable injury in a motor vehicle crash;
- why people sought legal representation; and
- how people can be assisted following a compensable injury and their experience with the claims process improved.

Declaration

At the time of this study the first author was employed by the State Insurance Regulatory Authority. To reduce the potential for interviewer bias accepted qualitative methods were used (grounded theory approach) including: standardised open-ended questions developed a priori by authors (DM, KL and IC); focus groups were recorded and transcribed; neutral feedback and non-directive probing was provided; and first two authors (DM and KL) independently conducted content analysis with analyst triangulation by the fourth author (IC) to ensure credibility of the results.

This chapter is reprinted from:
Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper ‘The perceptions and experiences of people injured in motor vehicle crashes in a compensation scheme setting: a qualitative study’ we confirm that Darnel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Data collection, analysis and data synthesis
- Manuscript preparation and critical review

Keri Lockwood Signed: 
Date: 23/11/15

Dr Belinda Garth Signed: 
Date: 23/11/15

Professor Ian Cameron Signed: 
Date: 23/11/15

This paper has been published as:

Murgatroyd D, Lockwood K, Garth B, Cameron ID. The perceptions and experiences of people injured in motor vehicle crashes in a compensation scheme setting: a qualitative study. 
The perceptions and experiences of people injured in motor vehicle crashes in a compensation scheme setting: a qualitative study

Darnell Murgatroyd, Keri Lockwood, Belinda Garth and Ian D Cameron

Abstract

**Background:** The evidence that compensation related factors are associated with poor recovery is substantial but these measures are generic and do not consider the complexity of scheme design. The objectives of this study were to understand people's perceptions and experiences of the claims process after sustaining a compensable injury in a motor vehicle crash (including why people seek legal representation), and to explore ways to assist people following a compensable injury and improve their experience with the claims process.

**Methods:** A qualitative study in a Compulsory Third Party (CTP) personal injury scheme covering the state of New South Wales (NSW), Australia. A series of five focus groups, with a total of 32 participants who had sustained mild to moderate injuries in a motor vehicle crash, were conducted from May to June 2011 with four to eight attendees in each group. These were audio-recorded and transcribed. The methodology was based on a grounded theory approach using thematic analysis and constant comparison to generate coding categories for themes. Data saturation was reached. Analyst triangulation was used to ensure credibility of the results.

**Results:** Five primary themes were identified: complexity of the claims process; requirement of legal representation; injury recovery expectations; importance of timely healthcare decision making; and improvements for injury recovery. Some participants struggled, finding the claims process stressful and subsequently sought legal advice; whilst others reported a straightforward recovery, helpful insurer interactions and no legal representation. Most participants were influenced by injury recovery expectations, and timely healthcare decision making. To assist with injury recovery, access to objective information about the claims process using online technology and social media was considered paramount.

**Conclusions:** Participants had contrasting injury recovery experiences and their perceptions of the claims process differed and were influenced by injury recovery expectations, and timeliness of healthcare decision making. Improvements to the claims process are required, including simplification or streamlining (possibly using online technology and/or social media to reduce paperwork) and providing access to objective information. There is a need to trial early interventions and new claims management policies that could improve injury recovery and satisfaction with the claims process.

Background

There is now sufficient evidence that compensation related factors are associated with poor recovery following injury [1-3]. However, it is less obvious which aspects of compensation systems are responsible and there is still much debate [6,7]. Research has shown that changing scheme legislation can contribute positively to people's recovery by removing specific entitlements (e.g. general damages for pain and suffering), encouraging early claims lodgement, and/or early access to treatment [8,9]. Other factors such as claim duration or legal representation have also been shown to influence recovery [10-14].

Currently, compensation related factors in the literature are defined generically, for example: compensation status, claim type/duration, and legal representation [1-5,13,14]. There is little consideration of scheme design complexity. Although qualitative studies investigating the...
claims experience following injury have found that the adversarial aspects of scheme design can undermine recovery and hinder return to work [15-18].

Similarly, other emerging evidence indicates that the influence of compensation schemes is multi-factorial with the stressfulness of claiming compensation contributing to increased disability and poor psychological function post injury [19-23]. However, there is also the suggestion that baseline mental health plays a significant role in whether or not people find the claims process stressful [19,20].

Further exploratory research is needed to identify how to positively influence distinct compensation systems so that people’s interactions with insurers lead to improved rather than poorer health post injury; whilst maintaining scheme equity and affordability.

This exploratory study examined the experiences of people who had a compensation claim in a single scheme setting. Specifically, the study sought to answer the following questions:

1. What are people’s perceptions and experiences of the claims process after sustaining a compensable injury in a motor vehicle crash?
2. Why do people seek legal representation?
3. How can people be assisted following a compensable injury and their experience with the claims process improved?

Methods
Study population and design
The Motor Accidents Authority (MAA) is the government insurance regulator of the Compulsory Third Party (CTP), personal injury scheme in New South Wales (NSW), Australia. The scheme is privately underwritten and predominantly fault-based providing lump sum compensation for entitlements including economic and non-economic loss, and medical expenses. However, there is also limited access to entitlements (e.g. medical expenses and lost wages) for those at fault. Legal representation can be sought at any stage during a claim.

NSW has a population of just over seven million with 26,253 road casualties recorded in 2010/2011. The propensity to claim during this period was 39% and the MAA received 13,373 new claim notifications [22]. Potential participants for this study were identified via the MAA claims database from March 2010 to February 2011. Criterion sampling was used [23] where inclusion criteria consisted of adults over 18 years with mild to moderate injuries (e.g. soft tissue injuries and simple fractures) following a motor vehicle crash in the last three months. Exclusion criteria were severe traumatic brain injury, spinal cord injury or over seven days hospitalisation.

There were 1518 eligible claims lodged within three months of injury between March and December 2010, with 626 invited to participate in a prospective cohort study investigating predictors for poor recovery at 12 and 24 months post injury. Consent and baseline data were obtained from 417 participants. From this sample of 417, a subset of 315 potential participants was obtained for the focus groups following additional exclusions for inability to communicate in English or attend due to geographical distance of home residence. Given the exploratory nature of this study, focus groups were chosen because of their capacity for open discussion between small groups of people with similar experiences, where interaction between participants can facilitate the clarification of ideas [23].

Potential participants were mailed an invitation letter in May 2011 with selection criteria, aims and practical information about the focus groups. They were contacted by telephone within two weeks and asked if they were interested in contributing to focus groups about their perceptions and experiences of the claims process. If agreeable, they were consented and allocated a group based on their availability to attend on a specific date and location.

Of the 193 contacted (106 non-contactable, 16 disconnected numbers) 147 declined, reasons included lack of interest, personal/work commitments and travel time required. Six to nine attendees were allocated per group to allow for lack of attendance. A participation letter was sent including relevant details and all potential participants received a reminder phone call prior to their group. There was no payment but catering and transport costs were covered. Of the 46 that accepted, 32 attended (five focus groups with a minimum of four and a maximum of eight attendees in each group, see Table 1). The remaining 14 were unable to attend due to other commitments, illness or provided no reason.

The study was approved by the Sydney Local Health Network and the University of Sydney Human Research Ethics Committees.

Data collection
Socio-demographic and injury data were obtained from the existing population cohort study database. Injuries

<table>
<thead>
<tr>
<th>Table 1 Focus group attendees (n = 32)</th>
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<td><strong>Group</strong></td>
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<tr>
<td><strong>Total</strong></td>
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were coded using the Abbreviated Injury Scale (AIS) (2005) at claim lodgement and reviewed within 12 months of injury [24]. The Injury Severity Score (ISS) is an indicator of potential mortality and is calculated by summing the squares of the three highest AIS scores from different body regions [25]. The AIS ranks injuries to particular body regions on a scale from one to six (six is not survivable). Additional information obtained by telephone included claim settlement, legal representation and return to work (Y/N).

All focus groups were facilitated by DM with assistance from KL for two groups (4, 5). Each session lasted one and a half hours to allow sufficient time for discussion. A script introducing confidentiality, group procedure, and the AAA-As interest in compensation factors was followed on each occasion. No directive feedback was provided. The groups were recorded and transcribed with consent. The issues explored are shown in Table 2 with their corresponding questions.

**Data analysis**

The qualitative methods were based on a grounded theory approach [26,27]. Thematic analysis of the data was conducted independently by DM and KL with no pre-conceived categories, that is open coding was used initially where data were coded if it related to the aims of the study. Patterns and themes emerged from these codes, and the constant comparison method was used to generate and refine categories and sub-categories [26,28]. Analysis was completed when data saturation was reached and no new themes emerged in the final two groups [26]. Agreement was reached between the investigators on all themes. Analyst triangulation was also used with a third investigator (IC) independently reviewing the transcripts followed by a group discussion to ensure credibility of the results and consensus was attained for all themes [28].

**Table 2 Investigator questions**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Investigator questions</th>
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<tbody>
<tr>
<td>Injury recovery experience</td>
<td>How was your experience following injury?</td>
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<tr>
<td></td>
<td>• What was your experience with the injured person?</td>
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<tr>
<td></td>
<td>• What was your experience with health professionals that assisted you?</td>
</tr>
<tr>
<td></td>
<td>What was your experience with the lawyer (why did you get/not get a lawyer)?</td>
</tr>
<tr>
<td>Assistance with injury recovery experience</td>
<td>What has assisted you in your recovery?</td>
</tr>
<tr>
<td>Improvements to injury recovery experience</td>
<td>What has hindered you in your recovery?</td>
</tr>
<tr>
<td></td>
<td>What could be improved to help people involved in a motor vehicle crash?</td>
</tr>
</tbody>
</table>

**Results**

The participant profile is outlined in Table 3. Each participant had lodged a compensation claim between six and 15 months previously (median 10 months). Over half of the attendees had returned to work, and of those not working, six were retired/at home and two were receiving a disability pension.

Primary themes were prevalent throughout all five groups, whereas secondary themes were less common but still relevant to our study objectives (see Table 4). The two main topics from which the themes emerged (the claims/legal process and injury recovery) were seen from opposing viewpoints as illustrated by the quotations. The themes are displayed with a narrative and specific quotations.

**Primary themes**

**Complexity of the claims process**

Many participants considered the claims process was unduly complicated with poor insurer communication and customer service. This was often combined with delayed treatment approvals which affected continuity of care.

"My case manager... she is terrible, she doesn't return phone calls, she doesn't return emails, I sent her an email two weeks ago and I've heard nothing."

(Group 1)

**Table 3 Participant profile in the five focus groups (n = 32)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participant data</th>
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</thead>
<tbody>
<tr>
<td>Age range, mean (years)</td>
<td>22-79, 47</td>
</tr>
<tr>
<td>Gender (male, female)</td>
<td>12, 20</td>
</tr>
<tr>
<td>Injury severity score range, median</td>
<td>1-14, 2</td>
</tr>
<tr>
<td>Time since injury range, median (months)</td>
<td>6-15, 10</td>
</tr>
<tr>
<td>Educationa</td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>1</td>
</tr>
<tr>
<td>Secondary school</td>
<td>8</td>
</tr>
<tr>
<td>Certificate or diploma</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor degree or higher</td>
<td>11</td>
</tr>
<tr>
<td>Pre-injury occupation (at time of crash)</td>
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</tr>
<tr>
<td>Managers and professionals</td>
<td>12</td>
</tr>
<tr>
<td>Technicians, trades, community and personal service workers</td>
<td>2</td>
</tr>
<tr>
<td>Clerical, administrative and sales workers</td>
<td>5</td>
</tr>
<tr>
<td>Machinery operators, drivers and labourers</td>
<td>0</td>
</tr>
<tr>
<td>Unemployed, retired/home duties, disability pension</td>
<td>3, 8, 2</td>
</tr>
<tr>
<td>Returned to work at time of focus group (yes/no)</td>
<td>19, 13</td>
</tr>
<tr>
<td>Claim settled at time of focus group (yes/no)</td>
<td>12, 20</td>
</tr>
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Table 4 Primary and secondary themes

<table>
<thead>
<tr>
<th>Theme</th>
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<tbody>
<tr>
<td><strong>Primary</strong></td>
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<tr>
<td>Complexity of the claims process</td>
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<tr>
<td>Requirement of legal representation</td>
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<tr>
<td>Injury recovery expectations</td>
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<td>Importance of timely healthcare decision making</td>
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<tr>
<td>Improvements for injury recovery</td>
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<tr>
<td><strong>Secondary</strong></td>
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<td>Drive for financial compensation</td>
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<td>Lack of trust by insurers</td>
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<td>Medical-legal assessments</td>
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<td>Family and social support</td>
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“You talk with someone on the phone and they say okay, we do that and then you get a letter that refuses it, that’s happened to me twice already, and my care manager has changed three times and every time I have to tell them the whole story.” (Group 2)

“I found the company’s intent and their action quite disappointing... I got the phone call up front, you know, we’ll help you, we’ll do this... then the next thing I heard about it was... A case of turning up one day [at the physiotherapist] and her saying, you’re not covered anymore... no phone call, how are you going? Just you’re not covered anymore.” (Group 3)

In particular, participants with a psychological or chronic illness, or those from a Non English Speaking Background (NESP) often found the claims process especially difficult to negotiate.

“They refused all the treatment that my doctor requested... I’ve done everything they asked me to do, I even returned to work part-time, I mean I am working two days per week with great difficulty... that’s what keeps me off the depression.” (Group 2)

“I can get quite ill if I get too much physical or psychological stress... it has just been too terrible because all I wanted to do was just get better... they just passed me from one person to another, can’t get any sense out of them.” (Group 5)

“My English is bad, my brain doesn’t work, she asks something and I think something else and she took it in the wrong way.” (Group 5)

However, others had the opposite experience. They found insurers helpful, with regular communication and timely approvals for treatment. These participants tended to describe less complicated claims.

“I had a guy helping me out. He asked if there was anything else I needed aside from physio... And he called me up after I finished my treatment, maybe a month or two later to see if I was alright. So overall it was pretty good but it was only a small situation.” (Group 2)

“I had to have an operation... they fast tracked everything... just went out of their way... they’ve approved everything I’ve asked for.” (Group 3)

“A slight injury with whiplash and I only needed five sessions of physiotherapy and no real ongoing problems... The whole process seemed to be fairly simple.” (Group 4)

**Requirement of legal representation**

Participants dissatisfied and frustrated with the claims process and lack of objective information commonly turned to legal advice for support. This was particularly relevant when recovery was thought to be impeded.

“I’m now considering going to a lawyer because my condition is no better... I feel I need to get a lawyer to bat for me because I don’t know the finer points of the legal system.” (Group 2)

“They certainly didn’t give any indication of how the system works, so it was a lot of googling, arguing with them, what happens next... I ended up engaging a lawyer simply because I felt I wasn’t getting any cooperation.” (Group 4)

“I thought I can’t, I’m going to a solicitor because I can’t do it, it’s too much.” (Group 5)

For others the engagement of a lawyer related to entitlements.

“People just say you must get a lawyer, I didn’t know and then when I started researching, oh that’s why you need a lawyer... You get a better outcome... lawyers know what to do, that’s their job they know what to claim for and what not to.” (Group 3)

On the contrary, participants who felt their claims were straightforward were less likely to seek a legal opinion.

“It’s never occurred to me... mine’s too minor I guess.” (Group 2)

“In my case it was quite straightforward, there was no question, I was at a standstill and he just went into the back of me.” (Group 4)
Injury recovery expectations
Participants had differing expectations regarding injury recovery, dependent on their personal experiences and beliefs. Some participants perceived their recovery was relatively easy, reporting minimal pain and disability. These participants tended to cope well with the claims process.

“Started getting some pains in my back so went for a few months of physio and that was about it. Sort of cleaned up.” (Group 2)

“A slight injury with whiplash... no real ongoing problems since then, just occasional twinges... The whole process seemed to be fairly simple.” (Group 4)

Alternatively, others described their pain in powerful terms linked to poor recovery. They demonstrated high levels of disability intertwined with their pain.

“Didn’t think that it was going to be almost 16 months later that I was sitting here... still in nine out of ten pain; it’s ridiculous.” (Group 1)

“I have such severe whiplash that the nerves that my hands got affected... I feel that my flesh is coming off the bones... I can’t drive very far... I can’t hold the browser [sic computer mouse].” (Group 2)

“Pain is there, like you’re crushed and like you feel lonely... other people destroy my life, so I can’t work now, I can’t dance, I can’t swim... and now I can do nothing.” (Group 5)

Participants who struggled with prolonged high levels of pain and/or disability expressed dissatisfaction when they sensed disbelief by health professionals of their injury, and felt vindicated when diagnostic scans displayed evidence of an injury. Others wanted testing and a medical diagnosis to understand their symptoms, believing this was essential to aide recovery and appropriate treatment decisions.

“They [the General Practitioner] referred me to get CT scans which actually showed that there were problems with my spine, so that like legitimised the pain... I know that something was wrong and it was just frustrating that they [the General Practitioner] didn’t believe me, I found that quite unfair.” (Group 3)

“They [the insurer] didn’t approve for MRI; seven months now... they approved for me to go to do physiotherapy, which is silly because you don’t know what is wrong inside my body... I did this for six months and it didn’t work, my body’s hurting me... I’m using all these drugs.” (Group 5)

Importance of timely healthcare decision making
The role of health professionals in timely decision making about treatment was perceived as important, particularly as requests for compensable treatment needed to be approved by the insurer prior to commencement of the service. Lack of consistent decision making between health professionals, coupled with poor care coordination, also confused participants.

“I had one shoulder specialist that just said you’ll be fine, it’ll fix, it’ll fix. Now I’m getting told that I have to have a reconstruction, so I can’t see how he could have said that.” (Group 1)

“I don’t know if I will be able to go back to full-time work... I’ve seen some specialists and no one can tell me if I will get better... the worse for me is not knowing how much longer... what the outcome is going to be.” (Group 2)

Any poorly timed decision making then added tension to the triadic relationship between patient, health professional and insurer.

“I’m still waiting for approval to go and see a podiatrist because my arch has collapsed on my foot.” (Group 1)

“They paid all my expenses up until about three weeks ago and then said, right no more physio, so the physio had a stand up fight with them.” (Group 2)

Conversely, if participants received timely treatment and assistance from knowledgeable and supportive health professionals, particularly to negotiate the claims process, satisfaction with their care was greater.

“She [the General Practitioner] has been really good at helping me sort those issues out... she actually cares about where I am going.” (Group 1)

“He [the physiotherapist] contacted the insurance company and said... ‘how do you want me to do this’... so he actually negotiated... I had double sessions, so it depends how good your physio is.” (Group 1)

“I got recommended... this chiropractor who has worked in the insurance industry for a long time... he knew exactly how to prepare my report, saying this person needs this much rehabilitation... I’ve got a pretty good experience.” (Group 3)

Improvements for injury recovery
In a privately underwritten scheme, each insurer separately provides information to the claimant about the
claims process. If legally represented, the insurer is required to communicate with the claimant via their lawyer and not directly, which can delay the receipt of information. Many participants suggested the claims process needed to be simplified, and that objective information should be provided from a single source.

"Information should be out there... until you've been through it you have no idea what to do and normally when you're in an accident you're not really in a fit state to know what you have to do... They [the insurer] don't give you much... They give you as much detail as they want you to have I suppose." (Group 3)

"Streamline the process, so you don't have to deal with multiple people and tell them the same story over and over again." (Group 4)

"Anybody involved in an accident should be given as much information as possible, straight away, about what the procedures are, as clearly as possible." (Group 4)

This especially applied for those struggling with the claims process. Recommendations included the use of technology, social media, and a reduction in paperwork.

"It Facebook, be it video, whatever, we've got the technology now where you can actually speak to somebody, that's my insurer, I'm actually speaking to somebody real, and I think that would actually assist a lot in getting rid of the stigma." (Group 5)

"I need to have this operation ASAP, instead I'm being told... forms have to be posted... look at the modern technology we've got now, surely you still don't have to send something in post and wait for something to be signed." (Group 3)

It was also suggested that information pertaining to injury recovery expectations would be useful.

"Some people get well really quickly, some people don't. It would be good if there was more objective knowledge about this thing, so that you weren't just floundering about." (Group 5)

Secondary themes
Desire for financial compensation
Participants sustained mild to moderate injuries, yet some expressed a desire for financial compensation related to their perceived injury severity and need for treatment.

"I thought no this [claim] is worth it, because I am spending a lot of my own money to help myself get better." (Group 2)

"I've got a condition that you [the insurer] don't understand and none of us know what's going to happen in the long run because of this accident. Like I have no idea how you're going to compensate me for that." (Group 4)

"Another thing is actually knowing what you're entitled to, telling people what they're entitled too, that's important as well." (Group 3)

Trust of insurers
Some participants perceived they were not believed by insurers, which tended to hinder their recovery and derange their relationship with the insurer. Mis-trust led some to feel they were being discriminated against, even if the insurer was investigating the claim to meet legislative requirements prior to paying entitlements.

"Sometimes you sort of feel victimised by the insurance... you feel like they're saying you're a bludger, you don't want to go back to work... you're scamming... I want to go back to work, I want my normal." (Group 1)

"They sent several doctors to question me just like I'm a criminal robbing their money. And just wonder whether I'm telling lies, just a horrible experience." (Group 2)

Medico-legal assessments
The usefulness of medico-legal assessments was also questioned. Assessments could be sought by insurers or plaintiff/defendant lawyers with health professionals to provide an opinion about diagnosis, treatment or care needs. There was particular reference to the number and veracity of assessments when recommendations were made by a health professional paid for by the insurer.

"It's a conflict of interest... They're [the insurer's assessor] going to give an outcome or a report that's going to be favourable to the insurance company... so I think that is fundamentally flawed, completely dated and has got to go." (Group 2)

"What he [the lawyer] said on the first day that I met him, tracked through... getting medico-legal reports from just about every healthcare professional I've ever seen." (Group 3)
Family and social support
The positive influence of family and social support was noted by a number of participants. Having a strong network was important and enabled participants to feel secure. Although in the presence of pain and disability, this did not always transpire to increased independence.

“I’ve got an absolutely fantastic group of friends and family... he [my friend] drives me around if there’s days... that you’re in absolute rank pain like today, I wouldn’t have driven today... You’ve got to have that support network, if you don’t have it, you’d just, I would disintegrate.” (Group 1)

“In terms of just psychological wellbeing, my family was really supportive because going from being like perfectly healthy to having like a really painful injury is like depressing.” (Group 3)

Discussion
This study explored people’s perceptions and experiences of the claims process after sustaining a compensable injury in a motor vehicle crash, and examined ways to assist people in a compensable environment within the first year post injury. The results revealed contrasting viewpoints. Some participants, namely those with prolonged recovery and/or higher pain or disability, found the claims process complicated, difficult to negotiate and frequently sought legal advice. Limited injury recovery expectations, and greater pain and/or disability, appeared to influence participants’ relationships with insurers which was aggravated by inconsistent care from health professionals.

On the contrary, others found the claims process easy to navigate particularly if coupled with an expeditious recovery, positive and supportive interactions with health professionals and insurers, and effective health service delivery. A key factor for satisfaction with the claims process appeared to be a communicative and empathetic relationship with the insurer. In these situations legal representation was often deemed unnecessary.

Experiences of the claims process
Our study reiterated previous research whereby people with a straightforward injury recovery, positive relationship with health professionals, and timely communication and approvals from the insurer generally felt satisfied with the claims process and their care from health professionals and insurers [15,18,29]; they also appeared to have less complex needs, pain and/or disability, and shorter treatment duration [17]. Our study also identified the presence of strong family and social support as important for recovery, which is supported in the literature [5,13,30].

Conversely, poor insurer communication, customer service and delayed treatment approvals were identified as key areas of concern. This is similarly reflected in different jurisdictions in the United States, Canada and Australia [15,19,29,31].

Many participants struggled with high initial pain intensity, psychological distress and co-morbidities, putting them at risk of poorer outcomes following injury [2,4,5,11-13,32]. In similar research, lack of understanding about claim requirements, claim delays and medico-legal assessments also impacted negatively on psychological function following injury, predominantly in the presence of poor baseline mental health [19,20]. A dearth of evidence exists indicating what might assist these people to recover in a compensable environment.

While many study participants believed injury recovery depended on a definitive diagnosis, evidence indicates that investigations do not provide a diagnosis predictive of outcome or pain [33,36]. Current guidelines allow 10 working days for an insurer to approve or decline a treatment request [37], and if the insurer delayed or denied investigations this compounded dissatisfaction with the claims process. Comparable studies also found that participants experienced frustration and anger when investigations and/or treatment perceived as relevant were questioned or denied [16,17]. This intersection of a third party payer also complicated the health professional-patient relationship, as reiterated in other studies with similar sentiments of disconnect between the parties; particularly over timeframes and resources for making decisions about investigations, treatment and other benefits [16,38].

The desire for financial compensation expressed by some claimants in our study was connected to perceived injury severity and the need for treatment. This appeared to reflect a perceived entitlement to benefits in a more general sense, and not the psychological entitlement (the sense that one deserves more and is entitled to more than others) reported elsewhere in the literature [38,39].

The lack of trust by insurers was based on perceived unfair insurer conduct particularly for access to treatment. In the NSW motor accidents scheme, access to treatment is on a case-by-case basis taking into account the principles of ‘reasonable and necessary’ which include benefit to the injured person; appropriateness of the service/provider; relationship to the crash, and cost [40]. With this approach, there is the potential for the insurer and participant to disagree. Existing research also relates these secondary themes to power imbalances and stigmatisation [15,17], and perceived injustice; a multidimensional construct that includes unfairness, irreparable of loss and injury severity [21,41].

Our study also highlighted the potential conflict of interest when insurers pay for health professionals to
conduct medico-legal assessments. This questionable value of medico-legal assessments is emerging in the literature and likely to be dependent on scheme design [18,19,31]. In other related research, the secondary themes found in our study were identified as primary themes, possibly because participants in other studies sustained more severe injuries, and/or were predominantly over one year post injury [15,17,31].

Why people sought legal representation
Frustration with the claims process and a perceived lack of insurer cooperation led some participants to seek legal advice. Although legal representation has been shown across different compensation systems to be associated with poorer outcomes, there is no compelling explanation of the mechanisms involved [5,10,11,13,14]. Our findings suggest seeking legal advice may be influenced by the complexity of the compensation system and perceived slow injury recovery, particularly if recovery was thought to be impeded by the claims process. In the NSW motor accidents scheme, legal representation of full claims is almost 60% within the first 12 months [22]. Discussion amongst legal researchers and participants who expressed an opposing point of view supports these concepts [4,24]. In addition, poor baseline mental health, vulnerability to stress and initial pain intensity may also be drivers of seeking legal representation [4,5,11,13,14,19,20].

Ways to improve the claims process
The extensive information and paperwork required to access entitlements has been well documented [16,18,19]. Similarly, our study found that access to objective information from the scheme regulator and/or health professionals about the claims process (e.g. entitlements, obligations of both parties, legal representation) and injury recovery was important yet in need of streamlining. Use of new technology and social media was suggested to simplify the process, break down communication barriers and reduce paperwork requirements. Examples include: YouTube and Apps to explain claims procedures; accessing entitlements including timeframes, and insurer obligations to provide reasons for decisions - particularly declination; FaceTime and Skype for video conferencing to improve communication and possibly reduce stigmatisations and Facebook or WhatsApp for information sharing about ways to optimise injury recovery – staying active or when to seek medical advice. This call for assistance has been found across jurisdictions predominantly in schemes with adversarial components such as legislative requirements for proving causation of injury or receiving benefits for lost wages; timeframes to access to entitlements; and/or a propensity for seeking legal representation [15,17,19,29,44]. A recent rapid review also reported a lack of evidence surrounding the effectiveness of interventions that focused on information about the claims process [45].

Study strengths and limitations
Due to the diversity of compensation scheme design, generalisability is limited. Only participants relatively early in the claims cycle with minor to moderate injuries were included. Conversely, contemporary information is provided about perceptions of the claims process and injury recovery experience in this early phase. Much of the literature refers purely to Workers Compensation jurisdictions; this study adds to the few involving road traffic injury schemes [19,29,31]. Lastly, these focus groups were conducted using established methodology which resulted in robust data with across group data saturation [26-28].

Further research and policy implications
These findings provide an opportunity to understand the complexity of compensation systems and new evidence about which aspects of the claims process could be associated with poor recovery such as poor insurer communication; delays in decision making about treatment; the triggers for seeking legal representation; and the lack of objective information. Moreover, risk factors for poor prognosis and co-morbidities, especially poor mental health, appear to be aggravated by the claims process. There is a need to trial early interventions and new claims management policies that could improve injury recovery and satisfaction with the claims process. Such interventions could include: streamlining claims lodgement and treatment requests with online facilities to reduce delays; a comprehensive information package from an independent source such as the scheme regulator; face-to-face communication with participant and insurer in person or online; early identification of risk factors for poor recovery; and subsequent early appropriate treatment referrals. Further consideration should be given to consolidating resources for these at risk and minimising insurer involvement with those recovering well.

Notwithstanding that, further qualitative research is needed with different injury groups, timeframes and compensation schemes to consolidate themes. In addition, the role of having a NLSB needs to be explored to understand how to assist this population.

Conclusions
The findings of this study echo those of other jurisdictions regardless of scheme design. Participants had contrasting injury recovery experiences. Some participants found the claims process stressful and subsequently sought legal advice; whilst others reported a straightforward recovery, helpful insurer interactions and no legal
representation. Both groups were influenced by injury recovery expectations and timeliness of healthcare decision making. The triadic relationship between the parties could particularly aggravate health service delivery.

Improvements to the claims process are required including simplification or streamlining - possibly using online technology and/or social media to reduce paperwork and providing access to objective information. Addressing some of the negative issues raised by participants could reduce the adversarial nature of the claims process in a compensable setting and alleviate the triggers for seeking legal representation; thereby providing a more optimal environment for injury recovery.

Competing interests
The authors Daniel Murgatroyd, Kerri Lockewood, Indeida Garth and Ian Cameron declare that they have no competing interests for this article publication. This manuscript has not been published elsewhere, nor is it under consideration with another journal.

Authors’ contributions
CM significantly contributed to the study conception and design, data acquisition, analysis, and interpretation, and drafting of the manuscript. KI significantly contributed to the data acquisition, analysis and interpretation, and revised the manuscript for intellectual content. IG significantly contributed to the study conception and design, data acquisition, analysis and interpretation, and revised the manuscript for intellectual content. All authors read and approved the final manuscript.

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Chapter 5: Predictors of Seeking Financial Compensation Following Motor Vehicle Trauma: Inception Cohort with Moderate to Severe Musculoskeletal Injuries

Journal Article 4

Chapter 5 is the first paper from the inception cohort study. Prior to reporting on return to work and injury recovery outcomes, it is pertinent to consider whether there are any factors associated with seeking financial compensation and legal representation (as outcomes). Chapters 6 and 7 will explore the impact of seeking financial compensation (and other predictors) on physical and mental health status, and return to work. The aim is to:

- investigate the predictors of seeking financial compensation, namely making a claim and seeking legal representation, following motor vehicle related orthopaedic trauma.

This chapter is under review at BMC Health Services:

Murgatroyd D, Harris IA, Chen JS, Cameron ID. Predictors of seeking financial compensation following motor vehicle trauma: inception cohort with moderate to severe musculoskeletal injuries
Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper ‘Predictors of seeking financial compensation following motor vehicle trauma: inception cohort with moderate to severe musculoskeletal injuries’ we confirm that Darmel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Data collection, analysis and data synthesis
- Manuscript preparation and critical review

Professor Ian Harris
Signed: [Signature]
Date: 23/11/15

Dr Jian Sheng Chen
Deceased: 22 October 2014

Professor Ian Cameron
Signed: [Signature]
Date: 23/11/15

This paper is under review at BMC Health Services:
Title: Predictors of seeking financial compensation following motor vehicle trauma: inception cohort with moderate to severe musculoskeletal injuries

Abstract

Introduction: Compensation related factors have been repeatedly associated with poor recovery following orthopaedic trauma. There is limited research into the factors associated with seeking financial compensation. Further understanding of these factors could facilitate injury recovery by purposeful compensation scheme design. The aim of this study was to investigate the predictors of seeking financial compensation, namely making a claim and seeking legal representation, following motor vehicle related orthopaedic trauma.

Methods: Participants were admitted patients identified from two trauma hospitals with upper or lower extremity fractures following a motor vehicle crash. Baseline data were collected within two weeks of injury. Participants were followed up at six months. Analysis involved: descriptive statistics for baseline characteristics; comparison of compensable and non-compensable participants with Analysis of Variance (ANOVA) and chi-squared tests; and logistic regression for predictor models.

Results: The cohort consisted of 452 participants. Baseline characteristics showed: mean age 40 years; 75% male; 74% working pre-injury; 30% in excellent pre-injury health; 56% sustained serious injuries - Injury Severity Score (ISS) 9-15; 61% had a low-middle range household income; and 35% self-reported at fault in the crash. There was no significant difference in pre-injury/baseline health between compensable and non-compensable participants. Follow up data was available for 301 (67%) participants.
The most significant predictor of claiming compensation was higher body mass index (BMI) (overweight Odds Ratio [OR] 3.05, 95% Confidence Interval [CI] 1.63-5.68; obese OR 1.63, 95%CI 0.83-3.20). Participants less likely to claim were: involved in a motorcycle crash (OR 0.47, 95%CI 0.28-0.82); socioeconomically advantaged (OR 0.37, 95%CI 0.17-0.82) or most advantaged (OR 0.39, 95%CI 0.17-0.90); at risk for short term harm (injury) due to alcohol consumption (OR 0.56, 95%CI 0.32-0.97); and with fair-poor pre-injury health (OR 0.30, 95%CI 0.09-0.94). The predictors for seeking legal representation were speaking a language other than English at home (OR 2.80, 95%CI 1.2-6.52) and lower household income (OR 3.63, 95%CI 1.22-10.72). Participants less likely to seek legal representation were most socioeconomically advantaged (OR 0.15, 95%CI 0.04-0.50).

**Conclusions:** Seeking financial compensation was associated with a higher pre-injury BMI rather than injury-related factors. Seeking legal representation was solely related to socio-economic factors.
Introduction

Motor vehicle related orthopaedic trauma is a major contributor to the burden of disease and injury [1, 2] and can occur within a compensation environment providing injured people with access to financial entitlements. Compensation related factors have been associated with poor recovery following orthopaedic trauma across different compensation systems; such factors include making a claim and legal representation [3-9]. However, these negative associations have been criticised due to the potential for reverse causality bias between compensation related factors and pre-injury and/or baseline health status [10, 11].

To the authors’ knowledge two studies have compared health status between compensable and non-compensable participants and found a difference at baseline and follow up in a trauma cohort [3, 12]. Involvement in the compensation process and the stressfulness of having a claim has been associated with poorer mental health status following injury but a significant portion of that poorer status was present at baseline [13, 14]. Furthermore, baseline health is a known predictor of injury recovery [4-6].

Reverse causality is when the direction of cause and effect is contrary to what is presumed or is a two-way causal relationship [15]. For example, does poor health lead people to claim compensation or does claiming compensation cause poor health? As part of our analysis, we addressed the first part of this question.

In addition, others have pointed out the need for further comparative research between and within different jurisdictions to tease apart the complex issues surrounding compensation systems including scheme design and the societal framework in which they operate [16, 17].
Although many studies have explored the association between compensation related factors and trauma recovery, few have investigated the drivers for making a claim or seeking legal representation following motor vehicle related orthopaedic trauma.

Compensation schemes tend to have eligibility requirements such as being fault-based and/or a work-related. These requirements dictate access to financial entitlements. Recent Australian reports show that, despite being eligible, some people choose not to make a claim. The reasons are diverse for example, a lack of awareness of eligibility, sustaining a minor injury, and current and/or future employment concerns [18, 19]. However, that research has been focussed on work-related injuries.

The intricate relationship between health, psychosocial and socio-economic factors, and compensation systems has been more closely examined in the qualitative literature. Researchers have looked at the impact of the claims process, interactions between injured workers, health care providers and insurers [20-22], and financial and employment considerations [23]. Results showed having a compensation claim had largely negative influence on injury recovery. However, these relationships were mostly explored during the claims process, not prior to making a claim. Background factors (i.e. those present prior to injury) may be determinants of making a claim and/or post-injury outcomes.

Hence, the aim of our study was to investigate the predictors for seeking financial compensation, namely making a claim and seeking legal representation, following motor vehicle related orthopaedic trauma.
Methods

Study design and setting

This inception cohort study recruited patients from two trauma hospitals (Liverpool and St George) in Sydney, New South Wales (NSW), Australia between November 2007 and February 2011. These hospitals were selected to provide a representative sample of motor vehicle related orthopaedic trauma requiring inpatient hospitalisation in NSW. Participants were followed at six, 12 and 24 month post injury.

Eligible patients identified via a hospital trauma database were invited to participate. Informed consent was obtained. Inclusion criteria were: admission to hospital within two weeks of injury; involvement in a motor vehicle crash; age 18 years or over; and an upper or lower extremity fracture (humerus, radius, ulna, pelvis, acetabulum, femur, patella, tibia, fibula, talus, calcaneus). Eligible patients from Culturally and Linguistically Diverse (CALD) backgrounds were interviewed with an English speaking family member. Patients were excluded if they had: dementia or a significant pre-existing cognitive impairment preventing the ability to consent; spinal cord injury; Glasgow Coma Score (GCS) less than 12 on admission; amputation of a limb; or isolated phalangeal, carpal, metacarpal, tarsal or metatarsal fractures.

There were 32 variables measured for each participant. Allowing for 10 participants per variable a sample size of 450 was calculated [24]. This was considered sufficient to accommodate a 25% loss to follow up based on previous similar studies [8, 25].

Follow up questionnaires were posted at six, 12 and 24 months post injury. If no response was received by three weeks, up to six attempts were made to contact participants by
telephone (questionnaires could be completed by telephone) and/or by mailing additional questionnaires. Participants were removed from the study if non-contactable or they declined to participate. The study was approved by the governing human research ethics committees (South Western Sydney Local Health District, South Eastern Sydney Local Health District, and The University of Sydney).

Study factors
Baseline data were collected in hospital within two weeks of injury using a written questionnaire. Demographic data including date of birth, age, gender, and injury related information were retrieved from the trauma database and hospital records. The study factors were chosen to reflect the aims and objectives of the study with reference to relevant research [6, 7, 26, 27].

Injury related factors
Injuries were coded using the Abbreviated Injury Scale (AIS) (1990 Revision, Update 98)[28]. The Injury Severity Score (ISS) and New Injury Severity Score (NISS) were calculated as measures of injury severity; these are considered indicators of potential mortality [29] and are calculated by summing the squares of the three highest AIS scores from different body regions (ISS) regardless of body region (NISS). The AIS ranks injuries to particular body regions on a scale from one to six (six is not survivable). Injuries were classified as minor–moderate (1-8), serious (9-15) or severe–critical (16-75) based on ISS/NISS scores [30].
**Socio-demographic factors**

Socio-demographic factors included age, gender, marital status, occupation, and education. Current work status (yes/no) was asked with additional variables for full/modified duties (e.g. lifting restrictions, reduced hours) and full-time (usually working at least 35 hours per week) or part-time (usually working one hour to 35 hours per week) [31].

Household income was measured exclusive and inclusive of household structure to allow for potential differences in income distribution. An adjusted income (inclusive of household structure) was calculated by dividing the household income by the sum of points 1 for the first person aged ≥15 years, 0.5 for each additional person aged ≥15 years, and 0.3 for each person aged <15 years [32, 33].

The Index of Relative Socioeconomic Disadvantage (IRSD) is a summary measure of economic and social conditions within a particular area/postcode such as employment, fluency in English and household size [32]. A low score is indicative of greater socioeconomic disadvantage. It can be used as a continuous variable or divided into quintiles.

**Health related factors**

The health conditions measured as an indicator of baseline health status were chronic illnesses – asthma, cancer, heart and circulatory conditions, diabetes, arthritis, osteoporosis, mental and behavioural problems, and neck and back problems/disorder/pain). These were compatible with the National Health Priority Areas initiative (conditions that imposed high social and financial costs on Australian society)[34]. The classification was based on the Australian Bureau of Statistics (ABS) Health Survey which defines a long term condition as one which the patient currently has, and which has lasted or they expect to last for 6 months.
Body Mass Index (BMI) was calculated from the participant’s self-reported weight and height.

Other factors taken from the ABS Health Survey included: recent injuries (other than the motor vehicle crash) in the last four weeks that required medical intervention or were associated with a decrease in usual activities; medication use in the last two weeks for asthma, arthritis, osteoporosis, heart or circulatory conditions, diabetes, high sugar levels, mental wellbeing; and smoker status [33].

In previous research, associations were found between poor recovery and poor expectations for return to usual activities and work [26, 36-38]. Due to the lack of validated measures for self-efficacy we used two measures from a large Canadian study of soft tissue injuries, which were applicable [37]. These were return to work (yes/no) and return to usual activities (number of days).

Alcohol consumption was measured using a validated scale, the first three questions of the Alcohol Use Disorders Identification Test: Self-Report Version (AUDIT-C) [39, 40]. The word ‘standard’ and ‘in the past year’ were added. Alcohol quantity was based on an Australian standard drink [41, 42]. Risk of long and/or short term harm due to alcohol consumption was assessed with the National Health and Medical Research Council (NHMRC) levels [41]. Because these levels were mismatched with the AUDIT-C categories an algorithm was used to compare results based on the Bettering the Evaluation of Care and Health (BEACH) Survey, (Associate Professor K Conigrave, personal communication March 19, 2007). Categories for other study factors are explained in Table 1.
Compensation related measures

The majority of compensation related factors were not recorded at baseline as most questions would have been unanswerable within two weeks of injury. At six months post injury the following questions were asked: claim made (yes/no), claim type (Compulsory Third Party [CTP]/Workers Compensation [WC]/other), claim accepted (yes/no/don’t know), and legal representation obtained (yes/no). Claim made ‘yes’ was defined as making a personal injury claim of any type (CTP, WC or other) to access entitlements, which included a CTP Accident Notification Form (ANF) for expenses < AUD$5000 within 28 days of injury. Self-reported fault of the driver was measured at baseline (i.e. whether the driver considered themselves to have caused the crash). Pedestrians and passengers were considered not at fault because road rules dictate that vehicles must give way to pedestrians. However, both have a responsibility for their own safety and where they fail to take care, rules of apportionment under contributory negligence (i.e. the insurer believes that the person contributed to the crash and/or their injuries) can result in reduced financial entitlements at settlement [43].

In NSW at the time of the study, the Motor Accidents Authority (MAA) was the government insurance regulator of the CTP personal injury scheme, it is a privately underwritten modified common law scheme. WorkCover was the government insurance regulator of the WC scheme, it is a publically underwritten statutory benefit scheme where private insurers manage claims on behalf of WorkCover [44, 45]. In 2015, the regulators of these schemes merged to form the State Insurance Regulatory Authority (SIRA).

All motor vehicles travelling on public roads must be registered. To make a CTP claim a motor vehicle must also be registered and the claim is made against the driver at fault. Since April 2010, regardless of who was at fault, anyone injured in a motor vehicle crash can access
limited entitlements (i.e. medical expenses and lost wages up to AUD (Australian Dollar) $5,000). Before 2012, to make a WC claim a motor vehicle crash must have occurred during travel between place of employment and home, and/or any work-related place, and a person injured (regardless of fault) [44, 45].

For both schemes, a claim must be lodged within six months of injury and the insurer has three months to determine final liability and accept or deny the claim. Provisional liability enables earlier payment of medical expenses and for WC weekly wage benefits. In WC, the insurer must be notified of an injury within 48 hours [45]. Entitlements include past and future losses across each scheme (e.g. medical expenses, loss of income, and pain and suffering/impairment). Legal representation can also be obtained at any time for either scheme.

Data analysis

Descriptive statistics were used to summarize baseline characteristics of the participants by claim status at six months. The differences in the baseline characteristics between those that claimed compensation and those that did not were compared using ANOVA tests for continuous variables and Chi-squared tests for categorical variables. Chi-squared tests were also undertaken to determine relationships between claim type and legal representation as well as claim type and claim acceptance. Logistic regression models were employed to determine predictors of claiming compensation and legal representation at six months. All potential predictor variables with a p-value of <0.20 in univariate analyses were reported and considered to be included in the final predictive models which included only predictor variables with a p-value of ≤0.10. C-statistic (equivalent to the area under the Receiver Operating Characteristic curve) was used as an indication of the predictive accuracy of the
final models. All data analysis was performed using SPSS statistical software version 21 (SPSS Inc, USA).

**Results**

*Baseline characteristics*

From November 2007 and February 2011 there were 840 eligible participants admitted to hospital across both sites, 491 were screened with 452 (92%) consenting to participate. There were 349 eligible participants that were not screened due to resource limitations. Additional analysis of those eligible but not screened was not possible due to lack of patient consent ethical considerations. Potential participants were likely to have been missed at random. There were 31 refusals and eight who were discharged and unable to be contacted. Reasons for refusals were: not interested (10); language difficulties (5); and already involved in another study (1). The remaining 15 gave no reason.

The mean age of participants in the study was 40 years (17.1 SD) with a range of 18-87 years. Serious injuries with ISS/NISS of 9-15 were sustained by 56% (ISS) and 42% (NISS). The majority of participants were male (75%). More participants (59%) were in the IRSD middle and lower two quintiles with corresponding middle and lower household income brackets. Seventeen percent had obtained a bachelor degree or above.

At the time of injury 74% of participants were working, the majority full time (83%), on full duties (96%). Job satisfaction was high (96%), and 90% expected to return to work following injury. Only 35% considered themselves at fault in the crash and 91% of crashes occurred on a public road.
Excellent pre-injury health was perceived by 30%, while 7% considered it fair to poor. Regarding other health factors, 35% had a chronic illness, 60% were overweight or obese, 27% had taken medication in the last two weeks and 28% were current smokers. Overall the majority had a low risk of long term harm due to alcohol consumption (93%) but a larger risk of short term harm at 56%, that is: injury due to alcohol consumption (data not shown).

**Compensation and participant status**

In line with the study aims, participants were analysed by their compensation status (i.e. claim made or no claim made regardless of claim acceptance). The characteristics of each group are illustrated in Table 1. Of the 301 (67%) participants that completed the six month follow up questionnaire, 294 answered the compensation related questions and of those 61% (179/294) made a compensation claim.

There were significant differences between the compensable and non-compensable groups. Notably, those with greater eligibility to make a compensation claim under NSW legislation did so: these participants self-reported not at fault and were involved in a crash on a public road. There were no significant differences in pre-injury or baseline health status between the two groups, these measures largely related to physical health. There were significant differences between responders and non-responders at follow up, these are illustrated in Table 2. For all other variables there was no significant difference (p > 0.05) between responders and non-responders (data not shown).

Within the compensable cohort (n=179), rates of claim acceptance and legal representation at six months were investigated. These results are shown in Table 3. A CTP claim was made by 117 participants, with 80% being legally represented at six months compared to 48% of the
54 WC claimants. Only 55% of CTP claimants knew their claim was accepted compared to
82% of WC claimants. There were eight other claims (i.e. not CTP or WC). These differences
were significant (p<0.001) across the three groups (i.e. CTP, WC and other).

**Predictors of making a claim**

In the unadjusted analysis the most significant predictors of making a claim reflected greater
eligibility to claim such that participants who self-reported at fault were much less likely to
claim (OR 0.14, 95%CI 0.08-0.23, p<0.001), and participants who were involved in a crash
on a public road were more likely to claim (OR 3.74, 95%CI 1.63-8.59, p=0.002). For our
study, we were interested in factors other than eligibility and the final model was restricted
accordingly; these results are shown in Table 4.

The most significant predictor of claiming compensation in the adjusted analysis was BMI.
Obese or overweight participants were more likely to make a claim than those with normal or
low BMI. Participants involved in a motorcycle crash and those at risk for short term harm
(injury) due to alcohol consumption were less likely to make a claim than those who were not
at risk. Those who were socioeconomically advantaged and most advantaged were less likely
to claim compared with those of average advantage and those with fair-poor health compared
to those with excellent health were also less likely to claim. The C-statistic for the
multivariable logistic regression model was 0.71 indicating that the predictive value of the
model was acceptable. Values of 0.8-0.9 are considered excellent but higher values are rare
[46].
Predictors of legal representation

As previously described, the final model was restricted to factors other than eligibility. The significant predictors of self-reported fault (OR 0.08, 95%CI 0.03-0.19, p<0.001) and crash on a public road (OR 9.16, 95%CI 1.84-45.7, p=0.007) were removed from the analysis. Participants who spoke a language other than English at home were more likely to seek legal representation, and those participants with a household income of ≤ AUD$39,999 were more likely to seek legal representation compared to participants with higher household income. Participants who were most socioeconomically advantaged were less likely to seek legal representation compared to participants with average disadvantage, this relationship was not linear. These results are displayed in Table 5. The C-statistic for the multivariable logistic regression model was 0.77.

To check for multicollinearity between the variables in the models, correlations and VIF were tested. The correlations found were small, that is: $r_s<0.4$ and unlikely to cause any multicollinearity problems. This was confirmed with multicollinearity diagnostic testing using VIF with results showing VIFs ≤ 2 for all the variables. A VIF of greater than five or 10 usually indicates a multicollinearity problem.

Discussion

In summary, the most significant predictor of making a claim was being overweight or obese. Motorcycle crash, risk of short term harm due to alcohol consumption and poorer pre-injury health were associated with a decreased likelihood of making a claim. Amongst compensable participants, the predictors of seeking legal representation were largely related to socio-
economic factors. Lastly, the differences between compensable and non-compensable participants were not related to physical pre-existing/baseline health status measures.

**Compensation status**

It has been suggested that people with poorer health are more likely to claim than those in good health and that pre-injury/baseline health accounts for a poorer recovery not ‘exposure’ to compensation [10, 11]. We found that the differences between those ‘exposed’ (i.e. made a claim) and those ‘unexposed’ were not related to certain health measures. Bias from reverse causality was not detected in this cohort [15]. However, these results should be interpreted with caution due to the limited psychological variables measured.

The timeframes for claim acceptance reflect scheme design – WC is no-fault, CTP is fault-based, the latter can delay liability determinations. Likewise, explanations for high legal representation include liability issues, access to financial entitlements and/or the complexity of negotiating the claims process as reported previously [14, 22].

**Predictors of making a claim and legal representation**

Eligibility contributes to propensity to claim, which is as expected. However, injury severity (ISS/NISS) was not a predictor, which is unexpected given the moderate to severe injuries sustained by participants. It has been shown that those with minor injuries are far less likely to claim due to the inconvenience and effort required [18, 19]. For other factors, higher BMI has been associated with poorer physical and mental health, and long term disability [47, 48]. In Australia, where almost 63% of adults are overweight or obese, obesity is a national health priority area and a significant public health problem [34]. Overweight or obese people could be faced with a prolonged recovery and therefore, more likely to claim. There is evidence
linking obesity to increased WC claim rates across numerous jurisdictions particularly for upper and lower limb injuries [49-51]. It follows that people with a higher BMI may be more likely to experience greater levels of disability and people with greater disability are more likely to make a claim.

For those less likely to claim, motorcyclists are more likely to be involved in single vehicle crashes [52]. In these crashes there is no one to claim against [44]. In addition, speeding and alcohol are stronger contributors to single vehicle crashes, which could result in traffic and/or criminal violations [52]. In NSW, a police report is required to make a claim and motorcyclists could be less likely to approach police under these circumstances [53, 54]. These are plausible reasons for the low claim rate in motorcyclists.

Similarly, short term harm due to greater alcohol consumption increases the risk of alcohol-related injury [55]. The most common cause of death due to intoxication is a road traffic crash [56], and alcohol consumption is linked to numerous medical conditions, which along with pre-injury fair-poor health could be associated with being disadvantaged and/or not understanding how to claim. This last comment should be interpreted cautiously due to small numbers in this group. In addition, those who are socioeconomically advantaged are more likely to have higher levels of education and be employed in professional and/or associated jobs, and less likely to have co-morbidities. This is likely to reduce their need to claim for economic and other losses such as medical expenses [57].

Besides eligibility, a person’s decision whether or not to make a claim can also be influenced by other factors. These include a perception their injury is too minor, concerns about current or future employment options, and/or a lack of knowledge about eligibility to claim [18, 19].
Our study population sustained moderate to severe, not minor injuries, so this is unlikely to have been a factor. Concerns about current or future employment options and a lack of knowledge about eligibility to claim are possible but they were not measured in this study.

The predictors of legal representation were speaking a language other than English at home and a low household income. These factors are commonly associated with health inequities (e.g. increased illness and disability, poor access to health services, and poor health literacy) [57, 58]. These inequities could lead to increased legal representation due to the complexity of managing a claim and/or accessing health care services via a third party payer (the insurer) [14, 22]. Alternatively, people who are most socioeconomically advantaged may not require legal assistance to access financial entitlements particularly if work capacity is not affected.

Moreover, qualitative research shows people feel they require legal representation to assist with adversarial claims processes, accessing reasonable entitlements, perceived illegitimacy of injury, and system disorganisation (e.g. communication and administrative deficits) [20, 22, 23]. It is feasible these factors would be challenging to people with limited English proficiency and those from lower socio-economic backgrounds particularly in the presence of physical or psychological limitations.

**Strengths and limitations**

Our prospective study was a trauma cohort of moderate to severe injuries involving upper and lower limb fractures. We used validated and standardised measures. Participants were predominantly male, from lower socio-economic backgrounds with a household income below AUD $80,000. Although reflective of a more severe trauma population, they may not
be representative of all CTP and WC claimants. The issues surrounding eligibility to claim are complex, dependent on scheme design and involve a myriad of legal interpretations.

It would have been beneficial to measure self-reported fault by including the constructs of blame, perceived injustice and/or attributions of responsibility [59, 60]. Recent research has shown that these factors are significant predictors of poorer health outcomes [5, 59, 60]. Fault (i.e. the driver caused the crash) is not the same as blame (i.e. blaming someone or something for the injury) [59, 60]. For example, a driver may have ‘caused’ the crash, but blame his/her passenger for distracting them or poor road conditions. Blame or perceived injustice do not necessarily mean access to compensation. Our singular measure does not encompass these constructs.

Further, the collection of baseline psychological variables would have been useful. Poor baseline mental health and stressfulness has been associated with poor recovery in a compensable setting; which could impact on making a claim and seeking legal representation [13, 14]. Other limitations were recruitment of participants solely from hospital and moderate loss to follow-up (32%).

Lastly, we did not include any indices of social support. There is growing awareness of the importance of social support to aid injury recovery and return to work [61]. There are a number of validated measures of workplace and family support and future research would benefit from their inclusion [62, 63].
Future research and policy implications

The predictors of making a claim illustrate the problems associated with a higher BMI and how this extends into the compensable arena. However, scheme regulators and insurers are limited in their capacity to address this significant societal issue. Conversely, those less likely to claim may benefit from access to health care services and financial entitlements and, if socioeconomically advantaged, may have no need to claim for these items. The predictors of seeking legal representation provide insight into the importance of socio-economic and language factors.

Given the limited research, these factors need to be explored in different populations with alternative compensation systems to determine whether the findings are replicable. The presence of reverse causality bias should be routinely investigated if compensation related factors are potential confounders.

For policy makers there is an opportunity to conduct risk assessments, identify those likely to struggle post injury, and attempt to mitigate that risk with proactive health interventions and claims management. In addition, extra assistance for claimants from CALD and lower socio-economic backgrounds may alleviate some of the pressure to seek external advice. For example: face-face meetings conducted in an appropriate language; a streamlined claims process; and/or early payments for treatment and financial hardship. Conversely, the most socioeconomically advantaged may benefit from minimal insurer intervention.

Finally, the generalisability of our results could be affected by the diverse and complex socio-political environment of compensation schemes. For example, NSW has a predominantly fault-based modified common law CTP scheme; whereas other Australian states have purely
common law or no-fault CTP schemes. Internationally, compensation schemes are based on mechanism of injury and/or type of disability, and/or governing legislation to access financial entitlements. Notwithstanding that, themes from qualitative research appear to be consistent across jurisdictions and countries [20, 21]. Further, increased BMI has been associated with greater absenteeism, healthcare costs and claim rates across numerous jurisdictions, albeit in larger cohorts [50, 51].

**Conclusion**

Seeking financial compensation was associated with a higher pre-injury BMI rather than injury-related factors. Seeking legal representation was solely related to socio-economic factors. Evidence to date suggests these relationships are complex, population specific and dependent on scheme design.

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**Authors’ Contributions:** Authors DM, IH and IC contributed significantly to: study conception and design; data acquisition, analysis and interpretation. Author JSC conducted the statistical analysis and provided data interpretation (deceased 22 October 2014). All authors contributed to drafting and critical revision of the manuscript.

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References


Table 5.1: Baseline characteristics and health status by compensation claim status at six months

<table>
<thead>
<tr>
<th>Variable</th>
<th>No.</th>
<th>Claim made (n=179)</th>
<th>No claim made (n=115)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years), Mean (SD)</strong></td>
<td>294</td>
<td>41.3 (16.0)</td>
<td>39.7 (16.7)</td>
<td>0.42</td>
</tr>
<tr>
<td><strong>Injury Severity Score, No. (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor - moderate 1-8</td>
<td>294</td>
<td>44 (24.6)</td>
<td>31 (27.0)</td>
<td>0.62</td>
</tr>
<tr>
<td>Serious 9-15</td>
<td></td>
<td>105 (58.7)</td>
<td>61 (53.0)</td>
<td></td>
</tr>
<tr>
<td>Severe - critical 16-75</td>
<td></td>
<td>30 (16.8)</td>
<td>23 (20.0)</td>
<td></td>
</tr>
<tr>
<td><strong>New Injury Severity Score, No. (%)</strong></td>
<td>294</td>
<td>34 (19.0)</td>
<td>25 (21.7)</td>
<td>0.49</td>
</tr>
<tr>
<td>Minor - moderate 1-8</td>
<td></td>
<td>67 (37.4)</td>
<td>48 (41.7)</td>
<td></td>
</tr>
<tr>
<td>Serious 9-15</td>
<td></td>
<td>105 (58.7)</td>
<td>61 (53.0)</td>
<td></td>
</tr>
<tr>
<td>Severe - critical 16-75</td>
<td></td>
<td>78 (43.6)</td>
<td>42 (36.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Index of Relative Socioeconomic Disadvantage, Mean (SD)</strong></td>
<td>294</td>
<td>969 (149)</td>
<td>990 (149)</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Index of Relative Socioeconomic Disadvantage, No. (%)</strong></td>
<td>294</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td></td>
<td>53 (29.6)</td>
<td>28 (24.3)</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td></td>
<td>17 (9.5)</td>
<td>6 (5.2)</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>37 (20.7)</td>
<td>17 (14.8)</td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td></td>
<td>37 (20.7)</td>
<td>38 (33.0)</td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td></td>
<td>35 (19.5)</td>
<td>26 (22.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Male, No. (%)</strong></td>
<td>294</td>
<td>120 (67.0)</td>
<td>90 (78.3)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Marital status, No. (%)</strong></td>
<td>293</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td></td>
<td>58 (32.4)</td>
<td>46 (40.4)</td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td></td>
<td>103 (57.5)</td>
<td>56 (49.1)</td>
<td></td>
</tr>
<tr>
<td>Divorced/widowed/separated</td>
<td></td>
<td>18 (10.1)</td>
<td>12 (10.5)</td>
<td></td>
</tr>
<tr>
<td><em><em>Education skill level</em>, No. (%)</em>*</td>
<td>291</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree and above</td>
<td></td>
<td>36 (20.1)</td>
<td>17 (15.0)</td>
<td>0.06</td>
</tr>
<tr>
<td>Certificate and advanced diploma</td>
<td></td>
<td>66 (36.9)</td>
<td>53 (46.9)</td>
<td></td>
</tr>
<tr>
<td>Secondary education</td>
<td></td>
<td>65 (36.3)</td>
<td>42 (37.2)</td>
<td></td>
</tr>
<tr>
<td>Pre-primary and primary education</td>
<td></td>
<td>11 (6.1)</td>
<td>1 (0.9)</td>
<td></td>
</tr>
<tr>
<td><em><em>Occupation skill level</em>, No. (%)</em>*</td>
<td>294</td>
<td></td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>Home duties/retired</td>
<td></td>
<td>15 (8.4)</td>
<td>6 (5.2)</td>
<td></td>
</tr>
<tr>
<td>Managers/administrators/ professionals/associate professionals</td>
<td>39 (21.8)</td>
<td>31 (27.0)</td>
<td>50 (27.9)</td>
<td>42 (36.5)</td>
</tr>
<tr>
<td>Tradespersons/advanced clerical and service workers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate clerical/sale/service production/transport workers</td>
<td>28 (15.6)</td>
<td>14 (12.2)</td>
<td>47 (26.3)</td>
<td>22 (19.1)</td>
</tr>
<tr>
<td>Elementary clerical/sales/service/labourers/related workers</td>
<td>28 (15.6)</td>
<td>14 (12.2)</td>
<td>47 (26.3)</td>
<td>22 (19.1)</td>
</tr>
<tr>
<td><strong>Work status before injury (working), No. (%)</strong></td>
<td>292</td>
<td>140 (78.2)</td>
<td>91 (80.5)</td>
<td>0.64</td>
</tr>
<tr>
<td><strong>Work level before injury (full duties), No. (%)</strong></td>
<td>231</td>
<td>133 (95.0)</td>
<td>89 (97.8)</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>Work hours before injury (full time), No. (%)</strong></td>
<td>227</td>
<td>105 (76.8)</td>
<td>80 (88.9)</td>
<td>0.02</td>
</tr>
<tr>
<td><em><em>Pre-injury job satisfaction</em> (satisfied), No. (%)</em>*</td>
<td>231</td>
<td>136 (97.1)</td>
<td>84 (92.3)</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Recovery expectations for work (yes), No. (%)</strong></td>
<td>229</td>
<td>125 (89.9)</td>
<td>85 (94.4)</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Recovery expectations for usual activities (days), No. (%)</strong></td>
<td>278</td>
<td>104 (60.5)</td>
<td>74 (69.8)</td>
<td>0.37</td>
</tr>
<tr>
<td>≤90</td>
<td></td>
<td>104 (60.5)</td>
<td>74 (69.8)</td>
<td></td>
</tr>
<tr>
<td>91-180</td>
<td></td>
<td>37 (21.5)</td>
<td>20 (18.9)</td>
<td></td>
</tr>
<tr>
<td>181-365</td>
<td></td>
<td>24 (14)</td>
<td>10 (9.4)</td>
<td></td>
</tr>
<tr>
<td>≥366</td>
<td></td>
<td>7 (4.1)</td>
<td>2 (1.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Language other than English (yes), No. (%)</strong></td>
<td>294</td>
<td>72 (40.0)</td>
<td>32 (27.8)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Total yearly household income† (before tax, AUD) excluding number of people in household, No. (%)</strong></td>
<td>270</td>
<td>42 (25.5)</td>
<td>22 (21.0)</td>
<td>0.47</td>
</tr>
<tr>
<td>≤$39,999</td>
<td></td>
<td>42 (25.5)</td>
<td>22 (21.0)</td>
<td></td>
</tr>
<tr>
<td>$40,000-$79,999</td>
<td></td>
<td>55 (33.3)</td>
<td>32 (30.5)</td>
<td></td>
</tr>
<tr>
<td>Income Range</td>
<td>Total Adjusted Yearly Household Income (before tax, AUD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥$80,000</td>
<td>68 (41.2)</td>
<td>51 (48.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $39,999</td>
<td>97 (58.8)</td>
<td>58 (55.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40,000-$79,999</td>
<td>54 (32.7)</td>
<td>32 (30.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥$80,000</td>
<td>14 (8.5)</td>
<td>15 (14.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BMI Range</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.50 (underweight)</td>
<td>4 (2.3)</td>
<td>3 (2.6)</td>
</tr>
<tr>
<td>18.50-24.99 (normal)</td>
<td>49 (27.7)</td>
<td>47 (40.9)</td>
</tr>
<tr>
<td>≥25.00 (overweight)</td>
<td>78 (44.1)</td>
<td>35 (30.4)</td>
</tr>
<tr>
<td>≥30.00 (obese)</td>
<td>46 (26.0)</td>
<td>30 (26.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking History</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td>34 (19.1)</td>
<td>28 (24.3)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>47 (26.4)</td>
<td>36 (31.3)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>97 (54.5)</td>
<td>51 (44.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic Illnesses</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>71 (39.7)</td>
<td>37 (32.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medication Use (Current)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52 (29.2)</td>
<td>32 (27.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recent Injury Other Than Crash</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>7 (3.9)</td>
<td>5 (4.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol Use in the Past Year</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>37 (20.7)</td>
<td>18 (15.7)</td>
</tr>
<tr>
<td>≤1/month</td>
<td>45 (25.1)</td>
<td>20 (17.4)</td>
</tr>
<tr>
<td>2-4 times/month</td>
<td>42 (23.5)</td>
<td>30 (26.1)</td>
</tr>
<tr>
<td>2-3 times/week</td>
<td>32 (17.9)</td>
<td>24 (20.9)</td>
</tr>
<tr>
<td>≥4 times/week</td>
<td>23 (12.8)</td>
<td>23 (20.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol Use in the Past Year (≥6 standard drinks/occasion)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>84 (46.9)</td>
<td>39 (33.9)</td>
</tr>
<tr>
<td>Less than monthly</td>
<td>47 (26.3)</td>
<td>34 (29.6)</td>
</tr>
<tr>
<td>Monthly</td>
<td>16 (8.9)</td>
<td>14 (12.2)</td>
</tr>
<tr>
<td>Weekly</td>
<td>27 (15.1)</td>
<td>20 (17.4)</td>
</tr>
<tr>
<td>Daily or almost daily</td>
<td>5 (2.8)</td>
<td>8 (7.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk of Long Term Harm Due to Alcohol Consumption (standard drinks/week)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk - ≤28 male or ≤14 female</td>
<td>172 (96.1)</td>
<td>104 (91.2)</td>
</tr>
<tr>
<td>Risky - 29–42 male or 15–28 female</td>
<td>4 (2.2)</td>
<td>4 (3.5)</td>
</tr>
<tr>
<td>High risk - ≥43 male or ≥29 female</td>
<td>3 (1.7)</td>
<td>6 (5.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk of Short Term Harm Due to Alcohol Consumption (yes)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>95 (53.1)</td>
<td>76 (66.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-reported at fault (yes)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>33 (18.5)</td>
<td>72 (62.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle</td>
<td>111 (62.0)</td>
<td>52 (45.2)</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>61 (34.1)</td>
<td>58 (50.4)</td>
</tr>
<tr>
<td>Bicycle</td>
<td>7 (3.9)</td>
<td>5 (4.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-morbid Neck Pain in Last 6 Months (yes)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>6 (3.4)</td>
<td>9 (7.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-morbid Neck Pain (yes)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>38 (21.2)</td>
<td>21 (18.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crash on a Public Road (yes)</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>170 (95.0)</td>
<td>96 (83.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-assessed Pre-injury Health Status#</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>55 (30.7)</td>
<td>35 (30.4)</td>
</tr>
<tr>
<td>Very Good</td>
<td>72 (40.2)</td>
<td>41 (35.7)</td>
</tr>
<tr>
<td>Good</td>
<td>46 (25.7)</td>
<td>26 (22.6)</td>
</tr>
<tr>
<td>Fair-Poor</td>
<td>6 (3.4)</td>
<td>13 (11.3)</td>
</tr>
</tbody>
</table>

^Pre-injury job satisfaction is based on the stem question from the Measure of Job Satisfaction questionnaire by Traynor, M. and Wade, B. 1993.

±Categories of income are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey Wave 6 Household Questionnaire.

~BMI classification is from the Global Database on Body Mass Index, World Health Organisation.

ᶿ1 standard drink contains 12.5 millilitres or 10 grams of alcohol according to the National Health and Medical Research Council (NHMRC), Australian Alcohol Guidelines Health Risks and Benefits, October 2001.

#Self-assessed pre-injury health status is based on Question 1 from the Short Form 36, version 2, (SF36v2).
Table 5.2: Baseline characteristics and health status of participants in the study compared to non-participants at six month follow up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participation at six months</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes(^c) (n=301)</td>
<td>No (n=151)</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Age (years), Mean (SD)</td>
<td>41.2 (16.5)</td>
<td>36.5 (17.8)</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>Marital status, No. (%)</td>
<td></td>
<td></td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>107 (35.7)</td>
<td>80 (53.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/defacto</td>
<td>162 (54.0)</td>
<td>54 (36.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced/widowed/separated</td>
<td>31 (10.3)</td>
<td>15 (10.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation skill level*, No. (%)</td>
<td></td>
<td></td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Home duties/retired</td>
<td>22 (7.3)</td>
<td>17 (11.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managers/administrators/professionals/associate professionals</td>
<td>71 (23.6)</td>
<td>27 (17.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tradespersons/advanced clerical and service workers</td>
<td>93 (30.9)</td>
<td>33 (21.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate clerical/sale/service production/transport workers</td>
<td>43 (14.3)</td>
<td>21 (13.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary clerical/sales/service/workers/related workers</td>
<td>72 (23.9)</td>
<td>53 (35.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work status before injury (working), No. (%)</td>
<td></td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Total yearly household income± (before tax, AUD) excluding number of people in household, No. (%)</td>
<td></td>
<td></td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>≤$39,999</td>
<td>68 (24.5)</td>
<td>47 (35.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40,000-$79,999</td>
<td>89 (32.1)</td>
<td>47 (35.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥$80,000</td>
<td>120 (43.3)</td>
<td>40 (29.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking history, No. (%)</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>64 (21.3)</td>
<td>61 (40.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>86 (28.7)</td>
<td>33 (22.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>150 (50.0)</td>
<td>56 (37.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle type, No. (%)</td>
<td></td>
<td></td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>169 (56.1)</td>
<td>102 (67.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td>120 (39.9)</td>
<td>37 (24.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>12 (4.0)</td>
<td>12 (7.9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^c\) Participation status ‘yes’ was measured using the information recorded in variables - work status at six months and the SF36, Physical Component Score (PCS).

*The measure for occupation is from the Australian Standard Classification of Occupations (ASCO), Cat. No. 1220.0, Australian Bureau of Statistics 1997.

±Categories of income are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey Wave 6 Household Questionnaire.
### Table 5.3: Relationships between claim type and legal representation* and claim acceptance among 179 participants who made a claim within first six months

<table>
<thead>
<tr>
<th>Claim type at 6 months</th>
<th>Compulsory Third Party</th>
<th>Workers Compensation</th>
<th>Other±</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td></td>
</tr>
<tr>
<td>Legal representation at 6 months</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>93 (79.5)</td>
<td>26 (48.1)</td>
<td>6 (75.0)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>24 (20.5)</td>
<td>28 (51.9)</td>
<td>2 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Claim acceptance at 6 months</td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>64 (54.7)</td>
<td>44 (81.5)</td>
<td>2 (25.0)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>10 (8.5)</td>
<td>0 (0)</td>
<td>2 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>43 (36.8)</td>
<td>10 (18.5)</td>
<td>4 (50.0)</td>
<td></td>
</tr>
</tbody>
</table>

* Not all participants who sought legal representation made a claim (n=3).
± (medical negligence=1, Australian Defence Force (ADF)=1, Department of Veteran Affairs (DVA)=1, income protection insurance=1, civil action=1, not stated=3).
Table 5.4: Predictors for making a claim at six months (n=294)

<table>
<thead>
<tr>
<th>Variable*</th>
<th>Unadjusted OR (95% CI)</th>
<th>P</th>
<th>Adjusted^ OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Mass Index (BMI)</strong>~ (kg/m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18.50 (underweight)</td>
<td>1.28 (0.27, 6.02)</td>
<td>0.07</td>
<td>0.87 (0.17, 4.40)</td>
<td>0.005</td>
</tr>
<tr>
<td>18.50-24.99 (normal)</td>
<td>1.00</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>≥25.00 (overweight)</td>
<td>2.14 (1.22, 3.76)</td>
<td></td>
<td>3.05 (1.63, 5.68)</td>
<td></td>
</tr>
<tr>
<td>≥30.00(obese)</td>
<td>1.47 (0.80, 2.71)</td>
<td></td>
<td>1.63 (0.83, 3.20)</td>
<td></td>
</tr>
<tr>
<td><strong>Vehicle type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>1.00</td>
<td>0.02</td>
<td>1.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>0.49 (0.30, 0.80)</td>
<td></td>
<td>0.47 (0.28, 0.82)</td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>0.66 (0.20, 2.16)</td>
<td></td>
<td>0.91 (0.26, 3.21)</td>
<td></td>
</tr>
<tr>
<td><strong>Index of Relative Socioeconomic Disadvantage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>0.87 (0.42, 1.81)</td>
<td>0.09</td>
<td>0.70 (0.32, 1.55)</td>
<td>0.04</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>1.30 (0.44, 3.89)</td>
<td></td>
<td>1.13 (0.35, 3.67)</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>1.00</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>0.45 (0.22, 0.93)</td>
<td></td>
<td>0.37 (0.17, 0.82)</td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>0.62 (0.29, 1.33)</td>
<td></td>
<td>0.39 (0.17, 0.90)</td>
<td></td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree and above</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate and advanced diploma</td>
<td>0.59 (0.30, 1.16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary education</td>
<td>0.73 (0.37, 1.47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-primary and primary education</td>
<td>5.19 (0.62, 43.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work hours before injury</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulltime</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time</td>
<td>2.44 (1.13, 5.25)</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didn’t work</td>
<td>1.28 (0.72, 2.27)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Language other than English (yes)</strong></td>
<td>1.75 (1.05, 2.89)</td>
<td></td>
<td>1.75 (1.05, 2.89)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Risk of short term harm due to alcohol consumption (yes)</strong></td>
<td>0.58 (0.36, 0.94)</td>
<td></td>
<td>0.58 (0.36, 0.94)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Pre-morbid neck pain in last 6 months (yes)</strong></td>
<td>0.41 (0.14, 1.18)</td>
<td></td>
<td>0.41 (0.14, 1.18)</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Self-assessed pre-injury health status#</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>1.00</td>
<td>0.08</td>
<td>1.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Very good</td>
<td>1.12 (0.63, 1.98)</td>
<td></td>
<td>1.45 (0.77, 2.74)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>1.13 (0.59, 2.14)</td>
<td></td>
<td>1.16 (0.58, 2.34)</td>
<td></td>
</tr>
<tr>
<td>Fair-Poor</td>
<td>0.29 (0.10, 0.84)</td>
<td></td>
<td>0.30 (0.09, 0.94)</td>
<td></td>
</tr>
</tbody>
</table>

*All variables with p value <0.20 were included in this table.

^Adjusted for other variables in the column.

±The measure for education is from the Australian Standard Classification of Education (ASCED), Cat. No. 1272.0, Australian Bureau of Statistics 2001.

#Self-assessed pre-injury health status is based on Question 1 from the Short Form 36, version 2, (SF36v2).

~BMI classification is from the Global Database on Body Mass Index, World Health Organisation.
Table 5.5: Predictors for seeking legal representation at six months (n= 179)

<table>
<thead>
<tr>
<th>Variable*</th>
<th>Unadjusted OR (95% CI)</th>
<th>P</th>
<th>Adjusted^ OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language other than English (yes)</td>
<td>2.47 (1.23, 5.00)</td>
<td>0.01</td>
<td>2.80 (1.2, 6.52)</td>
<td>0.02</td>
</tr>
<tr>
<td>Index of Relative Socioeconomic Disadvantage</td>
<td>0.11</td>
<td>0.11</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>0.45 (0.16, 1.28)</td>
<td>0.35 (0.11, 1.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>0.63 (0.15, 2.61)</td>
<td>0.98 (0.16, 5.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantaged</td>
<td>0.40 (0.13, 1.23)</td>
<td>0.50 (0.16, 1.60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>0.23 (0.08, 0.69)</td>
<td>0.15 (0.04, 0.50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.47 (0.23, 0.99)</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>0.68 (0.34, 1.37)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced/widowed/separated</td>
<td>6.48 (0.80, 52.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work status before injury (working)</td>
<td>0.35 (0.14, 0.89)</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery expectations for work (yes)</td>
<td>0.29 (0.06, 1.33)</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total yearly household income (before tax, AUD)</td>
<td>0.04</td>
<td>0.045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤$39,999</td>
<td>3.49 (1.29, 9.43)</td>
<td>3.63 (1.22, 10.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40,000-$79,999</td>
<td>1.10 (0.53, 2.32)</td>
<td>0.98 (0.44, 2.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥$80,000</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol use in the past year</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>4.40 (1.15, 16.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤1/month</td>
<td>0.80 (0.28, 2.28)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-4 times/month</td>
<td>1.50 (0.50, 4.51)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 times/week</td>
<td>0.78 (0.26, 2.37)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥4 times/week</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-morbid neck pain in last 6 months (yes)</td>
<td>0.20 (0.04, 1.14)</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-morbid neck pain (yes)</td>
<td>2.21 (0.91, 5.40)</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* All variables with P value <0.20 were included in this table.
^ Adjusted for other variables in the column.
±Categories of income are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey Wave 6 Household Questionnaire.
Chapter 6: Predictors of Return to Work Following Motor Vehicle Related Orthopaedic Trauma

Journal Article 5

Chapter 6 is the second paper from the inception cohort study, it explores the association between individual worker and injury characteristics, compensation related factors, and return to work over time. Of particular interest are predictors that could be amenable to change. Thus, the aim is to:

- determine the predictors (including compensation related factors) of time to RTW.

This chapter is reprinted from:

Murgatroyd DF, Harris IA, Tran Y, Cameron ID. Predictors of return to work following motor vehicle related orthopaedic trauma. BMC Musculoskelet Disord. 2016; 17(1):171.
Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper ‘Predictors for return to work following motor vehicle related orthopaedic trauma’ we confirm that Darnel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Data collection, analysis and data synthesis
- Manuscript preparation and critical review

Professor Ian Harris  
Signed:  
Date: 23.11.15

Dr Yvonne Tran  
Signed:  
Date: 23.11.15

Professor Ian Cameron  
Signed:  
Date: 23.11.15

This paper is under review.
Predictors of return to work following motor vehicle related orthopaedic trauma

Daniell F. Murgatroyd, Jan A. Harris, Yvonne Tran and Ian D. Cameron

Abstract

Background: Work disability following motor vehicle related orthopaedic trauma is a significant contributor to the burden of injury and disease. Early identification of predictors for return to work (RTW) is essential for developing effective interventions to prevent work disability. The study aimed to determine the predictors (including compensation related factors) of time to RTW following motor vehicle related orthopaedic trauma.

Methods: Admitted patients were recruited prospectively from two trauma hospitals with upper and/or lower extremity fractures following a motor vehicle crash. Baseline and follow-up data were collected by written questionnaire. For baseline, this occurred in person within 2 weeks of injury. For follow-up, this occurred by mail at 6, 12 and 24 months. Additional demographic and injury-related information was retrieved from hospital databases. Analysis involved descriptive statistics, logarithm test to detect survival distributions of categorical variables; and Cox proportional hazards regression models for risks of time to RTW using baseline characteristic and compensation related variables (at 6 months).

Results: Of 452 study participants, 334 (74%) were working pre-injury; results are based on this subset. Baseline characteristics were mean age 36 years (13.9 Standard Deviation [SD]), 80% male; 72% self-assessed very good/excellent pre-injury health, 83% household income > AUS40,000 (Australian Dollar). Follow up data was available for 233 (70%), 210 (68%) and 182 (54%) participants at 6, 12 24 months, respectively. Significant risks of a longer time to RTW were greater injury severity, as measured by the New Injury Severity Score (NISS) (HR = 0.54, 95% CI 0.35-0.82) and having lower occupational skill levels (HR = 0.57, 95% CI 0.34-0.83). Significant risks of a shorter time to RTW were: recovery expectations for usual activities within 90 days (HR = 2.10, 95% CI 1.49-2.90); full-time pre-injury work hours (HR = 1.95, 95% CI 1.26-3.14); and very good self-assessed pre-injury health status (HR = 1.45, 95% CI 0.98-2.02). Legal representation (analyzed at six months only) was not associated with time to RTW. At each time period, there were 146 (63%), 149 (71%), and 137 (76%) working participants.

Conclusions: A longer time to RTW was associated with greater injury severity and lower occupational skill levels; while a shorter time to RTW was associated with recovery expectations for usual activities within 90 days, full-time pre-injury work hours, and very good self-assessed pre-injury health status. Our findings reinforce existing research. There is an opportunity to trial interventions that address potentially modifiable factors. The issues surrounding legal representation are complex and require further research.

Keywords: Compensation and redress, Wounds and injury, Multiple trauma, Return to work.
Background

Work is pivotal to determining individual identity, social roles and status; it is also a key factor in physical and mental health and it provides financial security and enables active participation in society [1]. Consequently, work disability following trauma intensifies the societal burden with increased disability, pain and health care utilisation rates [2–4]. In addition, motor vehicle related orthopaedic trauma is a significant contributor to the burden of injury and disease that commonly involves people of working age [5].

Early identification of predictors for return to work (RTW) after injury is essential as a prerequisite for developing effective interventions to prevent work disability and reduce the overall burden of injury [6]. However, there remains a lack of rigorous prospective studies following orthopaedic trauma that investigate these predictors. Results from a systematic review were inconclusive with limited predictors measured across studies, short follow up periods, and selective reporting of results [7]. Nonetheless, individual studies have shown that education, occupation, injury severity, self-efficacy and compensation related factors are predictive of work disability in this population [2–4, 8].

There are many predictors for RTW: individual worker factors such as job and injury characteristics; medical and vocational rehabilitation interventions; and organisational employer/insurer characteristics [6, 9]. Other factors include societal, legislative and macro-economic factors such as litigation, compensation scheme design, wage replacement benefits, and unemployment rates. Many of these are population specific [6].

In that context, there is evidence of an association between compensation related factors and poorer health outcomes, including RTW, following trauma [7, 10].

These associations have been found in workers compensation and traffic injury compensation systems across jurisdictions and injury types, despite the highly contextual socio-political environment in which compensation schemes operate. Similarly in qualitative research, adversarial claims processes, perceived legitimacy of injury, and financial hardship have also impacted negatively on injury recovery and RTW [11–13].

Our study explored the association between individual worker and injury characteristics, compensation related factors, and time to RTW. Of particular interest were predictors that could be amenable to change [6, 7]. Thus, the aim was to determine the predictors (including compensation related factors) of time to RTW following motor vehicle related orthopaedic trauma.

Methods

Study design and setting

The inception cohort study recruited patients from two trauma hospitals in Sydney, New South Wales (NSW), Australia between November 2007 and February 2011, to provide a representative sample of motor vehicle related orthopaedic trauma requiring inpatient hospitalisation. Eligible patients identified via a hospital trauma database were invited to participate. Informed consent was obtained. Patients from Culturally and Linguistically Diverse (CALD) backgrounds were interviewed with an English speaking family member.

Inclusion criteria were:

• admission to hospital within 2 weeks of injury;
• involvement in a motor vehicle crash;
• age 18 years or over; and
• an upper or lower extremity fracture (humerus, radius, ulna, pelvis, acetabulum, femur, patella, tibia, fibula, talus, calcaneus).

All extremity and pelvic fractures that required admission to hospital were included. These fractures were selected because treatment usually involves hospital admission and surgical intervention, but surgery alone was not an inclusion criterion. There were no restrictions, therefore, intra-articular and/or extra-articular, open and/or closed, and simple and/or complex fractures were included. Spinal trauma was excluded because these injuries were not usually treated at the participating centres.

Exclusion criteria were:

• dementia or a significant pre-existing cognitive impairment preventing the ability to consent;
• spinal cord injury;
• Glasgow Coma Score <12 on admission;
• amputation of a limb or
• isolated clavicle, scapula, phalangeal, carpal, metacarpal, tarsal or metatarsal fractures not requiring admission to hospital.

There were 32 variables allowing for 10 participants per variable, a sample size of 450 was calculated [14]. This was considered sufficient to accommodate a 25% loss to follow up, based on similar research [15].

Follow up questionnaires were posted at six, 12 and 24 months post injury. Of no response was received by 3 weeks, up to six attempts were made to contact participants by telephone and/or by mailing additional questionnaires.

Baseline data were collected in hospital within 2 weeks of injury using a written questionnaire. Demographic and injury related information was retrieved from the hospital trauma database and records. The study factors were chosen to reflect the study aims with reference to relevant research [16–18]. The study was approved by the governing human research ethics committees (South
Western Sydney Local Health District, South Eastern Sydney Local Health District, and The University of Sydney.

**Injury related factors**

Injuries were coded using the Abbreviated Injury Scale (AIS) (1990 Revision, Update 98) [19]. The AIS ranks injuries from one to six (six is not survivable). The Injury Severity Score (ISS) and New Injury Severity Score (NISS) were calculated by summing the squares of the three highest AIS scores from different body regions (ISS), and regardless of body region (NISS). They are indicators of potential mortality [20]. Injuries were classified as minor — moderate [1—6], serious [7—15] or severe — critical (16—75) [21].

**Socio-demographic factors**

Socio-demographic factors included age, gender, marital status, occupation, and education. Income was measured exclusive and inclusive of household structure to allow for potential differences in income distribution. An adjusted income (inclusive of household structure) was calculated by dividing the income by the sum of points: 1 for the first person aged >15 years; and 0.3 for each person aged <15 years [22].

**Health related factors**

Self-reported chronic illnesses were measured as an indicator of baseline health status, they were asthma, cancer, heart and circulatory conditions, diabetes, arthritis, osteoporosis, mental and behavioural problems, and neck/back disorders. These self-reported illnesses were compatible with the National Health Priority Areas initiative (conditions that imposed high social and financial costs on Australian society) [23]. A chronic condition was defined as one which the patient currently has, and which has lasted or is expected to last for six months or more, from the Australian Bureau of Statistics (ABS) Health Survey [22, 23]. Other factors included: recent injuries (other than the motor vehicle crash) in the last 4 weeks requiring medical intervention or a decrease in usual activity; medication use in the last 2 weeks for a chronic illness; and smoker status [22].

Previous research has found an association between poor expectations for recovery and poor RTW and health outcomes, but there was an absence of validated measures[9, 18, 24, 25]. Therefore, we used two applicable measures from a large Canadian study of soft tissue injuries [24]. The questions asked were: If you were working before the motor vehicle accident, do you think you will recover enough to return to your usual job (Y/N); and How long do you think it will take you to return to your usual activities (number of days).

Alcohol consumption was measured using the first three questions of the Alcohol Use Disorders Identification Test: Self-Report Version (AUDIT-C) [26]. The word 'standard' and 'in the past year' were added. Risk of long/short term harm due to alcohol consumption was assessed with the National Health and Medical Research Council (NHMRC) levels [27]. Because these levels were mismatched with the AUDIT-C categories, an algorithm was used based on the Bettering the Evaluation of Care and Health (BEACH) Survey, (Associate Professor K Conigrave, personal communication March 19, 2007). Categories for other study factors are explained in the Tables.

**Compensation related measures**

The majority of compensation related factors were recorded at six months because most questions would have been unanswerable at baseline. The following questions were asked: claim made (Y/N); claim type (Compulsory Third Party [CTP]/Workers Compensation [WC]/other); claim accepted (Y/N); don't know; and legal representation obtained (Y/N). Claim made 'yes' was defined as making a personal injury claim of any type, which included a CTP Accident Notification Form (ANF) for expenses less than AUD5,000 (Australian Dollar) within 28 days of injury. At baseline self-reported fault of the driver was measured (i.e. whether the driver considered that they caused the crash). Passengers and pedestrians were considered not at fault.

In NSW, CTP personal injury insurance is a privately underwritten, statutory, modified common law scheme. All motor vehicles travelling on public roads must be registered and insured for CTP. A CTP claim is made against the owner or driver of the vehicle at fault. Since April 2010, regardless of who was at fault, anyone injured in a motor vehicle crash can access limited entitlements (medical expenses and lost wages up to AUD5,000). The WC scheme is publicly underwritten with statutory benefits and administered by private insurers. To make a claim for injury the motor vehicle crash must have occurred during travel between place of employment, home and/or any work-related place and a person injured (regardless of fault). Further, the insurer must be notified of an injury within 48 hours and there is a legal obligation under the NSW WC legislation for employers to accommodate RTW of an injured employee, although there is no obligation under the NSW CTP legislation [28, 29]. In 2015, the government regulators of these schemes merged to form the State Insurance Regulatory Authority (SIRA).

For both schemes, a claim must be lodged within six months of injury and the insurer has three months to determine final liability (accept or deny the claim). Provisional acceptance of liability enables earlier
payment for medical expenses, and for WC weekly wage benefits based on work capacity and weeks since injury [29]. In CTP, lump sum payments are available on a case-by-case basis for financial hardship. Entitlements include past and future losses across each scheme (e.g. medical expenses, loss of income, and pain and suffering/impartiality) [28, 29]. Legal representation can also be obtained at any time for either scheme.

**Outcome measure - return to work**
There are no standardised measures for RTW. Those used in this study encapsulated self-reported duration and level of work [6, 7]. The primary measure was time (days) to return to work (i.e. from date of injury to date of RTW). At each time period work status (Y/N) was measured. Working participants were then asked the date of RTW, if they were working full-modified duties (e.g. lifting restrictions), and full-time (usually working 35 hours per week) or part-time (usually working 1–35 hours per week) [a] [30]. These questions were asked pre-injury (baseline) and post-injury (six, 12 and 24 months). Participants were also asked if their inability to RTW was employment-related, and if they had changed their occupation following injury.

**Data analysis**
RTW baseline characteristics, including full-modified duties and full/part-time, were summarised using descriptive statistics. Outcomes were assessed using survival analysis with Cox proportional hazards regression models employed to determine the multivariate predictors of time to RTW. The Cox model is considered an appropriate approach to accounting for time to an event [31]. The variables selected for the model have been shown to be independent predictors of RTW and/or potential confounders of poorer outcomes in other research [7, 16–18]. Similarly, compensation-related factors were selected for the same reasons [2, 4, 7, 8].

Selection of variables for the Cox model was based on associations between baseline characteristics, including compensation related factors and time to RTW. These were assessed using the logrank test to detect differences in the survival distributions across categorical variables. All variables with p-value ≤ 0.20 were entered into the Cox regression model using a backward elimination process with an entry p-value < 0.05 and an exit p-value < 0.10.

Variable selection was confirmed through explained variation and predictive accuracy using R-squared values calculated with the Cox and Snell R-squared approach and a concordance index [32]. The concordance index is a widely applicable measure with progressive addition of factors that improve discrimination of the model. When a variable is added and the c-index plateaus or decreases, that variable and additional variables can be regarded as noise and excluded to avoid over-fitting in the model [31]. Furthermore, explained variance using R-squared describes the relative importance of adding each variable into the Cox regression model.

Data from participants where the endpoint (RTW) had not occurred or was unknown at 24 months were considered censored. In cases of survival, in which the outcome is death, Hazard Rates Ratios (HRR) greater than 1 indicates risk. However, in this study, the fewer cumulative days of time taken to RTW, the more positive the outcome, in terms of injury recovery/RTW, and the higher the HRR. Therefore, a HRR less than 1 indicates higher risk and a longer time taken to RTW. A test of proportionality was performed on all predictors, and claim made and legal representation. The assumption of proportionality was not violated (p > 0.05) [33].

A separate Cox proportional hazards regression analysis was done for compensation related variables (claim made and legal representation), as these variables were measured at the six month time point and only a portion of participants made a claim and sought legal representation. In this Cox regression, claim made and legal representation were added to the final variables in the baseline RTW model. All data analysis was performed using SPSS statistical software version 22 (SPSS Inc USA).

**Results**
From November 2007 to February 2011, 1,400 eligible participants were admitted to hospital across both sites, 491 were screened (349 eligible participants missed being screened due to resource limitations), and 452 (92 %) consented to participate. There were 31 refusals and eight who were discharged and unable to be contacted. Additional information about recruitment and follow up for study participants is shown in Fig. 1. There were significant differences (p < 0.05) in baseline characteristics, namely socio-demographic and socio-economic factors, between those working and not working pre-injury. These differences were expected and people not working were not included in the analyses (data not shown). Of the 452 participants, our subsequent results are based on the subset of 354 (74 %) participants who worked up to the time of injury.

**Baseline characteristics**
Baseline characteristics were: mean age 36 years (13.9 Standard Deviation [SD]), 80 % male, 73 % self-assessed very good-excellent pre-injury health, 83 % annual household income > AU$40,000. Follow up data was available for 233 (70 %), 210 (65 %), and 182 (54 %) participants at six, 12 and 24 months respectively. There were significant differences between responders and non-responders at six, 12 months and 24 months; this is
explained in Table 1. For all other variables there was no significant difference (p > 0.05) (data not shown). In addition, there were significant differences between those participants that made a claim at six months (n = 140) and those that did not (n = 91). This reflected eligibility to claim under the NSW legislation; those participants more likely to make a claim were not at fault (78%), had crashed on a public road (94%), and worked pre-injury (77%). For all other variables there was no significant difference (p > 0.05) (data not shown).

Characteristics of return to work
At baseline, of the 334 who worked, 83% were full-time and 96% performed full duties. At six months, of the 146 (63% of responders) who worked, 65% were full-time and 63% performed full duties. At 12 months, of the 149 (71% of responders) who worked, 73% were full-time and 69% performed full duties. At 24 months, of the 137 (75% of responders) who worked, 81% were full-time and 79% performed full duties. In addition, at six months, failure to RTW was related to the crash for 84%, and 10% had changed occupation. At 12 months, failure to RTW was related to the crash for 80%, and 16% had changed occupation. At 24 months, failure to RTW was related to the crash for 81%, and 22% had changed occupation.

Overall, there were nine participants who initially returned to work at either six or 12 months but did not remain at work during the subsequent follow-up period(s). Of these, five participants worked at six and 12 months but not at 24 months. Two participants returned to work at 12 months but no longer worked at 24 months, and two participants who had returned to work at six months no longer worked at 24 months.

Predictors of time to return to work
For all 334 study participants, the median time to RTW was 231 days (95% CI 190.05-271.96). For RTW, the probability of participants working at six months was 40.6%, at 12 months was 62.2%, and at 24 months was 74.2%. This is based on the Kaplan-Meier estimates of the survival curve as shown in Fig. 2. Associations between baseline characteristics and time to RTW are shown in Table 2. The significant variables identified in the logrank test, including age and sex, were entered into the Cox proportional hazards regression model. Based on the variables identified from the backwards elimination process, Table 3 shows the concordance (c-index) and R-squared of each of the variables as they were added to the Cox model. The c-index plateaued at the variable of smoking history; the remaining variables were not included in the model. Of the variables that were not significant only age and sex were deemed necessary to be included in the Cox model.

The Cox proportional hazards regression model for risks of time to RTW is presented in Table 4. The significant risks of taking a longer time to RTW were greater injury severity (NISS), namely those with severe critical injuries as compared to those with minor moderate and serious injuries, and lower occupational skill levels as compared to managerial or professional skill levels. In the same model, the significant risks of taking a shorter time to RTW were full-time pre-injury work hours compared to part-time pre-injury work.
Table 5: Baseline characteristics and health status of participants in the study compared to non-participants at six, 12 and 24 month follow up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participation at six months</th>
<th>Participation at 12 months</th>
<th>Participation at 24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n = 107)</td>
<td>Yes (n = 123)</td>
<td>P</td>
</tr>
<tr>
<td>Age (years), Mean (SD)</td>
<td>21.9 (12.0)</td>
<td>28.2 (14.2)</td>
<td>** NS</td>
</tr>
<tr>
<td>New Injury Severity Score, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor - moderate 1-6</td>
<td>22 (18.3)</td>
<td>41 (33.4)</td>
<td>** NS</td>
</tr>
<tr>
<td>Serious 9-15</td>
<td>50 (40.5)</td>
<td>94 (75.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>Severe - critical 16-25</td>
<td>20 (16.1)</td>
<td>96 (78.1)</td>
<td>** NS</td>
</tr>
<tr>
<td>Mental status, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>60 (60.0)</td>
<td>87 (70.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>Married/divorced</td>
<td>36 (36.0)</td>
<td>131 (106.5)</td>
<td>** NS</td>
</tr>
<tr>
<td>Divorced/widowed</td>
<td>4 (4.0)</td>
<td>14 (11.6)</td>
<td>** NS</td>
</tr>
<tr>
<td>Occupation - skill level, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managers/professionals</td>
<td>20 (19.0)</td>
<td>58 (47.2)</td>
<td>** NS</td>
</tr>
<tr>
<td>Translators</td>
<td>26 (25.7)</td>
<td>86 (69.6)</td>
<td>** NS</td>
</tr>
<tr>
<td>Intermediate clerical</td>
<td>17 (16.5)</td>
<td>33 (27.1)</td>
<td>** NS</td>
</tr>
<tr>
<td>Elementary related</td>
<td>38 (37.5)</td>
<td>54 (43.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>Body Mass Index (BMI, kg/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18.5(9) (underweight)</td>
<td>4 (4.0)</td>
<td>2 (1.7)</td>
<td>** NS</td>
</tr>
<tr>
<td>18.5-24.99 (normal)</td>
<td>25 (24.0)</td>
<td>78 (63.4)</td>
<td>** NS</td>
</tr>
<tr>
<td>≥25.00 (overweight)</td>
<td>35 (34.0)</td>
<td>69 (55.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>≥30.00 (obese)</td>
<td>17 (16.0)</td>
<td>62 (50.4)</td>
<td>** NS</td>
</tr>
<tr>
<td>Smoking history, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>88 (82.0)</td>
<td>51 (41.5)</td>
<td>** NS</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>23 (23.0)</td>
<td>67 (54.8)</td>
<td>** NS</td>
</tr>
<tr>
<td>Never smoked</td>
<td>59 (55.0)</td>
<td>114 (91.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>Self-reported chronic illness, No. (%)</td>
<td>17 (16.5)</td>
<td>76 (61.3)</td>
<td>** NS</td>
</tr>
<tr>
<td>Medication use (current), No. (%)</td>
<td>11 (10.5)</td>
<td>56 (46.7)</td>
<td>** NS</td>
</tr>
<tr>
<td>Vehicle type, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>61 (60.4)</td>
<td>114 (94.9)</td>
<td>** NS</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>31 (30.2)</td>
<td>160 (130.6)</td>
<td>** NS</td>
</tr>
<tr>
<td>Bicycle</td>
<td>9 (8.9)</td>
<td>14 (11.6)</td>
<td>** NS</td>
</tr>
</tbody>
</table>

* Participation status ‘yes’ was measured using the information recorded in variables - work status at six, 12 and 24 months, and the Short Form-36 Version 2 (SF-36V2), Physical Component Score (PCS) at six, 12 and 24 months respectively.  ** P < 0.05; NS = not significant  
* The measure for occupation is from the Australian Standard Classification of Occupations (ASCO), Cat. No. 12063; Australian Bureau of Statistics 1997. See Table 2. Occupational skill level for 8 categories.  
# BMI classification is from the Global Database on Body Mass Index, World Health Organization.
**Discussion**

Time to RTW was associated with both injury and non-injury related factors in a cohort with motor vehicle related moderate-severe orthopaedic injuries. The main findings were that greater injury severity and lower occupational skill levels were significant risks of a longer time to RTW. Whereas, recovery expectations for usual activities of ≥90 days, full-time pre-injury work hours, and very good self-assessed pre-injury health status were significant risks of a shorter time to RTW. Legal representation at six months was not associated with time to RTW.

**Predictors of time to return to work**

In our study, the significance of injury severity as a risk of time to RTW was driven by those with severe-critical injuries (ISS 16–75). Similarly, the significance of occupation was driven by those with lower occupational skill levels such as elementary workers and tradespersons. Existing research confirms that injury severity and occupational skill level are predictors of RTW, particularly for lower limb injuries [3, 4, 8, 34, 35]. This result is not unforeseen given the socio-demographic profile of the cohort—men age 36 years, 80% male, and 33% tradespersons, advanced clerical or service workers. Adequate physical function is likely to be an important component of work. In other research, these factors have been independent predictors of RTW, although the level of evidence is variable [7]. Likewise, the significance of full-time pre-injury work hours and very good pre-injury health status is likely to be dependent on the study population. These factors have been reported as predictors of a shorter time to RTW and recovery [4, 7, 16, 36]. Again, results are inconsistent and measures vary. For example, higher baseline income or job involvement is measured instead of pre-injury work hours [4, 7].

Recovery expectations and illness perception, and low self-efficacy, are significant predictors of RTW rates and/or recovery across a range of injuries and illnesses [7, 24, 25, 37, 38]. This shows they are robust predictors of RTW that relate to the individual rather than a specific diagnosis. These predictors are complex and multi-dimensional [24, 37, 39]. Theoretically, self-efficacy (i.e., person’s belief in their own competence) materialises during childhood and evolves throughout life. Those with strong self-efficacy master problems, recovering expeditiously; those with weak self-efficacy avoid challenges, focusing on negative outcomes [40]. Similarly, illness perception is based on a self-regulatory model that appraises a person’s response to their illness event [41]. In other words, how well you think you will recover can influence how well you actually recover.

The association between making a claim and legal representation, and poor RTW rates or recovery is well documented [7, 10]. As before, results vary according to the study population, outcome measures, and possibly the compensation scheme. In this study, the logrank test between legal representation and time to RTW was
Table 2: Baseline characteristics and time to RTW of study participants (n = 334) (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
<th>Median time to RTW (months)</th>
<th>Logrank Test p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>334</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury Severity Score</td>
<td>6.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor - moderate 1-4</td>
<td>84 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe - critical 1-7</td>
<td>198 (59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Injury Severity Score</td>
<td>5.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor - moderate 1-8</td>
<td>63 (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe - critical 1-10</td>
<td>127 (38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index of Relative Socioeconomic Disadvantage</td>
<td>6.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most disadvantaged</td>
<td>99 (29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>34 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>64 (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most advantaged</td>
<td>60 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>67 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>267 (79)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>144 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>162 (49)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced/widowed/separated</td>
<td>18 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education skill level¹</td>
<td>6.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree and above</td>
<td>60 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate and advanced diploma</td>
<td>143 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary education</td>
<td>118 (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and primary education</td>
<td>10 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation skill level</td>
<td>6.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managers/Administrators/professionals/associate professionals</td>
<td>78 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical person/assistant, dental and service workers</td>
<td>111 (33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate clerical/sales/service professionals/transport workers</td>
<td>52 (16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary clerical/sales/service/leisure/related workers</td>
<td>92 (28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work level before injury</td>
<td>4.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Duties</td>
<td>321 (96)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part Duties</td>
<td>13 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work hours before injury</td>
<td>0.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>273 (82)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>57 (17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Injury job satisfaction</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>820 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>14 (4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Baseline characteristics and time to RTW of study participants (n = 334) (Continued)

| Recovery expectations for work                                           | 0.08    |                            |                      |
| Yes                                                                      | 298 (2) |                            |                      |
| No                                                                       | 32 (1)  |                            |                      |

| Recovery expectations for usual activities                               | <0.0001 |                            |                      |
| Yes                                                                      | 302 (1) |                            |                      |
| No                                                                       | 111 (3) |                            |                      |

| Language other than English                                              | 0.08    |                            |                      |
| Yes                                                                      | 104 (3) |                            |                      |
| No                                                                       | 226 (7) |                            |                      |

| Total yearly household income⁷ (before tax, AUD) excluding number of people in household | 0.17    |                            |                      |
| $39,999                                                                  | 53 (2)  |                            |                      |
| $40,000 - $49,999                                                        | 110 (3) |                            |                      |
| $50,000 - $59,999                                                        | 148 (4) |                            |                      |

| Total adjusted yearly household income⁷ (before tax, AUD) including number of people in household | 0.07    |                            |                      |
| $50,000                                                                  | 163 (5) |                            |                      |
| $50,000 - $59,999                                                        | 121 (3) |                            |                      |
| $60,000                                                                  | 37 (1)  |                            |                      |

| Body Mass Index (BMI, kg/m²)                                             | 0.54    |                            |                      |
| <18.50 (Underweight)                                                    | 0.02    |                            |                      |
| 18.50-24.99 (Normal)                                                    | 123 (3) |                            |                      |
| 25.00-29.99 (Overweight)                                                | 124 (4) |                            |                      |
| 30.00-39.99 (Obese)                                                     | 79 (2)  |                            |                      |

| Smoking history                                                         | 0.02    |                            |                      |
| Current smoker                                                          | 89 (27) |                            |                      |
| Ex-smoker                                                               | 90 (27) |                            |                      |
| Never smoked                                                            | 153 (47) |                           |                      |

| Self-reported chronic illnesses                                         | 0.02    |                            |                      |
| Yes                                                                     | 93 (2)  |                            |                      |
| No                                                                      | 241 (7) |                            |                      |

| Medication use                                                          | 0.03    |                            |                      |
| Yes                                                                     | 67 (2)  |                            |                      |
| No                                                                      | 366 (11) |                           |                      |

| Recent injury other than cash                                          | 0.02    |                            |                      |
| Yes                                                                     | 15 (0)  |                            |                      |
| No                                                                      | 216 (6) |                            |                      |

| Risk of long term harm due to alcohol consumption¹ (standard drink/week) | 0.02    |                            |                      |
| Low risk - <5 drinks male or <1 drink female                           | 311 (9) |                            |                      |
| High risk - > 5 drinks male or > 1 drink female                         | 12 (0)  |                            |                      |

| Risk of short term harm due to alcohol consumption¹ (yes)              | 0.14    |                            |                      |
| Yes                                                                     | 116 (3) |                            |                      |
| No                                                                      | 218 (7) |                            |                      |

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Table 2 Baseline characteristics and time to RTW of study participants (n = 334) (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-reported at fault</td>
<td>0.04</td>
</tr>
<tr>
<td>Yes</td>
<td>125</td>
</tr>
<tr>
<td>No</td>
<td>208</td>
</tr>
<tr>
<td>Vehicle type</td>
<td>0.02</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>175</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>140</td>
</tr>
<tr>
<td>Bicycle</td>
<td>19</td>
</tr>
<tr>
<td>Peri-auricular neck pain in last 6 months</td>
<td>0.70</td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
</tr>
<tr>
<td>No</td>
<td>319</td>
</tr>
<tr>
<td>Post-auricular neck pain</td>
<td>0.71</td>
</tr>
<tr>
<td>Yes</td>
<td>59</td>
</tr>
<tr>
<td>No</td>
<td>273</td>
</tr>
<tr>
<td>Crash on a public road</td>
<td>0.05</td>
</tr>
<tr>
<td>Yes</td>
<td>297</td>
</tr>
<tr>
<td>No</td>
<td>37</td>
</tr>
<tr>
<td>Self-assessed pre-injury health statusa</td>
<td>0.02</td>
</tr>
<tr>
<td>Excellent</td>
<td>103</td>
</tr>
<tr>
<td>Very good</td>
<td>137</td>
</tr>
<tr>
<td>Good</td>
<td>78</td>
</tr>
<tr>
<td>Fair Poor</td>
<td>16</td>
</tr>
<tr>
<td>Days made by 6 months</td>
<td>0.08</td>
</tr>
<tr>
<td>Yes</td>
<td>140</td>
</tr>
<tr>
<td>No</td>
<td>91</td>
</tr>
<tr>
<td>Legal representation at 6 months</td>
<td>0.07</td>
</tr>
<tr>
<td>Yes</td>
<td>95</td>
</tr>
<tr>
<td>No</td>
<td>136</td>
</tr>
</tbody>
</table>

Table 3 Concordance (c-index), R squared as each variable is added into the model

<table>
<thead>
<tr>
<th>Factor</th>
<th>0.087</th>
<th>0.070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery expectations for usual activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation skillb</td>
<td>0.104</td>
<td>0.065</td>
</tr>
<tr>
<td>New injury severity score</td>
<td>0.121</td>
<td>0.063</td>
</tr>
<tr>
<td>Self-assessed pre-injury health statusb</td>
<td>0.154</td>
<td>0.052</td>
</tr>
<tr>
<td>Work hours before injuryb</td>
<td>0.177</td>
<td>0.071</td>
</tr>
<tr>
<td>Smoking historyb</td>
<td>0.194</td>
<td>0.078</td>
</tr>
<tr>
<td>Education levelb</td>
<td>0.197</td>
<td>0.079</td>
</tr>
<tr>
<td>Recovery expectations for work</td>
<td>0.265</td>
<td>0.067</td>
</tr>
<tr>
<td>Injury severity score</td>
<td>0.212</td>
<td>0.067</td>
</tr>
<tr>
<td>Total yearly household incomeb</td>
<td>0.225</td>
<td>0.065</td>
</tr>
<tr>
<td>Self-reported at fault</td>
<td>0.227</td>
<td>0.065</td>
</tr>
<tr>
<td>Language other than English</td>
<td>0.240</td>
<td>0.069</td>
</tr>
<tr>
<td>Crash on a public road</td>
<td>0.241</td>
<td>0.070</td>
</tr>
<tr>
<td>Risk of short term harm due to alcohol consumption</td>
<td>0.241</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.251</td>
<td>0.074</td>
</tr>
<tr>
<td>Sex</td>
<td>0.262</td>
<td>0.070</td>
</tr>
</tbody>
</table>

The blank row indicates the point where the concordance index plateaus. Factors above this were maintained while factors below this were dropped.

The new injury severity score is based on Question 1 from the Short Form-36, version 2, (SF-36v2).


** Measures for full-time (usually working at least 30 hours per week) and part-time (usually working 1-34 hours per week) are from the Australian Health Survey Users Guide, 2011–13, Cat. No. 4604.0.55.001, Australian Bureau of Statistics.

** Injury job satisfaction is based on the same question from the Measure of Job Satisfaction questionnaire by Maybery, M. and Wade, B. 1993.

** Categories of income are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey Wave 6 Household Questionnaire.

** Disability is from the Global Burden of Disease Mortality, World Health Organisation.

** To determine risk of harm were from the Alcohol Use Disorders Identification Test: Self-Report Version (AUDIT-C) were sourced from the Drinks Line program, The University of Sydney. http://sydney.edu.au/medicine/addiction/drinksline/resources.php.

** Standard drink contains 12.5 milligrams of 10 grams of alcohol according to the National Health and Medical Research Council (NHMRC), Australian Alcohol Guidelines Health and Safety, October 2001.

** Self-assessed health status is based on Question 1 from the Short Form-36, version 2, (SF-36v2).

The median score for fair poor self-assessed pre-injury health status, the median indicates that more than half did not return to work (mean = 529 days).

significant. However, baseline variables in the Cox regression could be a common cause of legal representation and time to RTW. In addition, it may be that people seek legal representation because they haven't returned to work and/or because of other intervening factors, or those who seek legal representation are more likely to take longer to RTW. It is not possible to address these issues in this study. Regardless, there was no association once baseline variables were taken into account.

More recently, within a compensable setting, legal representation has been linked to socio-economic and psychosocial factors such as stressfulness of making a claim, poorer baseline mental health; higher disability; socio-economic disadvantage; and financial entitlements [42–44]. This suggests that people seeking legal representation have different characteristics compared to...
Table 4: Cox proportional hazards regression model for predictors of time (days) to RTW

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>SE</th>
<th>P value</th>
<th>HR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.009</td>
<td>0.006</td>
<td>0.10</td>
<td>1.010</td>
<td>0.998-1.021</td>
</tr>
<tr>
<td>Sex (Male)</td>
<td>-0.028</td>
<td>0.302</td>
<td>0.851</td>
<td>0.963</td>
<td>0.048-1.430</td>
</tr>
<tr>
<td>New Injury Severity Score</td>
<td></td>
<td></td>
<td>0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor - moderate 1-4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Severe - critical 16-25</td>
<td>-0.700</td>
<td>0.302</td>
<td>0.040</td>
<td>0.484</td>
<td>0.258-1.254</td>
</tr>
<tr>
<td>Severe - critical 16-25</td>
<td>-0.619</td>
<td>0.201</td>
<td>0.009</td>
<td>0.539</td>
<td>0.353-0.822</td>
</tr>
<tr>
<td>Occupation skill levela</td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managers/administration/professionals</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Translators/advanced clinicians</td>
<td>-0.555</td>
<td>0.164</td>
<td>0.001</td>
<td>0.071</td>
<td>0.040-1.105</td>
</tr>
<tr>
<td>Intermediate clerical/service workers</td>
<td>-0.211</td>
<td>0.249</td>
<td>0.312</td>
<td>0.803</td>
<td>0.460-1.413</td>
</tr>
<tr>
<td>Elementary clerical/service/research workers</td>
<td>-0.632</td>
<td>0.227</td>
<td>0.033</td>
<td>0.533</td>
<td>0.341-0.829</td>
</tr>
<tr>
<td>Work hours before injury (Full-time)</td>
<td>0.088</td>
<td>0.032</td>
<td>0.003</td>
<td>1.003</td>
<td>1.000-1.008</td>
</tr>
<tr>
<td>Recovery expectations for usual activities</td>
<td>0.248</td>
<td>0.174</td>
<td>&lt;0.001</td>
<td>1.292</td>
<td>1.080-1.549</td>
</tr>
<tr>
<td>Self-assessed pre-injury health statusb</td>
<td></td>
<td></td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Very good</td>
<td>0.345</td>
<td>0.184</td>
<td>0.003</td>
<td>1.409</td>
<td>0.085-2.019</td>
</tr>
<tr>
<td>Good</td>
<td>0.111</td>
<td>0.219</td>
<td>0.612</td>
<td>1.095</td>
<td>0.305-3.736</td>
</tr>
<tr>
<td>Fair-Poor</td>
<td>-0.029</td>
<td>0.246</td>
<td>0.631</td>
<td>0.977</td>
<td>0.141-6.938</td>
</tr>
<tr>
<td>Current smoker</td>
<td></td>
<td></td>
<td>0.908</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>0.268</td>
<td>0.222</td>
<td>0.097</td>
<td>1.292</td>
<td>0.935-3.372</td>
</tr>
<tr>
<td>Never smoked</td>
<td>0.436</td>
<td>0.301</td>
<td>0.131</td>
<td>1.543</td>
<td>1.041-2.286</td>
</tr>
</tbody>
</table>

*aMeasures for occupation and education are from the Australian Standard Classification of Occupations (ASCO), Cat. No. 1360.0, Australian Bureau of Statistics, 1997.
*bMeasures for full-time (usually working >35 hours per week) and part-time (usually working >15-35 hours per week) are from the Australian Health Survey.

Other research shows that people seek legal advice to help with the adversarial claims process, communications and administrative deficits with insurers, perceived illegitimacy of their injury, and accessing reasonable entitlements [11-15]. It may not be 'legal representation' per se that is associated with RTW but these other factors. In addition, there is a lack of granularity when classifying exposure to legal representation. For example, the 'no win, no fee' legal services in NSW CTP and WC schemes provide a financial incentive for plaintiffs' lawyers to take viable cases where extracting a reasonable fee is more likely (e.g. people with more serious injuries, pre-existing and/or crash related factors that could allow access to greater financial entitlements) [45].

Characteristics of return to work

Measuring RTW is challenging – definitions and durations are diffuse [9]. In our study RTW was measured at three time periods inclusive of time (days) to RTW, full/part-time hours and full/modified duties. At each period the majority were working full-time on full duties but below baseline figures. In similar studies RTW varied from 38-68% at 6 months [3, 4]; 42% at 12 months [4]; and 51% at 24 months [4]. It is difficult to compare RTW rates due to heterogeneity between populations and the multidimensional nature of facilitators and barriers for RTW [9].

Taking into account the unemployment rate in Australia over the follow up period (4.2% in 2008 – 5.4% in 2013) [46, 47] and the socio-demographic profile of the study population, the limited RTW rate is of concern. Accepting that work is good for health and well-being, the converse is also true and poor health contributes to lost productivity and lower socio-economic status [1].

Strengths and limitations

This prospective study was a representative cohort of moderate-severe injuries following motor vehicle related orthopedic trauma. Standardised and validated measures were used with repeated follow up.
Additional measures at baseline would have been beneficial including initial pain intensity, baseline mental health, and other psychological measures. These have been associated with poorer outcomes following trauma [3, 5, 16, 17]. Further, there appears to be a relationship between these factors and having a compensation claim [42, 44]. The inclusion of medical and/or vocational interventions, individual job characteristics/tasks, and workplace/organisational factors would have been useful. These determinants of RTW are often population specific and amenable to intervention in a compensation setting [6, 9].

Another limitation was moderate loss to follow up. The study population characteristics were a plausible reason for loss to follow up. Participants were predominately younger males of lower socioeconomic status who were in semi-skilled occupations. They were often contactable (see Fig. 1) but would not return the questionnaire. These lost to follow up were younger, less likely to be married, and less likely to be currently taking medication. If they had remained in the study, these differences could have influenced time to RTW. Lastly, these findings require validation in future research with larger cohorts and different study populations.

Future research and policy implications

Predictors of RTW are multidimensional and cover numerous individual, work, organisational and societal domains, which makes high quality research challenging. Despite the abundant research to date, much remains inconclusive [7]. It is important to focus on factors amenable to intervention. Injury severity, pre-injury work hours and health status are relatively static outside the bounds of injury prevention programs.

However, expectations for return to usual activities, illness perception and self-efficacy are more dynamic. Validated measures are now available to gauge this risk factor of poor RTW and/or recovery [37, 39, 48]. Investing in interventions such as education, coaching or multidisciplinary programs could improve RTW rates by adjusting expectations, thereby reducing the associated costs of lost productivity [49–51].

There is a need to understand the paradigm of legal representation, and whether it is a valid measure. Measurement error can occur when the timing of exposure to a factor does not occur at baseline and/or there is questionable quality of the measure [52]. Since legal representation was measured at six months, not baseline, these results need to be interpreted cautiously. Further scheme specific, qualitative and quantitative research — principally of populations at risk for poor RTW — may assist to tease apart these complexities and provide researchers with ideas for RTW initiatives and scheme policy makers with opportunities for legislative or policy change if appropriate.

Lastly, taking into account the significance of lower occupational skill levels, it is crucial to improve RTW rates, and this is feasible, considering the strong evidence base for vocational rehabilitation. The coordination of early work-focused health interventions and accommodating workplaces with modified duties and hours is essential [53]. In WC jurisdictions this is not unforeseen, but in the CTP arena it remains arduous. There is often no legal impetus on the employer to reemploy an injured worker. In this instance, it may be necessary to advocate for legislative change or other policy initiatives like early identification and referral to vocational rehabilitation, or prospective claims management involving the employer to provide appropriate duties in the early post-injury period [53].

Conclusions

A longer time to RTW was associated with greater injury severity and lower occupational skill levels. A shorter time to RTW was associated with recovery expectations for usual activities of <500 days, full-time pre-injury work hours, and very good self-assessed pre-injury health status following motor vehicle related orthopaedic trauma. Our findings reinforce existing research. There is an opportunity to trial interventions that address potentially modifiable factors such as poor recovery expectations. The issues surrounding legal representation are complex and require further research.

Ethics approval and consent to participate

The study was approved by the governing human research ethics committee (South Western Sydney Local Health District, South Eastern Sydney Local Health District, and The University of Sydney).

Consent for publication

Not applicable.

Availability of data and materials

Results from the dataset are presented in the paper. The full dataset is available from the first author upon request.

Abbreviations

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors DM, PH and IC contributed significantly to study conception and design, data acquisition, analysis and interpretation. Authors VP and JS contributed to statistical analysis and provided data interpretation. All authors contributed to drafting and critical revision of the manuscript. All authors read and approved the final manuscript.

Authors' information

Not applicable.

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References


Chapter 7: The Association Between Seeking Financial Compensation and Injury Recovery Following Motor Vehicle Related Orthopaedic Trauma

Journal Article 6

Chapter 7 is the third paper from the inception cohort study, it illustrates the impact of compensation status (i.e. making a claim) on injury recovery specifically physical and mental health status, PTSD, and Global Rating of Change (GRC) over time at six, 12 and 24 months. The aim is to:

- investigate the influence of seeking financial compensation (i.e. making a claim) on injury recovery following motor vehicle related moderate-severe orthopaedic trauma.

This chapter is reprinted from:

Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper 'The association between seeking financial compensation and injury recovery following motor vehicle related orthopaedic trauma' we confirm that Darnel Murgatroyd has contributed to the following aspects of the manuscript:

- Conception and design
- Data collection, analysis and data synthesis
- Manuscript preparation and critical review

Professor Ian Harris
Signed: [Signature]
Date: 23.11.15

Dr Yvonne Tran
Signed: [Signature]
Date: 23.11.15

Professor Ian Cameron
Signed: [Signature]
Date: 23.11.15

This paper is under review at BMC Musculoskeletal Disorders
The association between seeking financial compensation and injury recovery following motor vehicle related orthopaedic trauma

Danel F. Murgatroyd1*, Ian A. Harris2, Yvonne Tran1 and Ian D. Cameron1

Abstract

Background: Motor vehicle related moderate-severe orthopaedic trauma has a major impact on the burden of injury. In Australia, all states and territories provide access to financial compensation following injury in a motor vehicle crash. The aim of this study was to investigate the influence of seeking financial compensation (i.e., making a claim) on injury recovery following motor vehicle related moderate-severe orthopaedic trauma.

Methods: Patients admitted with upper/lower extremity fractures after a motor vehicle crash were recruited from two trauma hospitals. Baseline data were collected in person by written questionnaire within two weeks of injury. Follow up data were collected by a mailed written questionnaire at 6, 12 and 24 months. Additional (demographic/injury-related) information was collected from hospital databases. All other measures were self-reported. Outcomes were: Short Form-36 Version 2.0 (SF-36v2), Physical/Mental Component Scores (PCS/ MCS); Post Traumatic Stress Disorder (PTSD) Checklist Civilian Version (PCL-C); and Global Rating of Change (GRC) scale. Analyses involved descriptive statistics and linear mixed models to examine the effect of compensation status on injury recovery over time.

Results: There were 453 study participants. Baseline characteristics showed a mean age of 40 years (17.1 Standard Deviation (SD): 7% male; 74% worked pre-injury; 67% in excellent/very good pre-injury health; 56% sustained serious injuries, Injury Severity Score (ISS) 9–15; 61% had a low-middle range household income. Overall, after controlling for possible confounders, the compensable group had poorer recovery compared to the non-compensable group for PCS (−2.97 Mean Difference (MD), 95% CI [−4.73, −1.22]); MCS (−1.44 MD, 95% CI [−5.62, −2.76]); PCL-C (0.34 MD, 95% CI [0.07, 0.59]); and GRC (−0.66 MD, 95% CI [−1.15, −0.17]). Injury recovery over time for all participants showed PCS improved from 6–12 and 12–24 months; MCS and GRC improved from 6–12 months; and PCL-C did not significantly improve from 6–12 and 12–24 months. Injury recovery over time continued for compensable and non compensable groups but compensable participants had poorer scores at each time period, especially MCS and PCL-C.

Conclusions: Making a claim was associated with poor injury recovery following motor vehicle related orthopaedic trauma, mainly for mental health. Irrespective of claim status, the majority had poor injury recovery, especially for mental health.

Keywords: Compensation and redress, Injury, Multiple trauma, Outcomes

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Background
Orthopaedic trauma is commonly sustained after a motor vehicle crash and often results in hospital admission [1] with many experiencing ongoing pain and physical and psychological disability [2–8]. In addition, motor vehicle related orthopaedic trauma has a major impact on the burden of injury [9, 10].

Analysis of Australian data shows the annual cost of motor vehicle crashes is approximately AUS36.2 billion in 2013–2014 [11]. The greatest economic burden occurs in New South Wales (NSW) where the total cost of motor vehicle crashes is AUS$7.7b per annum (in 2003). An evaluation of the Victorian state trauma system reported an increased incidence of hospitalised major trauma and years lived with disability from 2001–2011 [12]. These studies underscore the need for high quality research investigating predictors of recovery following motor vehicle related orthopaedic trauma and demonstrate the substantial economic burden on society.

To date, related research indicates there are numerous predictors of poor injury recovery, the most common being socio-demographic factors such as age, gender, occupation and education. These tend to have conflicting associations, possibly dependent on population differences [4, 6, 7, 13, 14]. Whereas psychosocial factors, for example high initial pain scores, mental illness and low self-efficacy, are more consistently associated with poor recovery [5, 6, 15, 16]

For compensation related factors, there is robust evidence from several systematic reviews that seeking financial compensation is associated with poor injury recovery [17–21]. These factors include making a claim [3, 13, 14], seeking legal representation [4, 5, 7, 36], and altering access to financial entitlements [22, 23]. Moreover, qualitative research, which has predominantly focused on the claims process experience, demonstrates that it can be detrimental to injury recovery, hinder return to work, and be conducive to financial hardship [24–27].

Despite this, the impact of seeking financial compensation remains contentious and the causal relationship is questionable [17, 20, 28, 29]. For example, recent evidence suggests that poor pre-injury mental health status is partly responsible for poor injury recovery in those seeking financial compensation [29, 30]. This is important, particularly with the high prevalence of mental illness in Australia (20%) [31]. There have been calls for more rigorous research with sound methodology including between and within scheme comparisons in specific populations [28, 29, 32, 33].

All Australian states and territories provide access to financial compensation following injury in a motor vehicle crash and a number of prospective studies have investigated the relationship between compensation related factors and injury recovery. However, these have largely been confined to mild-moderate injuries [13, 34, 35]; short follow up periods (six months) [2, 4]; and/or studies that include mechanisms of injury other than a motor vehicle crash [3]. This current study followed people with motor vehicle related, moderate to severe orthopaedic trauma in NSW, Australia for two years.

We were primarily interested in exploring the association between claim status and injury recovery. The specific aim was to investigate the influence of seeking financial compensation (i.e., making a claim) on injury recovery following motor vehicle related moderate-severe orthopaedic trauma.

Methods
Study design and setting
Patients from two trauma hospitals in Sydney, NSW, were recruited for the inception cohort study between November 2007 and February 2012. These hospitals are two of the seven level one trauma services in NSW (population approximately seven million), and provided a sample of patients that required inpatient hospitalisation following motor vehicle related orthopaedic trauma. Eligible patients were identified through the hospital database, and then invited to participate. Where possible, an English speaking family member was used to interpret for patients from a Culturally and Linguistically Diverse (CALD) backgrounds (i.e., spoke a language other than English at home) [36].

Inclusion criteria were:

- admission to hospital within two weeks of injury;
- involvement in a motor vehicle crash;
- age 18 years or over; and
- one or more upper or lower extremity fracture (humerus, radius, ulna, pelvis, acetabulum, femur, patella, tibia, fibula, tarsus, calcaneus).

Exclusion criteria were:

- dementia or a significant pre-existing cognitive impairment preventing the ability to consent;
- spinal cord injury;
- Glasgow Coma Score <12 on admission;
- amputation of a limb; or
- isolated phalangeal, carpel, metacarpal, tarsal or metatarsal fractures.

There were 32 variables, and allowing for a minimum of 10 participants per variable, a sample size of 320 was required for sufficient statistical power for regression analysis. Comparable research indicated that a final sample size of 450 was required to allow for a possible 25% loss to follow up [4, 37, 38]. However, based on power...
calculations for repeated measures in linear mixed models used in this study, a sample size of n greater than 100 was required in order to achieve power greater than 0.9 [39]. Questionnaires were mailed for follow up at six, 12 and 24 months. Up to six attempts to contact participants were made by telephone and/or by mailed questionnaire if no response was received within three weeks.

Within two weeks post-injury, baseline data were recorded in person by written questionnaire. Hospital databases were used to collect additional demographic and injury related information. All other measures were self-reported. The selection of study factors was based on similar research with relevance to the study aims [5-8, 46]. Approval for the study was given by the governing human research ethics committees (South Western Sydney Local Health District, South Eastern Sydney Local Health District, and The University of Sydney).

Injury related factors
The Abbreviated Injury Scale (AIS) (1990 Revision, Update 96) was used to code all injuries [41]. The scale has an injury ranking system from one to six (six is not survivable). Algorithms were used to calculate the Injury Severity Score (ISS) and New Injury Severity Score (NISS); sums of the squares of the three highest AIS scores from different body regions (ISS), and irrespective of body region (NISS). They indicate potential mortality [42]. Classifications for injuries were minor/moderate [1-8], serious [9-15] or severe/critical [16-75].

Socio-demographic factors
A number of socio-demographic factors were measured such as age, gender, marital status, occupation, and education. Household income measurements were exclusive and inclusive of household structure, this allowed for any potential difference in income distribution [44]. Current measures for Return To Work (RTW) are not standardized, therefore, RTW was self-reported and included duration (full-time/part-time) and level of work (full/modifying duties) [46].

Health related factors
For an indication of baseline health status a number of self-reported chronic illnesses were included: asthma; cancer; heart and circulatory conditions; diabetes; arthritis; osteoporosis; mental and behavioural problems; and neck/back disorders. The National Health Priority Areas initiative lists these conditions as inflicting significant social and financial costs within Australia [46]. The definition of a chronic condition was taken from the Australian Bureau of Statistics (ABS) Health Survey, it is one which a patient currently has, and it has lasted or is expected to last for six months or more [44, 46]. Additional measures were recent injuries (other than the motor vehicle crash) that required medical attention in the last four weeks or a decreased usual activity; medication use in the last two weeks for a chronic illness; and smoker status [44].

The definitions and categories of other self-reported factors such as recovery expectations for work and usual activities; risk of long/short term harm due to alcohol consumption; Body Mass Index (BMI); and health status are documented in the Tables. Additional information about study factors, outcomes and methodology including predictors of RTW can be found in another publication by the same authors [47].

Compensation related measures
In NSW, there is a privately underwritten, modified common law scheme which provides Compulsory Third Party (CTP) personal injury insurance. To travel on a public road all motor vehicles need to be registered and insured for CTP. An injured person claims against the owner or driver of the vehicle at fault. From April 2010, anyone injured in a motor vehicle crash (irrespective of fault) can claim restricted entitlements of medical expenses and lost wages up to AUS$5,000. For Workers Compensation (WC), a publically underwritten scheme exists that is managed by private insurers. An injured person can claim following a motor vehicle crash that happened whilst travelling between the workplace, home and/or any work-related place (irrespective of fault). In addition, notification of an injury must occur within 48 h [48, 49]. In 2015, the NSW government scheme regulators amalgamated the State Insurance Regulatory Authority (SIRA).

In each scheme, claims need to be submitted within six months of injury. Insurers have three months to decide whether to accept or deny liability for the claim. To allow early payment of medical expenses or weekly wage benefits (for WC), insurers can accept provisional liability [49]. For CTP insurers can pay lost wages for financial hardship, but decisions are made case-by-case. Other joint entitlements for past and future losses include medical expenses, lost income, and pain and suffering/impairment [46, 46]. For both schemes, people can seek legal representation at any time.

Self-reported compensation related measures of crash on a public road and at fault were taken at baseline. Whereas, making a claim (Yes/No) was measured by patient interview at six months because the majority of participants would not have been able to answer this question within two weeks of injury.

Health status outcome measures
General health status was measured using the Short Form-36 Version 2.0 (Australia) (SF-36v2). This self-report
instrument encompasses physical and mental health and measures an individual's own perception of their health status across eight domains (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health). The scores range from 0–100 with higher scores representing better health status. The Physical and Mental Component Scores (PCS/MCS) are summary scores of the eight domains [50]. The SF36 has high test-retest reliability, content validity and construct validity [50]. The minimal clinically important difference of PCS/MCS scores ranges from 0.3 to 7 for different diseases; 5 was selected as it is a commonly used threshold [51, 52]. The SF36v2 has been widely used in trauma populations [5, 6, 13, 14, 31, 33].

Post-Traumatic Stress Disorder: (PTSD) was selected as an outcome measure because it is commonly associated with motor vehicle related orthopedic trauma [21]. PTSD was measured using the PTSD Checklist Civilian Version (PCL-C), a self-report 17 item checklist of symptoms. Scores range from 1–5 (not at all – extremely) indicating at what level participants were bothered by a symptom over the past month [53]. Total scores range from 17–85. A cut-off score of 41 (i.e., >44 have PTSD) is recommended for overall diagnostic efficiency for people injured in a motor vehicle crash [54]. The checklist has been tested for reliability and validity, and it can be used for a provisional clinical diagnosis [54, 55]. A structured clinical interview would be required for confirmation. Evidence suggests 5 points is the minimum threshold to report clinical change [56]. The words ‘stressful experience’ was replaced with ‘accident’ to tailor the questionnaire to the motor vehicle crash [53].

A Global Rating of Change (GRC) scale is designed to quantify improvement or deterioration over time following an intervention or to monitor the course of a condition. These scales are often used in conjunction with more specific measures such as those encompassing pain, disability and quality of life [57]. GRC scales have high face validity and allow a person to rate their recovery in terms of what is important to them [58]. For this scale, participants were asked ‘how do you rate your health now, compared to your usual level of health prior to the accident? A recommended 11 point scale was used, ranging from ‘5 = much worse’, 0 = unchanged, 5 = completely recovered’ with a minimal clinically important difference of 2 points [59].

Linear mixed models, which expand the general linear model and account for the dependency between repeated measurements collected for each participant across time, were used to examine the effect of making a claim on injury recovery over time. The fixed effects were claim status, Index of Relative Socioeconomic Disadvantage (IRSD), gender, ISS, education, language other than English, BMI, vehicle type, risk of short term harm due to alcohol consumption, self-reported at fault, pre-morbid neck pain in the past six months, crash on a public road, self-assessed pre-injury health status, and time.

The co-variate was age and the interaction tested was claim status by time. These variables were selected based on level of interest (i.e., hypothesis driven) from past research [4–6], and significant confounding variables at baseline for claim status with a \( p \)-value <0.1. Other significantly different baseline variables between the two claim status groups not included in the model were work hours before injury and post-injury job satisfaction because they were measures only related to those working pre-injury, and alcohol use in the past year which is a construct of risk of long term harm due to alcohol consumption. Using the model estimates, marginal means and standard errors were reported for each health status measure (SF36v2 PCS/MCS, PCL-C and GRC) at six, 12 and 24 months.

To assess the impact of attrition bias, sensitivity analysis was conducted using the per protocol sample. This sample was selected based on participation for all measurement time points (i.e., six, 12 and 24 months).

To assess the impact of pre-existing mental health problems, sensitivity analysis was conducted on the sample without those who reported pre-existing mental health problems (\( n=19 \)). All data analysis was performed using SPSS statistical software version 22 (SPSS Inc., USA).

Results
From November 2007 to February 2011, 840 eligible participants were admitted to hospital across both sites, 491 were screened, and 452 (92 %) consented to participate. There were 349 eligible participants that were not screened due to resource limitations. There were 31 refusals and eight who were discharged and unable to be contacted. Additional information about recruitment and follow up for all study participants is shown in Fig. 1.

Baseline characteristics
The baseline characteristics of all 452 participants showed the mean age was 40 years (17.1 SD), range 18–87 years. Serious injuries with an ISS/NISS of 9–15 were sustained by 56 % (ISS) and 52 % (NISS) respectively. The majority were male (75 %) and 59 % were in middle
There were significant differences in pre-injury/baseline characteristics between those who made a claim (at six months) and those who did not, regardless of whether the claim was accepted by the insurer. Of note, those with greater eligibility to make a claim under NSW legislation did so (i.e., self-reported not at fault and crash on a public road). There were no significant differences in pre-injury/baseline health status measures between those who made a claim and those who did not. However, these measures largely related to physical health. These results are illustrated in Table 1. Of the 301 (67%) participants who completed the six month follow up questionnaire, 294 answered the compensation related questions and of those 61% (179/294) made a claim. Subsequent results are based on this subset (294) of participants.

For loss to follow up, there were significant differences between responders and non-responders at each period. The results for six, 12 and 24 months are shown in Table 2. Consistently, at six, 12 and 24 months, non-

![Flow chart of study participants](chart.png)

---

<table>
<thead>
<tr>
<th>Event</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible participants at trauma hospitals (n = 340)</td>
<td>340 eligible participants missed screening due to resource limitations</td>
</tr>
<tr>
<td>Eligible participants screened (n = 461)</td>
<td>31 refused (reasons included: not interested (10), language difficulties (5), already involved in another study (1), and no reason given (15)</td>
</tr>
<tr>
<td>Consented participants with baseline data (n = 452)</td>
<td>8 non-contactable post discharge</td>
</tr>
<tr>
<td>6 month follow up (n = 301)</td>
<td>Lost to 6 month follow up (n = 151) including:</td>
</tr>
<tr>
<td></td>
<td>- 43 non-contactable (0 deceased, 9 moved overseas, 1 interstate, 37 disconnected numbers and/or returned mail)</td>
</tr>
<tr>
<td></td>
<td>- 108 contactable (63 withdrew, 46 did not complete questionnaire)</td>
</tr>
<tr>
<td>12 month follow up (n = 271)</td>
<td>Lost to 12 month follow up (n = 30) including:</td>
</tr>
<tr>
<td></td>
<td>- 6 non-contactable (disconnected numbers and/or returned mail)</td>
</tr>
<tr>
<td></td>
<td>- 25 contactable (9 withdrew, 17 did not complete questionnaire)</td>
</tr>
<tr>
<td>24 month follow up (n = 220)</td>
<td>Lost to 24 month follow up (n = 41) including:</td>
</tr>
<tr>
<td></td>
<td>- 10 non-contactable (1 deceased, 9 disconnected numbers and/or returned mail)</td>
</tr>
<tr>
<td></td>
<td>- 31 contactable (5 withdrew, 26 did not complete questionnaire)</td>
</tr>
</tbody>
</table>

**Fig. 1 Flow chart of study participants**
Table 1: Baseline characteristics and health status by claim status at six months.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Claim made (n=179)</th>
<th>No claim made (n=113)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), Mean (SD)</td>
<td>141 (5.6)</td>
<td>157 (5.7)</td>
<td>0.42</td>
</tr>
<tr>
<td>Injury Severity Score, No. (%)</td>
<td></td>
<td></td>
<td>0.52</td>
</tr>
<tr>
<td>Minor – moderate I-6</td>
<td>204</td>
<td>44 (24.6)</td>
<td>31 (27.0)</td>
</tr>
<tr>
<td>Serious I-8</td>
<td>105 (58.2)</td>
<td>61 (53.8)</td>
<td>23 (20.6)</td>
</tr>
<tr>
<td>Severe - critical I-7</td>
<td>50 (6.8)</td>
<td>23 (20.6)</td>
<td>0.049</td>
</tr>
<tr>
<td>New Injury Severity Score, No. (%)</td>
<td></td>
<td></td>
<td>0.049</td>
</tr>
<tr>
<td>Minor – moderate I-8</td>
<td>204</td>
<td>34 (17.0)</td>
<td>35 (21.7)</td>
</tr>
<tr>
<td>Serious I-8</td>
<td>157 (84.0)</td>
<td>48 (41.7)</td>
<td>42 (36.3)</td>
</tr>
<tr>
<td>Severe - critical I-7</td>
<td>50 (25.6)</td>
<td>23 (20.6)</td>
<td>0.23</td>
</tr>
<tr>
<td>Index of Relative Socioeconomic Disadvantage (RSD), Mean (SD)</td>
<td>969 (149)</td>
<td>992 (149)</td>
<td>0.09</td>
</tr>
<tr>
<td>Index of Relative Socioeconomic Disadvantage (RSD), No. (%)</td>
<td>204</td>
<td>120 (62.2)</td>
<td>90 (76.8)</td>
</tr>
<tr>
<td>Mental status, No. (%)</td>
<td>204</td>
<td>58 (28.4)</td>
<td>46 (40.4)</td>
</tr>
<tr>
<td>Single</td>
<td>59 (28.4)</td>
<td>46 (40.4)</td>
<td>0.34</td>
</tr>
<tr>
<td>Marital status factor</td>
<td>103 (57.3)</td>
<td>56 (49.1)</td>
<td>0.056</td>
</tr>
<tr>
<td>Divorced/widowed/separated</td>
<td>18 (9.2)</td>
<td>12 (10.5)</td>
<td>0.24</td>
</tr>
<tr>
<td>Education skill level, No. (%)</td>
<td></td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>Bachelor degree and above</td>
<td>36 (17.8)</td>
<td>12 (11.5)</td>
<td>0.24</td>
</tr>
<tr>
<td>Certificate and advanced diploma</td>
<td>66 (36.9)</td>
<td>53 (46.9)</td>
<td>0.24</td>
</tr>
<tr>
<td>Secondary education</td>
<td>45 (25.9)</td>
<td>42 (37.2)</td>
<td>0.24</td>
</tr>
<tr>
<td>Pre-primary and primary education</td>
<td>11 (6.1)</td>
<td>1 (0.9)</td>
<td>0.24</td>
</tr>
<tr>
<td>Occupation skill level, No. (%)</td>
<td></td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>Home duties/retired</td>
<td>15 (8.4)</td>
<td>6 (5.2)</td>
<td>0.24</td>
</tr>
<tr>
<td>Managers/administrators/ professional/associate professionals</td>
<td>39 (21.8)</td>
<td>31 (27.0)</td>
<td>0.24</td>
</tr>
<tr>
<td>Teachers/persons/advanced clerical and service workers</td>
<td>50 (27.9)</td>
<td>42 (36.3)</td>
<td>0.24</td>
</tr>
<tr>
<td>Intermediate clerical/services production/transport workers</td>
<td>28 (15.6)</td>
<td>14 (12.2)</td>
<td>0.24</td>
</tr>
<tr>
<td>Elementary clerical/services/labourers/related workers</td>
<td>47 (26.3)</td>
<td>22 (19.1)</td>
<td>0.24</td>
</tr>
<tr>
<td>Work status before injury (working), No. (%)</td>
<td>202</td>
<td>140 (78.2)</td>
<td>51 (86.5)</td>
</tr>
<tr>
<td>Work hours before injury (full time), No. (%)</td>
<td>202</td>
<td>133 (65.8)</td>
<td>89 (97.8)</td>
</tr>
<tr>
<td>Work status before injury (full time), No. (%)</td>
<td>202</td>
<td>133 (65.8)</td>
<td>89 (97.8)</td>
</tr>
<tr>
<td>Pre-injury job satisfaction (satisfied), No. (%)</td>
<td>202</td>
<td>136 (67.1)</td>
<td>84 (92.3)</td>
</tr>
<tr>
<td>Recovery expectations for work* (yes), No. (%)</td>
<td>202</td>
<td>125 (61.3)</td>
<td>85 (94.4)</td>
</tr>
<tr>
<td>Recovery expectations for usual activities* (days), No. (%)</td>
<td>278</td>
<td>104 (50.5)</td>
<td>24 (99.8)</td>
</tr>
<tr>
<td>SNR</td>
<td>59 (28.4)</td>
<td>46 (40.4)</td>
<td>0.27</td>
</tr>
<tr>
<td>59-180</td>
<td>104 (50.5)</td>
<td>24 (99.8)</td>
<td>0.27</td>
</tr>
<tr>
<td>181-366</td>
<td>24 (11.4)</td>
<td>10 (40.4)</td>
<td>0.27</td>
</tr>
<tr>
<td>Language other than English (yes), No. (%)</td>
<td>204</td>
<td>72 (40.0)</td>
<td>32 (27.8)</td>
</tr>
</tbody>
</table>
Table 1 Baseline characteristics and health status by claim status at six months (Continued)

<table>
<thead>
<tr>
<th>Total yearly household income (before tax, AUC) excluding number of people in household, No. (%)</th>
<th>270</th>
<th>0.47</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤$39,999</td>
<td>42 (25.9)</td>
<td>52 (21.8)</td>
</tr>
<tr>
<td>$40,000–$79,999</td>
<td>75 (43.3)</td>
<td>82 (32.0)</td>
</tr>
<tr>
<td>≥$80,000</td>
<td>53 (31.9)</td>
<td>51 (44.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total adjusted yearly household income (before tax, AUC) including number of people in household, No. (%)</th>
<th>270</th>
<th>0.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤$59,999</td>
<td>47 (18.8)</td>
<td>38 (15.5)</td>
</tr>
<tr>
<td>$60,000–$79,999</td>
<td>54 (23.7)</td>
<td>32 (15.6)</td>
</tr>
<tr>
<td>≥$80,000</td>
<td>14 (9.5)</td>
<td>15 (15.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Body Mass Index (BMI)³ (kg/m²), No. (%)</th>
<th>292</th>
<th>0.02</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.50 (underweight)</td>
<td>4 (2.8)</td>
<td>6 (2.6)</td>
</tr>
<tr>
<td>18.50–24.99 (normal)</td>
<td>48 (27.9)</td>
<td>47 (24.9)</td>
</tr>
<tr>
<td>≥25.00 (overweight)</td>
<td>76 (44.1)</td>
<td>55 (30.4)</td>
</tr>
<tr>
<td>≥30.00 (obese)</td>
<td>46 (25.9)</td>
<td>36 (16.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking history, No. (%)</th>
<th>298</th>
<th>0.23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current smoker</td>
<td>24 (9.6)</td>
<td>26 (24.3)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>47 (21.3)</td>
<td>36 (13.1)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>97 (48.2)</td>
<td>51 (16.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-reported chronic illnesses (yes), No. (%)</th>
<th>294</th>
<th>0.19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication use (current), No. (%)</td>
<td>204</td>
<td>0.80</td>
</tr>
<tr>
<td>Recent injury other than claim (yes), No. (%)</td>
<td>204</td>
<td>0.085</td>
</tr>
</tbody>
</table>

Alcohol use in the past year, No. (%) 294 0.23

<table>
<thead>
<tr>
<th>Never</th>
<th>27 (22.7)</th>
<th>18 (15.7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–5/month</td>
<td>45 (33.1)</td>
<td>20 (17.4)</td>
</tr>
<tr>
<td>2–4 times/month</td>
<td>42 (32.3)</td>
<td>20 (26.1)</td>
</tr>
<tr>
<td>≥2 times/week</td>
<td>23 (17.7)</td>
<td>24 (20.9)</td>
</tr>
<tr>
<td>≥3 times/week</td>
<td>22 (18.2)</td>
<td>22 (18.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol use in the past year (standard drink on a typical day) (standard drink/occasion), No. (%)</th>
<th>293</th>
<th>0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>23 (7.9)</td>
<td>7 (3.9)</td>
</tr>
<tr>
<td>Less than monthly</td>
<td>27 (9.1)</td>
<td>32 (15.7)</td>
</tr>
<tr>
<td>Monthly</td>
<td>15 (5.0)</td>
<td>14 (7.4)</td>
</tr>
<tr>
<td>Daily or almost daily</td>
<td>5 (2.8)</td>
<td>8 (4.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk of long term harm due to alcohol consumption (standard drink/week), No. (%)</th>
<th>293</th>
<th>0.17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk – ≤26 male or ≤14 female</td>
<td>122 (96.3)</td>
<td>104 (91.1)</td>
</tr>
<tr>
<td>High risk – ≥26 male or ≥15 female</td>
<td>4 (2.2)</td>
<td>4 (2.2)</td>
</tr>
<tr>
<td>Risk of short term harm due to alcohol consumption (yes), No. (%)</td>
<td>294</td>
<td>0.03</td>
</tr>
<tr>
<td>Self-reported at fault (yes), No. (%)</td>
<td>293</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>33 (11.2)</td>
<td>72 (25.1)</td>
</tr>
</tbody>
</table>
responders were younger and more likely to have smoked or not to have worked pre-injury. For other variables there was no significant difference (p > 0.05) between responders and non-responders (data not shown).

**Influence of claim status on injury recovery over time**

The association between claim status and injury recovery over time are shown in Tables 3, 4 and 5. Table 3 – the mean differences in injury recovery scores between the two groups, Table 4 – the association between time and injury recovery, and Table 5 – the mean injury recovery scores between the claim status groups over time (interaction).

Table 3 showed that for each measure (PCS, MCS, PCL-C and GRC) the compensable group had poorer recovery than the non-compensable group at the three time periods. However, although these differences were statistically significant, they may be of marginal clinical importance taking into account the minimal clinically important difference for each measure (i.e., 5 points for PCS, MCS and PCL-C, and 2 points for GRC). The greatest differences in scores between the two groups were seen in mental health (MCS and PCL-C).

Table 4 showed that the association between time and injury recovery differed depending on the measure used for PCS, participants improved from 6–12 to 12–24 months; for MCS and GRC, participants improved from 6–12 months only; and for PCL-C participants did not significantly improve from 6–12 or 12–24 months. Although these changes were statistically significant, they appeared to be of marginal clinical importance.

Lastly, there was no significant difference in all injury recovery measures at six, 12 and 24 months for participants who were at fault in a crash before and after 1 April 2010 (when the CTP scheme changed). To assess the impact of attrition bias, the sensitivity analysis...
Table 2: Baseline characteristics and health status of participants in the study compared to non-participants at six, 12 and 24 month follow up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participation at six months</th>
<th>Participation at 12 months</th>
<th>Participation at 24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), Mean (SD)</td>
<td>41.2 (16.3)</td>
<td>41.8 (16.0)</td>
<td>42.7 (16.8)</td>
</tr>
<tr>
<td>Marital status, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>107 (37.0)</td>
<td>107 (37.3)</td>
<td>122 (37.3)</td>
</tr>
<tr>
<td>Married/cohabitant</td>
<td>152 (54.0)</td>
<td>140 (52.3)</td>
<td>127 (38.0)</td>
</tr>
<tr>
<td>Divorced/widowed</td>
<td>21 (14.2)</td>
<td>15 (11.3)</td>
<td>21 (14.3)</td>
</tr>
<tr>
<td>Smoking history, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>60 (21.1)</td>
<td>60 (21.3)</td>
<td>51 (32.3)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>85 (31.7)</td>
<td>76 (28.1)</td>
<td>66 (25.7)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>120 (46.3)</td>
<td>109 (40.6)</td>
<td>93 (32.3)</td>
</tr>
<tr>
<td>Medication use (current), No. (%)</td>
<td>83 (30.2)</td>
<td>85 (31.5)</td>
<td>73 (31.9)</td>
</tr>
<tr>
<td>Occupation, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work status before injury (working), No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total yearly household income (a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; $40,000)</td>
<td>0.018</td>
<td>0.018</td>
<td>0.053</td>
</tr>
<tr>
<td>Medium ($40,000-$70,000)</td>
<td>0.006</td>
<td>0.006</td>
<td>0.010</td>
</tr>
<tr>
<td>High (&gt; $70,000)</td>
<td>0.006</td>
<td>0.006</td>
<td>0.010</td>
</tr>
</tbody>
</table>

*Participation status was measured using the information recorded in variables: work status at six, 12 and 24 months and the SF-36 Physical Component Score (PCS) at six, 12 and 24 months respectively.

**P < 0.01, *P < 0.05, NS not significant.

The measure for occupation is from the Australian Standard Classification of Occupations (ASCO), Cat. No. 1260.9, Australian Bureau of Statistics 1997. See Table 1 for occupational skill level for all categories.

Categories of income are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey Wave 6 Household Income Income is before tax and excluding number of people in household.

Recovery expectations was based on two measures from a large Canadian study of injured workers with soft tissue injuries by Cole et al. (2002) due to the lack of validated measures.

showed that those lost to follow up had no significant greater likelihood of delayed recovery on all measures (PCS, MCS, PCL-C, GRC) compared to those who remained in the study. This was based on the similar mean difference scores over time, at six, 12 and 24 months (data not shown). To assess the impact of pre-existing mental health problems (n = 19), the sensitivity analysis showed that those with pre-existing mental health problems had no significant greater likelihood of delayed recovery on all measures (PCS, MCS, PCL-C, GRC).
Table 3 Association of claim status and injury recovery measures using linear mixed model analyses

<table>
<thead>
<tr>
<th>Health status measure</th>
<th>Mean difference (SE)</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36v2 PCS</td>
<td>−2.16 (0.89)</td>
<td>−4.23, −0.12</td>
<td>0.021</td>
</tr>
<tr>
<td>SF-36v2 MCS</td>
<td>−3.14 (1.77)</td>
<td>−6.82, −0.45</td>
<td>0.072</td>
</tr>
<tr>
<td>PCL-C</td>
<td>2.42 (1.31)</td>
<td>0.07, 4.79</td>
<td>0.009</td>
</tr>
<tr>
<td>GRC</td>
<td>−0.66 (0.59)</td>
<td>−2.85, 0.53</td>
<td>0.298</td>
</tr>
</tbody>
</table>

*Adjusted for age, gender, ISS, ISS, education skill level, language other than English, BMI, risk of short term harm due to alcohol consumption, self-reported at fault, vehicle type, pre-medicolegal pain in the last 6 months, crash on a public road, self-assessed pre-injury health status, time and claim status by time.

A negative mean difference indicates that the compensable group had on average a poorer outcome where higher scores indicate better outcomes. Health status measures are Short Form 36th Version 2.0 Physical Component Score (SF-36v2 PCS), Short Form 36th Version 2.0 Mental Component Score (SF-36v2 MCS), and Global Rating of Change (GRC) scale.

A positive mean difference indicates that the compensable group had on average a poorer outcome where higher scores indicate poorer outcomes. Health status measure is PTSD Checklists - Civilian Version (PCL-C).

compared to those without pre-existing mental problems (data not shown).

Discussion

In this study, those who made a claim had poorer injury recovery than those who did not, the greatest difference being in mental health scores (MCS and PCL-C). Overall, regardless of claim status, injury recovery continued over time for most measures (PCS, MCS, GRC). For PTSD (PCL-C) there was no significant improvement. Many statistically significant differences in physical and mental health scores between compensable and non-compensable groups may be of marginal clinical importance.

Influence of claim status on injury recovery over time

Our study reinforces existing research showing that seeking financial compensation is associated with poor injury recovery; this has been demonstrated across different jurisdictions and study populations [17–21]. Current evidence suggests that seeking financial compensation is associated with poor injury recovery for two reasons: firstly, the characteristics and circumstances of those who pursue a claim; and secondly, the claims process. These are not mutually exclusive and are likely to be co-dependent.

It is posited that those seeking financial compensation have poor pre-existing health status, for example mental health problems [19]; vulnerability to stress [30]; and/or higher rates of obesity [60]. In our study, there were no differences in pre-injury baseline health between those who made a claim and those who did not. However, this should be interpreted cautiously as the measures largely encompass physical and not mental health, and the greatest differences between the two groups post-injury were related to mental health (MCS and PCL-C). Given the prevalence of mental illness (population prevalence 20%) and related conditions such as chronic pain (population prevalence 73–94%) in Australia [31, 61], it is probable that a significant number of people who made a claim had pre-existing mental health problems. Participants were asked at baseline about pre-existing mental health problems, but specific diagnostic tools were not used.

With respect to other circumstances, those eligible to claim did so, that is self-reported not at fault and crash on a public road. Fault status was taken into account but other granular measures such as blame, external attributions of responsibility and/or a sense of perceived injustice were not. Previous studies have shown that these factors were associated with increased pain intensity [2, 65]; greater rates of PTSD [65, 66]; and depression post-injury [65]. Such factors are multi-dimensional (e.g., perceived injustice focusses on severity/irreparable of loss and blame/unfairness) and could have contributed to poorer recovery particularly for those who self-reported as not at fault [62].

The second point relates to the claims process, which qualitative research has found to be detrimental to injury recovery, conductive to financial hardships and tied to stigmatisation of injured workers [24–27]. These themes prevail across different study populations and

Table 4 Association of time, measured from 6–12 months and 12–24 months after injury, and injury recovery measures, using linear mixed model analyses

<table>
<thead>
<tr>
<th>Health status measure</th>
<th>Mean difference (SE)</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36v2 PCS</td>
<td>−2.78 (0.74)</td>
<td>−5.23, −0.32</td>
<td>0.007</td>
</tr>
<tr>
<td>SF-36v2 MCS</td>
<td>−3.23 (0.74)</td>
<td>−5.59, −0.87</td>
<td>0.006</td>
</tr>
<tr>
<td>PCL-C</td>
<td>2.25 (1.31)</td>
<td>0.02, 4.47</td>
<td>0.138</td>
</tr>
<tr>
<td>GRC</td>
<td>−0.87 (0.74)</td>
<td>−2.4, 0.67</td>
<td>0.145</td>
</tr>
</tbody>
</table>

*Adjusted for age, gender, ISS, ISS, education skill level, language other than English, BMI, risk of short term harm due to alcohol consumption, self-reported at fault, vehicle type, pre-medicolegal pain in the last 6 months, crash on a public road, self-assessed pre-injury health status, time and claim status by time.

A negative mean difference indicates improvement over time where higher scores indicate better outcomes. Health status measures are Short Form 36th Version 2.0 Physical Component Score (SF-36v2 PCS), Short Form 36th Version 2.0 Mental Component Score (SF-36v2 MCS), and Global Rating of Change (GRC) scale.

A positive mean difference indicates improvement over time where higher scores indicate poorer outcomes. Health status measure is PTSD Checklists - Civilian Version (PCL-C).
Table 5 Injury recovery measures as claim status at 6, 12 and 24 months after injury

<table>
<thead>
<tr>
<th>Health status measure</th>
<th>No compensation claim</th>
<th>Compensation claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>95% CI</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>SF-36 QoL-PC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>42.8 (1.77)</td>
<td>39.4 (0.95)</td>
</tr>
<tr>
<td>12 months</td>
<td>43.0 (1.87)</td>
<td>42.0 (1.71)</td>
</tr>
<tr>
<td>24 months</td>
<td>44.5 (1.92)</td>
<td>44.0 (1.82)</td>
</tr>
<tr>
<td>SF-36 QoL-MCS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>40.7 (2.83)</td>
<td>37.7 (1.63)</td>
</tr>
<tr>
<td>12 months</td>
<td>37.7 (2.12)</td>
<td>34.7 (1.84)</td>
</tr>
<tr>
<td>24 months</td>
<td>34.8 (2.17)</td>
<td>38.8 (1.79)</td>
</tr>
<tr>
<td>PCQ-ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>39.0 (2.57)</td>
<td>34.8 (2.12)</td>
</tr>
<tr>
<td>12 months</td>
<td>37.1 (2.71)</td>
<td>32.8 (2.47)</td>
</tr>
<tr>
<td>24 months</td>
<td>36.0 (2.79)</td>
<td>31.0 (2.60)</td>
</tr>
</tbody>
</table>

*Intergal means based on linear fixed effect model with time and claim status as fixed effects. Adjusted for age, gender, ISS, RRsO, education level, language other than English, BMI. All of time and sex have due to alcohol consumption, self-reported at fault, vehicle type, pre-injury neck pain in the last 2 years, crash on a public road, self-assessed pre-injury health status, time and claim status by time.

*Health status measured with Short Form 36 Version 2.2 Physical Component Score (SF-36 PCS-2); Short Form 36 Version 2.2 Mental Component Score (SF-36 MCS); PTSD Checklist = Civilian Version (PCL-C); and Global Rating of Change (GRC) scale.

jurisdictions. Notably for moderate-severe injuries [25, 26], there is much at stake access to financial entitlements for treatment, non-economic (pain and suffering) and economic loss and/or assistance with return to work. Unsurprisingly, people find this stressful and it can have a substantial impact on their mental health [17, 19, 21, 30]. Furthermore, it has been proposed that seeking financial compensation is a consistent predictor of PTSD due to the stressful claims process constant reminders of the motor vehicle crash and rumination over crash circumstances and ongoing symptoms (e.g., at medico-legal assessments, with treating health professionals and insurers) [21]. Taking into account the greater PTSD symptomatology and poorer mental health status in the compensable group, it is plausible this could be due to any one or more of these factors.

Notwithstanding the impact of claim status on injury recovery, there appeared to be only marginal improvements in physical and mental health measures over time in both groups, albeit less in the compensable group. Despite abundant research into predictors of recovery following moderate-severe orthopaedic trauma, many of which are unrelated to injury severity [2, 4, 7, 14, 16], it remains of concern that a population of mostly young working age males with (self-reported) excellent-good pre-injury health do not recover to physical and mental health population norms two years after injury. These results have been replicated elsewhere [5-8, 66].

Strengths and limitations

This prospective study was a large cohort of moderate-severe injuries following motor vehicle related orthopaedic trauma. Standardised and validated measures were used; these were based on existing research including large population studies [5-8, 30]. Follow-up was repeated at three intervals: 6, 12 and 24 months.

Additional baseline measures would have been advantageous including initial pain intensity; mental health comorbidities such as anxiety, depression and other affective disorders and social support indices. These factors have been associated with seeking financial compensation and poorer outcomes following orthopaedic trauma [2, 5-7, 13, 15, 16, 21, 31]. Many baseline health measures were self-reported, which has been associated with underestimating the prevalence of risk factors in the general population [67]. This could have impacted our results, although attempts were made to mitigate this by collecting baseline data in person, and the construct of simple questions with clear parameters to enhance recall of information.

Other limitations were participant recruitment solely from hospitals, a moderate sample size of screened eligible participants, and moderate loss to follow up. For the unscreened eligible participants, they were similar in injury type/severity and mechanism of injury to the screened eligible participants. Further, recruitment was conducted over a sustained timeframe (2007-2011) to meet the sample size. For loss to follow up, the study population characteristics are a plausible reason for this, participants were predominantly younger males who tended to be of lower socioeconomic status and who worked in semi- unskilled occupations. They were often contactable but would not return questionnaires (see Fig. 1). Additional sensitivity analysis showed this did not impact our results. Future research may benefit from a larger sample size and more resources allocated to recruitment and follow up particularly for a study with a similar population and aims.

Future research and policy implications

There are considerable implications for planning future rehabilitation services for this population. Irrespective of claim status, many have ongoing physical and mental health problems that do not resolve post injury. In Australia, rehabilitation is largely directed towards older people (average age 75 years, 56% female) [68]. Moreover,
the current focus is on emergency and surgical care [69]. Our findings, supported by other research, demonstrate that this population could benefit from additional services [5, 7, 8, 66].

Over one in five Australians experience mental illness but only one third of these people seek treatment [31]. There is a greater prevalence of mental illness in young people and males are less likely than females to seek treatment. Further, of the two-thirds who do not seek treatment, 90% report not seeking it [31]. This indicates that younger males who are more likely to sustain motor vehicle related orthopaedic trauma have a greater risk of mental health problems post injury, and not recovering, and not seeking treatment even if it was available.

There is a need to trial interventions in this population. Self-management programs are a viable avenue, particularly those with psychosocial components [70, 71]. Internet delivered therapy for chronic pain and anxiety disorders has shown promising results [72, 73]. There is also substantial evidence of efficacy for medication use and cognitive behavioural therapy for mental illness [74, 75]. The challenge will be attracting people to treatment without attrition and identifying barriers to treatment [31, 71].

In terms of seeking financial compensation, our findings indicate that if eligible, those with moderate-severe injuries are likely to make a claim and have poor injury recovery. There are numerous tools to conduct risk assessments, especially for co-morbidities [2, 5, 13, 16, 40], but less guidance for approval of appropriate treatment. However, in NSW insurers are bound by legislation, and financial entitlements exist for injuries that are causally related to the motor vehicle crash [48, 49]. Examples include: treating for exacerbation of major depression, not the entire illness; or providing a vocational program for return to part-time work in the presence of capacity for full-time work. For the injured person, clinicians and insurers, this disentanglement can be confusing, difficult to sustain and costly. Furthermore, it does nothing to establish mutual trust or build positive relationships between parties [24, 26, 27]. If desired, legislative change may be the only way to address this issue.

Alternatively, recommendations from qualitative research could alleviate other adversarial and stressful aspects of the claims process by: redesigning procedures for medico-legal assessments; reducing excess paperwork; improving communication between the parties; using internet-based technology; making timely decisions about entitlements; encouraging easier access to treatment; and providing incentives to return to work [24–27, 30]. These initiatives could diffuse some of the negativity associated with seeking financial compensation and improve injury recovery.

Lastly, instruments including perceived injustice, blame, and/or attributions of external responsibility could be advantageous in future studies when investigating the impact of the seeking financial compensation on injury recovery [62, 76]. Previous mixed methodology research attests to the importance of these factors [2, 24, 26, 27, 62, 65].

**Conclusions**

Making a claim following motor vehicle related orthopaedic trauma was associated with poor injury recovery, mainly in relation to mental health status and PTSD. However, this may be of marginal clinical importance. Irrespective of claim status, the majority had poor injury recovery on all measures over time, especially for mental health problems. These findings lend credence to existing research and bring into focus the need for efficacious mental health interventions. The reasons why seeking financial compensation is associated with poor injury recovery remains complex. There is a need for initiatives to manage potential co-morbidities and address the adversarial aspects of scheme design.

**Abbreviations**

ABS, Australian Bureau of Statistics; AIS, abbreviated injury scale; ACED, Australian standard classification of education; ASCO, Australian Standard Classification of Occupations; AU, Australian dollar; AUST-IC, alcohol use disorders identification test-self report version; BMI, body mass index; CALD, culturally and linguistically diverse; CCI, confidence interval; COP, gross domestic product; GPC, global scaling of change; HELP, household, economy and labour in Victoria (Australia); IRR, index of relative socio-economic disadvantage; ISS, injury severity score; MCI, mental component score; MD, main difference; NMAC, national health and medical research council; NS, new injury severity score; NSW, New South Wales; PELC, PTSD checklist; PES, physical component score; PSS, post traumatic stress disorder; RITW, return to work; SD, standard deviation; SF-36v1, short form-36 version 2.0; SRA, state insurance regulatory authority; WIC, workers compensation.

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**Availability of data and materials**

Results from the dataset are presented in the paper. The full dataset is available from the first author upon request.

**Authors’ contributions**

Authors DM, IH and IC contributed significantly to study conception and design, data acquisition, analysis and interpretation. Author YT conducted the statistical analysis and provided data interpretation. All authors contributed to drafting and critical revision of the manuscript.

**Authors’ information**

Not applicable.

**Competing interests**

All authors declare that they have no competing interest.

**Consent for publication**

Not applicable.
Chapter 8: Discussion

The principal aim of this thesis is to explore the impact of seeking financial compensation on injury recovery following motor vehicle related orthopaedic trauma. This relatively new field of research has remained controversial and fragmented by the nature of different scheme designs and study populations.(1-5) To this end, a series of different methodologies were employed to expand on existing knowledge and to provide further insights into why financial compensation is associated with poor injury recovery.

In this Discussion the main findings from each Chapter are summarised, followed by several key messages. Then implications of this research are described and opportunities for future work are identified. These include strategies to address adversarial scheme policy and design and interventions that could improve injury recovery in a compensable environment. Finally, concluding statements are presented.

Summary of main findings

Firstly, a systematic review was conducted to identify associations between compensation related factors and health outcomes following musculoskeletal injury. The review demonstrated there was moderate to strong evidence of associations between compensation related factors – most commonly making a claim and seeking legal representation, and poorer physical/psychological health and pain following musculoskeletal injury (6). However, these results were mixed. Based on existing research it cannot be determined whether this association is causal (Chapter 2).
Secondly, a series of focus groups were conducted in two different populations following a motor vehicle related trauma to explore factors that influenced injury recovery including any differences between compensable and non-compensable participants, and why people sought legal representation. This qualitative research was designed to address the lack of granularity in compensation related factors, that is: they are quantifiable but do not provide sufficient information about what aspects of making a claim or seeking legal representation might influence injury recovery.

The main findings for serious injuries were that the injury recovery experience was difficult for all people but it was particularly stressful for people claiming compensation (7). The themes that were identified indicated the complexity of the claims process, led to the necessity of seeking legal representation, and a perceived lack of trust between insurers and injured people, including a perceived sense of injustice and entitlement.

The main findings for minor to moderate injuries (in a solely compensable population) were that people had contrasting injury recovery experiences (8). Some participants found the claims process stressful and subsequently sought legal advice, whilst others reported a straightforward recovery, and no legal representation. Participants’ perceptions of the claims process were influenced by injury recovery expectations and timeliness of healthcare decision making (Chapters 3 and 4).

Thirdly, an inception cohort study was conducted following motor vehicle related orthopaedic trauma with three separate follow up intervals (six, 12 and 24 months) to investigate predictors of seeking financial compensation, predictors of return to work, and the influence of seeking financial compensation on injury recovery for people following
moderate to severe orthopaedic trauma related to motor vehicle crashes. The cohort was also analysed by compensation status (i.e. making/not making a claim) to investigate whether poor health led people to claim compensation. These results showed there were no significant differences in pre-injury or baseline health status between the two groups, although this should be interpreted cautiously as these measures were largely related to physical health (Chapter 5).

Other results showed that when compensation related factors were outcomes, seeking financial compensation (making a claim) was associated with a higher pre-injury Body Mass Index (BMI) rather than injury-related factors, and seeking legal representation was solely related to socio-economic factors (Chapter 5). A longer time to RTW was associated with greater injury severity and lower occupational skill levels. Whereas, a shorter time to RTW was associated with recovery expectations for usual activities of ≤90 days, full-time pre-injury work hours, and very good self-assessed pre-injury health status. Legal representation at six months was not associated with time to RTW (Chapter 6).

As a predictor, seeking financial compensation was associated with poor injury recovery, mainly for mental health status and Post-Traumatic Stress Disorder (PTSD). However, the differences were of marginal clinical significance. Irrespective of compensation status, the majority had poor injury recovery, especially for mental health. The reasons why seeking financial compensation is associated with poor injury recovery is complex and the causal nature of the relationship remains unclear (Chapter 7).
Key messages

The association between seeking financial compensation and poor injury recovery

Firstly, overall the evidence points to an association between seeking financial compensation and poor injury recovery and/or RTW on a range of physical, psychological and pain measures.\(^6,\ 9-12\) The impact appears greatest on mental health (Chapter 7).\(^7,\ 8\) Quantitative research provides the evidence of associations between seeking financial compensation and mental health status and/or PTSD \(^6,\ 13,\ 14\), and qualitative research offers credible reasons why these associations exist, for example: the stressful and adversarial nature of the claims process; the lack of trust between insurers and injured people; the perceived sense of injustice and entitlement; the inability to move on with life during the claims process; the financial burden and issues accessing financial entitlements; and the necessity to seek legal representation.\(^7,\ 8,\ 15-18\)

In addition, there is the likely presence of background pre-injury factors. In Australia, the population prevalence of mental health problems is 20\% \(^19\), chronic pain is 17-20\% \(^20\), and being overweight or obese is 63\%.\(^21\) Therefore, it is not unforeseen that injured people may have vulnerabilities prior to injury that partly or wholly explain the impact of seeking financial compensation on injury recovery including poorer mental health status. It has been argued previously that poorer health leads people to claim compensation not vice versa (that claiming compensation leads to poorer health).\(^2,\ 3,\ 22\) It is acknowledged that injured people with vulnerabilities prior to injury are more likely to struggle post-injury \(^19,\ 20,\ 23-26\), and potentially more likely to make a claim. \(^27-29\) Nevertheless, current evidence suggests these factors are most likely amalgamated, that is: background pre-injury factors explain part of the association but not all.\(^13,\ 14,\ 23,\ 30\)
In the past, the concepts of malingering or secondary gain were presented as explanations for the association between seeking financial compensation and poor injury recovery. (31-33) More recently, the complex relationship between pre-injury psychosocial and/or mental health factors, socio-economic factors, and compensation related factors, offer a more plausible interpretation for why injured people could be perceived as malingering or exaggerating symptoms for personal gain. However, these concepts remain in circulation. (34, 35)

In the cohort study the predictors of making a claim and seeking legal representation were related to non-injury factors (Chapter 5), but collectively, research evidence points to injury and non-injury factors. (27-29, 36-41) Knowledge about the claims process, eligibility, socioeconomic status, workplace circumstances (e.g. job satisfaction, negative impact on employment), co-morbidities and injury severity have all been reported. (36, 37, 39, 40) Most large scale studies have been within Workers Compensation (WC) jurisdictions where mechanism of injury (motor vehicle crash versus workplace), common injuries, and access to financial entitlements can differ. (27-29, 36, 37, 39-41) Similar reasons are likely to apply to Compulsory Third Party (CTP) and other road traffic injury schemes about deciding whether or not to make a claim.

The reasons for seeking legal representation prior to or after a claim is lodged appear different (Chapter 3-5). (42, 43) In epidemiological research, legal representation or litigation is usually cast as a predictor not an outcome (23, 44-47). Evidence is limited, it indicates that disability measures, pain catastrophising, poor mental health, and/or socioeconomic disadvantage are factors (Chapter 5). (42, 43) Results from qualitative research also support
this view, where many involved in the claims process feel compelled to seek legal advice.(7, 8, 16, 17) Further, Australian legal research has shown that people who are socioeconomically disadvantaged are more prone to legal problems such as those involving employment, crime, credit/debt, family, health, housing, and personal injury. These problems tend to escalate with most taking no action to resolve issues.(48)

However, regardless of compensation status, many people who sustain injuries in a motor vehicle crash have poor injury recovery and RTW rates.(6, 9, 12, 13, 49) This population of predominantly younger working age people are important to society. The burden of injury and years lived with disability are said to be increasing particularly with the aging population (50), and it is posited that the burden of injury is underestimated.(51) Furthermore, it has been demonstrated that work is fundamental to good physical and mental health, and poor health significantly contributes to lower socio-economic status.(52-54) Taking this all into account, the evidence is concerning particularly when past economic costs of motor vehicle crashes have been calculated at AUD$17b or 2.3% of Gross Domestic Product (GDP) per annum in 2003.(55) Moreover, in 2013-14 the State Insurance Regulatory Authority (SIRA), formally the Motor Accidents Authority (MAA), reported that over 14,000 claims were lodged and insurers paid out AUD$1.42b in benefits during the same period.(56) The associated costs of poor injury recovery, RTW rates and lost productivity are substantial.

*Adversarial scheme policy and design*

The second key point relates to the adversarial nature of the claims process and its impact on injury recovery, particularly mental health status. Research indicates for most injured people the claims process is arduous, stressful and complex, and seeking legal representation
becomes the only option (in their view). A number of consistent themes have emerged, particularly from qualitative research to explain this, including: sense of entitlement and perceived injustice (7, 16, 17, 57); injury recovery expectations; difficulty accessing financial entitlements including treatment (7, 8, 58); and poor communication and administrative functions. (7, 8, 15-17, 59) The context of these themes within a compensable environment requires elaboration.

Sense of entitlement relates to perceived injury severity, need for treatment and/or financial entitlements, not the construct of psychological entitlement that ‘one deserves more and is entitled to more than others’. (60, 61) Perceived injustice is a multidimensional construct with components of severity/irreparability of loss and blame/unfairness. (62) It can also include components of distributive, procedural, informative and interpersonal justice depending on the measure. (63) Research has shown that if people feel they have been treated fairly with minimal delays, appropriate claims management and/or RTW, they are more likely to perceive higher procedural justice and less likely to dispute their claim. (63-65) Moreover, there is growing evidence that perceived injustice is linked to poor injury recovery. (63, 66-71)

In addition, one component of perceived injustice, namely ‘blame’ or ‘external attributions of responsibility’ is pertinent. In NSW, CTP insurance operates a predominantly fault-based scheme, that is: there must be driver at-fault, someone to claim against to make a full claim. (72) Since April 2010, a partial claim can be made regardless of fault for limited entitlements (up to AUD$5,000). In these circumstances ‘fault’ relates primarily to eligibility and accessing financial entitlements. Yet, the legal concept of ‘fault’ can be separate from the moral concept of ‘blame’. There can be a number of factors or a person’s own decisions that
contribute to the crash, for example: poor road conditions; a pedestrian crossing before an oncoming car; or failing to slow down at an intersection. Irrespective of compensation status, blaming someone/thing else has been linked to higher pain levels and PTSD post injury.\(^{(67, 69, 71)}\) In other research within a no-fault scheme, those who attributed responsibility to someone else were more likely to be depressed and less likely to return to work.\(^{(68)}\) Whilst, a scheme may address the legal culpability of ‘fault’, it does not always address the moral culpability of ‘blame’.

The latter is important particularly given the debate around fault versus no-fault schemes and the belief that a no-fault scheme can reduce administrative, legal and premium costs, complexity and adversary within a scheme, and promote injury recovery.\(^{(73-76)}\) In Australia cross-jurisdictional comparisons show that some schemes are more cost effective.\(^{(76)}\) This is likely due to a range of factors for example, public versus private underwriting, public versus private administration (particularly with multiple private insurers), propensity to claim, access to financial entitlements, ability to contain medical costs, and/or claims management practices.\(^{(76, 77)}\) Furthermore, in the United States (US) a number of states have experimented with no-fault since the 1970’s and found that cost savings did not materialise primarily due to rising medical costs and an inability to contain them.\(^{(77)}\) If no-fault schemes are preferred from a social equity, administrative and cost savings perspective, then scheme policy and design is important and the culpability of ‘blame’ should be considered as a separate issue.

Injury recovery expectations, including self-efficacy and illness perception are multidimensional measures \(^{(78-82)}\), and robust predictors of recovery and RTW.\(^{(9, 78, 83, 84)}\) They relate to personal characteristics rather than a specific diagnosis.\(^{(81, 82)}\)
recovery, there are two parts: firstly, how well you think or expect you will recover does influence your actual recovery (9, 78, 83, 84); and secondly, what you believe or perceive you need for treatment/rehabilitation to recover (i.e. an entitlement) does influence your actual recovery.(83, 85, 86)

Lastly, the issues surrounding communication and administration functions including access to financial entitlements are central to the stressfulness experienced by many injured people. Research evidence asserts that mostly negative interactions with insurers occur during the claims process (e.g. poor communication, a lack of transparency and delays in treatment approvals, lack of empathy, scant objective information, excessive paper work, reliance on medico-legal assessments, and a lack of customer service.(7, 8, 15-17, 58) This builds distrust and raises issues of legitimacy which can eventuate in negative psychological consequences.(7, 8, 16, 17)

These issues are compounded by limited health literacy, Culturally and Linguistically Diverse (CALD) backgrounds, and other socioeconomic and psychosocial factors.(7, 8, 13, 14, 16, 17, 30, 58) Injured people have consistently declared the need for changes to the claims process that will assist rather than thwart injury recovery and RTW, and alleviate the pressure to seek legal representation.(7, 8, 15, 16, 30, 58)

**Strengths and limitations**

For this thesis, there has been extensive review of the literature and research evidence. The systematic review was conducted according to current guidelines and recommended methods of reporting, although there is a lack of agreed quality assessment methodology for
prognostic studies. The qualitative research (focus groups) was conducted using established methodology resulting in robust data with across group data saturation. These focus groups are among the few conducted within a road traffic injury scheme, most qualitative studies are within WC jurisdictions. The prospective study was a representative cohort of moderate to severe motor vehicle related orthopaedic trauma with repeated follow up. Standardised and validated measures were based on relevant existing research.

Compensation schemes operate in a complex socio-political environment. Mixed methodology (quantitative and qualitative) allowed for an in-depth analysis of the association between compensation related factors and injury recovery in a specific location within NSW CTP and WC jurisdictions. However, the diversity of compensation schemes means generalisability to other jurisdictions could be limited. Notwithstanding that, similar themes from the qualitative research have been found in multiple CTP and WC jurisdictions.

Currently, the measures of compensation related factors are limited for example, making a claim or seeking legal representation does not adequately reflect the complexity of scheme design. These limitations are difficult to counter and mixed methods research (including within and/or between scheme comparisons) has been recommended, along with the use of existing validated measures such as those for perceived injustice, and the development of new measures for items such as satisfaction with the claims process. Others have referred to the need for a reporting framework, which includes the features of scheme design preferably as study factors for example: access to financial entitlements, wage replacement benefits and vocational rehabilitation; scheme eligibility – fault, journey claims
(to and from home to work); scheme administration and regulation; and claims management practices.\(^{(97)}\) Consideration of study aims may be required to reduce onerous reporting.

Additional psycho-social and work-related measures at baseline would have added value to the research program, and these include initial pain intensity, pain catastrophising, mental health, social support indices, individual job characteristics/tasks and workplace/organisational measures. These have been associated with poorer outcomes including RTW following trauma.\(^{(44, 45, 53, 98-102)}\) In addition, many of these factors are population specific and could have been useful when assessing the implications for policy and design within one scheme. However, there are challenges when determining which measures to include in studies, future research would benefit from targeted approach.

Another limitation is moderate loss to follow up in the inception cohort study. Retention of cohort study participants was difficult to maintain with limited financial resources. The socio-demographic profile of study participants was a plausible reason for loss to follow up. They were predominantly younger males of lower socioeconomic status who were in semi-unskilled occupations. Many were often contactable but would not return the questionnaires (see Figure 1, Chapter 7).

Finally, there is the possibility of reverse causality and measurement error. Reverse causality is when the direction of cause and effect is contrary to what is presumed or is a two-way causal relationship.\(^{(103)}\) For example, does poor health lead people to claim compensation or does claiming compensation cause poor health? Reverse causality was addressed in the cohort study but with limited measures (Chapter 5), and it is conceivable that people with poorer health were more likely to make a claim. However, irrespective of compensation
status participants had poor injury recovery on all measures, particularly mental health (Chapter 7). Reverse causality has been investigated in other studies and pre-injury physical and mental health factors are significant in making a claim. (2, 3, 14, 23, 24, 30, 38, 104) These factors need to be included in future research.

Measurement error is likely when the timing of exposure to a compensation related factor does not occur at baseline and/or there is questionable quality of the measure. (105) These possibilities were discussed in Chapters 2 and 6 respectively. To reiterate, the exposure to a compensation related factor may not be at baseline (e.g. in NSW CTP and WC you have six months to lodge a claim from date of injury and can obtain legal representation at any time). To reduce the likelihood of an error occurring, compensation related factors taken at six months were used as potential predictors of time to RTW, and other physical/mental health measures at 12 and 24 months (Chapters 6 and 7).

Alternatively, is a measure like ‘seeking legal representation’ a valid measure or a composite? That is does it measure what it purports to measure? Studies have been criticised for a lack of granularity and scheme design can play a role, for example: access to a lawyer must be available under the legislation and there is the possibility that lawyers only take viable cases with a chance of reasonable financial compensation and/or solely do pro-bono work. (4) This problem is not resolved here, and further research is needed to determine the characteristics of those who seek legal representation, the lawyers who provide it, and the timing, duration and level of exposure to legal representation. (4, 48)
Future research and policy implications

The balance of empirical evidence points to an association between seeking financial compensation and poor injury recovery and RTW rates. Therefore, it is important to examine what can be done to address this. The key messages from this thesis, and other research, point to a number of opportunities. Some like screening of risk factors for poor injury recovery and/or RTW, and access to early appropriate treatment and rehabilitation, are well established principles in health systems but less so in many compensable schemes. Others that address adversarial scheme policy and design are complicated to present and for clarity have been divided into reforms that require legislative change and reforms that are do not.

Screening for risk factors of poor injury recovery and/or RTW

If many people who pursue financial compensation have different characteristics and circumstances to those who do not and this can influence injury recovery, what are the options? Presently, the NSW CTP and WC legislation requires insurers to cover losses and treatment for injuries sustained and/or exacerbated in the motor vehicle crash (i.e. those injuries causally related to the crash).(72, 106) Insurers can try to quarantine a condition as pre-existing rather than an aggravation and attempt to deny liability for treatment, rehabilitation and/or care, and other losses, but this imprecise and often destructive to the relationship between the insurer and the injured person.(7, 16, 17)

This makes a compelling case to screen for risk factors at claim lodgement that might prolong recovery or RTW. This could include individual-related factors (e.g. psychosocial and socioeconomic factors) (6, 13, 14, 30, 84, 102, 107), and work-related (e.g. job and employer characteristics).(9, 53, 54) There is extensive evidence including guidelines and validated
measures available that can assist insurers to develop targeted and practical screening tools. (108, 109) Factors like income, CALD backgrounds and work status are relatively easy to capture but others (e.g. pre-existing mental health problems, poor social support or expectations for recovery and RTW) are less simple to identify. Some insurers have had success with data collection (100, 110), but there can be resentment when personal information is requested that may not appear relevant to the injured person. (7, 8, 15-17, 111) It could be beneficial to publicise reasons for data collection independently for example, via the government regulator with a careful explanation about why this information is useful for injury recovery and claims management. Additional training, skills and an alternate customer service model may also be required as shown previously. (110)

Currently there is limited evidence that insurer screening for risk factors and altering claims management practice promotes injury recovery and/or RTW. Research remains in its infancy (110, 112, 113), although early findings from WC jurisdictions suggests there are differences in claims management practice that could influence claim duration and RTW. (113) Therefore, further research including trialling alternative claims management models is desirable especially in complex and challenging areas such as mental health. (112) If risk factors of poor injury recovery at claims lodgement and alternative claims management models are established, the challenge still remains to provide access to early appropriate treatment and rehabilitation.

Access to early appropriate treatment and rehabilitation

Regardless of financial compensation, many people who sustain motor vehicle related trauma have poor injury recovery and RTW rates, which creates a substantial economic burden
At present, there is minimal focus on post-injury rehabilitation following motor vehicle related trauma. Rehabilitation (at least in NSW) is focussed on those aged 65 years and over. Despite having a national clinical framework with a biopsychosocial approach for the delivery of healthcare services, state-based models of care, and activity based funding (cost weights are applied for different health services such as acute admitted, outpatient and emergency department), there are limited specific policies for rehabilitation following motor vehicle related trauma. Additional research has been recommended to determine the benefits of rehabilitation following trauma, a recent systematic review found there were no randomised and/or controlled clinical trials in this field, thus limited evidence to support the effectiveness of rehabilitation following trauma. Some studies have shown people with moderate to severe trauma could benefit from early rehabilitation. It would seem imperative to trial interventions that could improve injury recovery following motor vehicle related trauma.

In contrast for mental health problems, there is substantial evidence to support interventions such as Cognitive Behavioural Therapy (CBT) and medication use, and growing evidence for therapist-supported internet therapies. The challenge lies in accessing evidence based care. Recently, mental health services have been funded by Medicare in Australia signifying a need to improve mental health outcomes for Australians. In addition, those with a compensation claim can potentially have treatment covered by an insurer if it is reasonable and necessary and related to the injuries sustained in the motor vehicle crash. However, as stated in Chapter 7, 20% (point prevalence) of Australians have mental health problems, and those most likely to sustain moderate to severe orthopaedic trauma (younger working age males) are less likely to seek treatment or think that they need treatment, even when they have a mental health disorder.
compounded by an adversarial and stressful claims process is not an ideal environment for injury recovery. Again, there is an imperative to trial interventions for mental health problems in this population.

Similarly, for vocational rehabilitation there is substantial evidence for many aspects especially early work-focused healthcare and accommodating workplaces, which are interrelated and need to be coordinated.(53, 127) The recommended approach is simple principle-based interventions for up to six weeks, systematic service delivery options for up to six months, then ‘pathway’ mechanisms for the long term unemployed (after six months).(127) Various models have been suggested (128), but there remains limited evidence for how to scale up vocational programs across industries or communities.(127) RTW rates tend to vary across study populations (98, 99), but overall remain low following motor vehicle related trauma (Chapter 6). Moreover, mental health problems are an escalating cause of poor RTW and there is a need to trial efficacious vocational interventions in this group.(127) In terms of the compensation environment, for WC jurisdictions RTW is a priority and vocational rehabilitation can be mandated (106), but in CTP there no obligation for the employer to accommodate RTW. This makes vocational rehabilitation challenging and there is a need for proactive policy initiatives and/or legislative change to assist the process.

Lastly, when designing rehabilitation (including vocational) or mental health interventions, it is important to be cognisant of compensation related factors such as the influence of adversarial claims processes, sense of entitlement and perceived injustice, blame, injury recovery expectations, and how these could impact on mental health status and injury
recovery.(7, 14, 16, 30, 67, 70) These factors should be considered as potential confounders for injury recovery and/or may need to be a component of the intervention.

Reform with legislative change

There is some evidence from epidemiological research that legislative change can support injury recovery by: reducing timeframes for claim acceptance and duration; improving access to earlier treatment; changing to a no-fault scheme; and altering access to financial entitlements.(11, 129-132) These studies (and Chapters 3-7) emphasise the need to reduce adversarial scheme policy and design, which has also been advocated for by the judiciary.(4, 73-76)

Firstly, before the claims process has even begun, there can be delays. Legislated timeframes to lodge a claim vary between schemes but are usually between six to 12 months post injury.(72) For WC there is six months to lodge a claim but the employer is required to notify the insurer within 48 hours which can expedite appropriate services (treatment, rehabilitation and vocational).(106) In NSW, there are set limitation periods for civil matters that reflect the legal system.(133) Historically they were designed to protect defendants in common law and aid resolution of a case in a reasonable time period. In a personal injury scheme what makes this challenging is the difficulty to facilitate early appropriate treatment and/or RTW if a person has six or more months to lodge a claim and does not seek appropriate treatment or RTW beforehand. Insurers cannot act if there is no claim. There is a disconnection between the legal rights of the injured person and the empirical medical evidence on promoting injury recovery. Likewise, claim duration reflects the current legislation to ensure injuries have stabilised and no further improvement or change is likely.(72, 106)
Providing incentives for early lodgement and/or shorter claim durations would appear the best method to achieve good injury recovery and RTW rates in the current legal framework, for example: simplified claim and treatment forms; aiding faster liability and treatment decisions, particularly for those likely to be not-at-fault – passengers and pedestrians; upfront treatment payments; and early vocational rehabilitation programs.(127, 129) Technology could also assist with proactive claims management and rapid decision-making.(8)

Secondly, changing to a no-fault scheme, that is: shifting from tort ‘fault-based’ (payments for general damages) to no-fault (no payments for general damages – minor injuries) but with increased medical and income payments can promote injury recovery. In Saskatchewan, Canada, studies showed a decreased incidence of Whiplash Associated Disorder (WAD), low back pain and Mild Traumatic Brain Injury (MTBI), improved prognoses, and shorter claim durations following legislative change.(11, 132, 134)

The fault principle lies within tort law where it is asserted a person who causes loss or damage to another by his/her fault should compensate that person.(73) However, the merits of fault-based schemes have been debated by many in the judiciary with some concluding it does not serve the community well when interpreting the realities of delivering financial entitlements.(73-75) Conversely, the principle of no-fault lies in social equity, that one member of the community should not pay the price for what is often a myriad of factors involved in the cause of a motor vehicle crash (e.g. single vehicle crashes, poor road conditions, faulty vehicle mechanics).(73, 75)
However, any change to a no-fault scheme should be viewed with caution. In some jurisdictions, past experiments with no-fault have resulted in greater medical costs (by paying more per service and by paying for more services), and ultimate repealing of the legislation. (77) Credible reasons for this were cost shifting between health and auto insurers, and a lack of technical expertise and flexibility to contain costs. (77) Australia primarily operates a fee for service healthcare model (135), which means the more services provided by a health professional the higher the costs. This can encourage over servicing especially when the evidence to support efficacy is precarious (136, 137). Recently the need to seek efficiency based reforms was raised. (135) A no-fault scheme could lead to a greater number of people claiming for a greater number of services regardless of efficacy of that service. Measures are needed to contain costs particularly when insurers have limited ability to do so. Currently in NSW, WC is able to limit costs but with mixed success (136), there is no CTP policy for the same. In 2013, a Bill was introduced to parliament in NSW proposing a no-fault scheme. (138). This Bill did allow for the containment of medical and legal costs, but it was controversial (139), and after lobbying by the medical and legal profession (140), the Bill was withdrawn by parliament before enactment. (138) Interestingly, the state of Victoria administers a less expensive (publically underwritten, government administered) no-fault scheme with the ability to contain medical costs. (76) It is posited the ability to contain medical and legal costs is important particularly when widening access to a scheme (e.g. no-fault).

This leads into the overlapping constructs of ‘fault’ and ‘blame’. If no-fault legislation is embraced and costs contained appropriately, this does not remove perceived sense of injustice, blame or external attributions of responsibility. Even in a no-fault scheme, these would be risk factors for poor injury recovery and/or RTW rates. (67, 68, 70) Previously, it
has been recommended that targeted interventions need to be developed and evaluated to address factors ‘within’ an individual (sense of entitlement, perceived injustice) and ‘outside’ external sources of injustice such as insurer, workplace and healthcare provider. (70, 141)

Other jurisdictions have pursued approaches involving restorative justice and therapeutic jurisprudence. (142) Restorative justice is essentially mediated encounters between victims and offenders which discuss the offending behaviour, the effects of that behaviour and any reparation to be made. (142) It tends to be pragmatic with diverse goals dependent on the situation involving deterrence, prevention, community safety, offender rehabilitation, victim support and/or community trust. (142) For example, a widely known family group conferencing program in New Zealand for at risk Maori youth consists of an independent facilitator, a police officer stating facts, the offender admitting the facts, and the victim describing the effects, followed by a general discussion and options for making amends. (142) Following a motor vehicle crash it can be unclear who is to ‘blame’ and adjustments may need to be made as to the content and possible outcomes. Nonetheless, it may be a far less expensive and less stressful alternative for some than being involved in a lengthy, complex and adversarial claims process. (7, 8, 16, 17, 30, 111) In NSW, CTP and WC operate long tail schemes. In CTP, many claim payments take up to six years post injury to stabilise (56), and in WC 58% of claims remain open three years post injury. (143)

On the other hand, therapeutic jurisprudence hinges on the premise that the legal process affects individual wellbeing (especially psychological) and acknowledges that conflict within the justice system should be minimised. (142, 144) It focusses predominantly on improving legal process, values self-determination (142), and is being used increasingly by the judiciary. (142, 145) Examples of therapeutic jurisprudence include: injured workers being
involved in the design of their rehabilitation programs; defendants being offered viable rehabilitation alternatives to incarceration; or lawyers viewing their clients holistically taking into account their social, psychological, economic and legal situation. (142, 145) It is not unreasonable that a framework of therapeutic jurisprudence could be applied to aspects of the claims and/or legal process especially when risk factors of blame/external attributions of responsibility and/or perceived injustice are present. Currently for personal injury claims, dispute resolution is available either formally via the CTP or WC regulator, or through negotiation and/or mediation via the insurer. (126, 146) However, the latter have minimal policies in place to guide actual practice and there is no specific reference to acknowledging or managing the aforementioned factors. (126, 146) Other possibilities include placing some onus on lawyers to offer interventions to injured people with these risk factors, or to actively empower the injured person to make decisions and take responsibility for their injury recovery and/or RTW. (4, 17, 142, 145) In some respects therapeutic jurisprudence exists already (145), but there lacks a specific approach for personal injury and implementing a formal framework would require careful collaboration with the legal profession. It could be confronting for some and may be resisted. (4)

For decades legal experts have been advocating for no-fault schemes and the role of restorative justice and therapeutic jurisprudence in legal process. (73, 75, 142, 144) If serious consideration is given to these avenues of change (76), any approach would need legislative reform (binding) or policy initiatives (nonbinding), along with measures to determine whether there is any benefit to injury recovery and scheme efficiency. Otherwise, there is the distinct possibility of no change, that is: those seeking financial compensation, regardless of fault status, will have continue to have poorer injury recovery, and potentially rising scheme costs and inefficiency.
Thirdly, the other related area of legislative reform that can influence injury recovery is altering access to financial entitlements. In 2001, legislative changes were introduced in the NSW CTP scheme. These changes did not alter any fault-based principles, and entailed: decreasing access to general damages – pain and suffering for minor injuries; early notification and claim acceptance within 28 days of injury for limited financial entitlements; and thereby, enabling earlier access to treatment. A subsequent study showed decreased disability and pain measures in people with WAD. Since then, with the exception of catastrophic injury (no-fault access to treatment, rehabilitation and attendant care for adults and children), there have been minimal changes to the scheme.

Whereas in WC there have been a number of changes to financial entitlements, most recently in 2012, then 2015 when some of the 2012 changes were repealed. The 2015 changes were designed to support injured workers, promote work capacity and RTW, and reward employers with good safety records and suitable RTW programs. There is no evidence to evaluate these changes, but the focus on work capacity rather than disability is promising. However, keeping abreast of repeated legislative reform could be challenging and confusing for injured workers, insurers and lawyers adding to overall dissatisfaction with the claims process rather than an anticipated improvement.

Conversely, another interesting example of altering financial entitlements is in the US Military. In 2010, the eligibility criteria were reduced to access disability benefits for PTSD. This was designed to streamline the claims process. In 2011, an audit showed that the Veterans Benefits Administration (VBA) was incorrectly processing 100% disability evaluations for a projected 15% of claims and it predicted that the VBA would overpay
veterans US$1.1billion (for all injuries) over the next five years.(153) The audit was critical of VBA claims management including assigning permanent disability without adequate documentation. In 2015, a further audit indicated this had only been partially rectified.(154) Although it is not possible to confirm the impact of evidentiary changes on claims management, it is cause for concern. Conspicuously, this is coinciding with the rising PTSD rates in US veterans, in contrast to stable rates in United Kingdom veterans.(35, 155)

Overall, the evidence for altering access to financial entitlements is difficult to interpret and likely to be scheme and population specific. It can make a difference to injury recovery but any alteration to benefits requires diligent claims management policy to ensure financial entitlements are administered appropriately. Also, there is the possibility of poorer injury recovery and/or RTW if implemented due to political, administrative and/or cost drivers rather than a secure evidence base.

Reform without legislative change

Other factors that could impact on adversarial scheme policy and design are less likely to require legislative change. Themes like injury recovery expectations, which relate more to the individual, and poor communication and administrative functions including obtaining medico-legal assessments, which can be interpreted more broadly are key areas of potential change. It is also important to consider the legislative framework and obligations under which insurers are required to manage claims, otherwise there is the potential to misinterpret some of the observations from existing research.
Firstly, regardless of compensation status, research evidence signifies the importance of injury recovery expectations (9, 78, 83, 84), and alludes to the possible impact of what injured people ‘perceive’ as appropriate treatment. Some have unrealistic expectations that are not evidence based.(8, 85, 156) The triadic relationship between the injured person (who wants the treatment), health care practitioner (who recommends the treatment) and insurer (who pays for the treatment), complicates health service delivery. If the relationship is viewed with distrust, stigma or there is a power imbalance, this can create additional obstacles for accessing treatment and injury recovery.(7, 8, 15-17)

Injury recovery expectations are modifiable and potentially amenable to intervention. Results from previous trials are promising and offer cost effective options.(157-159) This factor has often been overlooked in compensation related research and requires further exploration. There are guidelines available to manage expectations and beliefs during the patient consultation (156), and the Calgary-Cambridge framework provides a clear reference for this.(160, 161) There is an opportunity to trial education programs that adjust injury recovery expectations, plus this topic lends itself to online training via webinar or other similar methods.

Secondly, the issues surrounding administration and communication are equally modifiable. There has been repeated advocacy for objective information (i.e. not from the insurer), reduced paperwork requirements, and faster transparent decision making.(7, 8, 15, 16) Although there are many guidelines available about injury recovery and the claims process (108, 109, 126, 146, 162), they do not appear to meet the needs of injured people (8), and most are only available in hard copy or Portable Document Format (PDF). There are a myriad of technology based alternatives that could offer simpler explanations, transparency, and
speed up decision-making for example: a video link to explain the claims process and financial entitlements; apps to provide information about injury recovery for specific conditions (including expectations); Skype for conversations with the insurer about financial entitlements; online claim forms and treatment request/cost recovery forms; online pre-approval of a limited number of treatment sessions for certain injuries, or direct transfer options similar to private health insurance to cover payments. To many these appear obvious and cost effective solutions to some of the difficulties navigating the claims process.

In considering these alternatives, it is worth noting the limited health literacy in Australia. Only 40% of the Australian population have the required level of health literacy to meet the complex demands of everyday life. Although, guidelines are available to ensure health literacy is addressed in high risk situations and printed or audio-visual material is appropriate, there appear to be few measures in a compensable environment that consider limited health literacy. Plus, there is evidence to suggest injured people struggle to understand what the claims process requires of them. It not surprising injured people disadvantaged through limited health literacy (e.g. language, psychosocial or socioeconomic barriers) struggle with the claims process and as a result seek legal advice.

In any environment, effective communication comprises of many activities including customer service (e.g. politeness, promptness, regularity and mode of delivery – written, verbal, audiovisual). A recent review of the literature focussing on written communication in WC schemes found that it was often impersonal, complex, jargonised, legalistic and difficult to understand. This was combined with a general lack of personalised contact (particularly by telephone) and continuity from claims managers. The review concluded there
were evident areas of improvement to provide clear, succinct, purposeful and readable written communication when appropriate (e.g. for important decisions relating to financial entitlements). Further, there was a need to consider alternatives such as verbal communication and be mindful of those with limited health literacy and CALD backgrounds. (163) In NSW, this has direct relevance where similar results have been found. (7, 8, 18) Existing guidelines largely refer to procedures and timeframes for decision-making. (126, 146) Reference to communication is limited to adjectives such as ‘good’ and ‘effective’ without defining what this means. (126, 162)

One important component in communication between insurers and injured people relates to how you perceive you are being treated, that is: treated respectfully, being listened to and believed. If the converse occurs, people can perceive this as disrespect which can lead to a sense of injustice. (165) This has been repeatedly found in compensation-related research. (7, 16, 17, 70, 141) However, in terms of offering solutions to address these issues, it appears far easier to find evidence that poor insurer communication contributes to poor injury recovery than vice versa (i.e. good communication promotes injury recovery). (7, 8, 16, 18, 30) There is a need to trial and develop new efficacious communication strategies between insurers and injured people possibly with a framework that includes the principles of empathy, understanding stigmatisation, perceived injustice, and the likely psychosocial and socioeconomic characteristics of injured people. This could assist to reduce communication barriers and improve satisfaction with the claims process. Examples from the literature about the patient clinician relationship may assist to set parameters. (166) If communication and administration functions were improved especially embracing new technology, it is likely that this would speed up the decision-making process for financial entitlements.
In addition, injured people generally report more positive interactions with their lawyers than insurers.\textsuperscript{(7, 8, 16, 17, 64)} In NSW CTP, recent data shows that legal representation is over 30\% within one year for full claims, rising to 65\% by four years.\textsuperscript{(56)} Evidence also suggests that the need to seek legal representation is linked to markers of socioeconomic disadvantage (Chapter 5), disability (including work incapacity), and mental health problems.\textsuperscript{(7, 8, 17, 30, 42, 64)}

A large survey of 20,716 Australians was conducted by the Law and Justice Foundation of NSW to assess the prevalence and vulnerability of different groups to different legal problems, adverse consequences, and outcomes.\textsuperscript{(48)} Some of the key findings included that: ‘rights and injury/health’ issues were a major source of legal problems; socioeconomically disadvantaged people were particularly prone to having legal problems; and the most common adverse findings were financial stress/income loss and stress related illnesses.\textsuperscript{(48)} In this context, the perceived need of some injured people to seek legal representation to assist with the claims process is not likely to go away without some form of intervention.

Some possibilities to alleviate the need for legal representation and/or improve these relationships have already been discussed, but others could involve providing information about the legal rights and redress from an independent source such as the government regulator to reassure injured people.\textsuperscript{(8, 48, 167)} Again, the use of technology could assist in this regard. Similarly, the principles of effective communication apply in the triadic relationship between insurers, lawyers, and injured people (not ignoring client legal privilege).\textsuperscript{(168)} Recommendations to improve written and verbal communication could be taken from other similar research.\textsuperscript{(8, 15, 16, 164)}
Furthermore, the new NSW CTP legal cost regulations have come into effect and include mandatory disclosure of solicitor to client legal fees. This provides an opportunity to seek transparency and accountability from the legal profession and work towards a more interactive relationship and multidisciplinary research between academics, insurers, lawyers, health professionals and government, which has been recommended previously.

Thirdly in NSW CTP and WC jurisdictions, there are currently no limitations on medico-legal assessments. Insurers and lawyers seek medico-legal assessments to assist with claims management for various reasons including to: understand reasons for failure to progress or RTW; justify access to general damages for pain and suffering; decrease or cease payments for treatment and/or care; ascertain future needs for claim settlement costs; and/or resolve a dispute about any of the above. This is despite growing evidence that they are of questionable value, possibly leading to increased distress, rumination and PTSD, and impact negatively on injury recovery. Medico-legal assessments remain an area of contention and are unlikely to change without proactive policy initiatives.

There are opportunities to improve practice. The Motor Accidents Insurance Commission (MAIC) in Queensland, Australia, have published guidelines about arranging medico-legal assessments, these include having joint assessments where possible, reporting requirements, and obligations on the parties once the report is received. Current compliance with the guideline is voluntary in that common law fault-based scheme. Nonetheless, there is the potential to limit the number and timeframe over which assessments can be conducted, although the latter may require legislative change. Alternatively, there could be a renewed focus on obtaining medical reports from treating health professionals with provisos on
structure, content and costs to ensure the receipt of adequate information and accountability for the injured person, their legal representative, and the insurer.

Lastly, notwithstanding the importance of the injured person and the themes associated with an adversarial claims process, it is important to draw attention to the obligations of insurers. They are bound by legislation including timeframes for attending to rehabilitation and treatment, correspondence, and delivering decisions (e.g. currently ten working days for a treatment decision and three months to determine liability).(126, 146) Insurers must adhere to certain guidelines and are audited on compliance (126, 146), others are designed to assist with decision-making.(108, 109) Furthermore in CTP, once an injured person is legally represented claims staff can only communicate directly in certain circumstances, otherwise it is usually via the lawyer or the insurer’s injury management representative.(126) These requirements may assist to regulate the claims process and ensure the rights of the injured person, but they can also increase delays in decision-making and add to the stressfulness of the claims process.

Many insurers have high average caseloads (up to 110-150 claims per consultant) and staff turnover can be challenging if over 15% annually and on occasion it has exceeded 25% (personal communication, Raj Kanhai, (former) NSW CTP State Claims Manager, QBE Insurance, (current) insurance industry consultant, Finity Consulting). There are minimal qualifications to be a consultant even though personal injury claims management can be complex, often requiring a multi-disciplinary approach (personal communication, Raj Kanhai, (former) NSW CTP State Claims Manager, QBE Insurance, (current) insurance industry consultant, Finity Consulting). These employment circumstances do not assist relationship building.(7, 8, 15-17) In Australia, the Personal Injury Education Foundation
(PEIF) was established in 2006 with the goal of raising the standards of personal injury claims management and making it a more desirable career choice. At this point, it is difficult to decide whether it has been successful.

**Conclusions**

Empirical research evidence has progressed in recent decades. There have been numerous studies that provide a deeper understanding of what predicts injury recovery following motor vehicle related trauma. This includes co-morbidities, psychosocial, socioeconomic and compensation-related factors, and validation of outcome measures that encompass disability, physical and mental health. However, personal injury compensation scheme policy and design have not kept pace with this change. In a compensable environment, there is good evidence to advocate for less adversarial ways of assisting injury recovery following motor vehicle related trauma, whilst maintaining scheme efficiency and costs.

In summary, results from this thesis and other research illustrates that seeking financial compensation is associated with poor injury recovery and RTW, particularly mental health status, but judging the extent to which this relationship is causal remains complex. Part of the explanation appears to lie in the legislative framework, design and policies of a compensation scheme, but consideration also needs to be given to injury and non-injury factors, particularly pre-existing physical and mental health status, psychosocial and socioeconomic factors.
Collectively, these results present a number of opportunities that warrant further consideration and/or investigation including:

- Screening at claims lodgement for risk factors of poor injury recovery and/or RTW, and providing appropriate interventions based on those risk factors;
- Trialling interventions for early rehabilitation and mental health problems post injury;
- Providing incentives for early claims lodgement and shorter claim durations;
- Containing medical and legal costs in a no-fault personal injury compensation scheme and/or fee for service healthcare model;
- Trialling interventions for perceived injustice, blame and/or external attributions of responsibility;
- Altering access to financial entitlements that promote injury recovery and RTW;
- Trialling interventions that adjust inappropriate injury recovery and/or treatment expectations;
- Implementing technology based alternatives to provide objective information about injury recovery and RTW, the claims and legal process, and financial entitlements;
- Implementing technology based alternatives to provide faster decisions and approvals about financial entitlements, especially treatment and rehabilitation;
- Making provisions for injured people with limited health literacy and socio-economic disadvantage during the claims and legal process;
- Implementing strategies to improve effective verbal and written communication between injured people, insurers, health and legal professionals; and
- Setting limitations on medico-legal assessments.

Many initiatives do not require legislative reform, already have a proven evidence base, and could be trialled or implemented with moderate resources. Others are complex, likely to
require legislative reform, and could be constrained or promoted by an influential socio-political environment including public or community support. Such changes usually require investment in research, proactive government, and collaboration (not just consultation) with industry stakeholders to achieve objectives. There are likely to be challenges and it may be more palatable if changes are introduced incrementally.

In the past, scheme reforms have tended to be reactive rather than proactive driven by rising premiums and claim costs and/or lack of competition in the market. A recent review of British business practice found that the pressure to focus on short-term objectives including financial sustainability and profits resulted in short-termism, that is: the pressure to deliver quick results to the potential detriment of long-term development and health of a company or industry. This short-term approach stifles investment in research, innovation and developing new capabilities and products. A key cause is the short-term focus of government. Clearly, there is the opportunity for future reforms to be driven by research evidence, focussing on the long-term not just the short-term to provide sustainable injury recovery, and reduce the costs associated with lost productivity and years lived with disability. In a compensable environment, this makes research and development important to maintain especially in Australia where motor vehicle related trauma is largely managed through personal injury compensation schemes.

Results from future research are likely to remain mixed due to different study populations and the diversity of compensation scheme policy and design. Mixed methods research (quantitative and qualitative) could provide the greatest insights when looking at a single compensation scheme setting, along with a targeted approach that includes factor and outcome measures appropriate to the study aims and objectives. The emphasis needs to be on
interdisciplinary research and aspects that are amenable to change in a compensable environment, inclusive of topics relevant to the users (i.e. injured people, healthcare practitioners, insurers, lawyers, and government).(1, 4, 5)

To conclude, there is considerable work to be done and many opportunities exist to improve injury recovery, enhance scheme efficiency, and reduce claim costs. Historically, schemes were developed in good faith to compensate for the disability or incapacity sustained post injury. In the future, it would be ideal to compensate for the ability or capacity that remained post injury, that is: to flip the incentive. This would require a fundamental shift in thinking.
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Appendix 1

Supporting information, Chapter 2

This comprises of the supporting information (Appendices) from the published paper ‘The Effect of Financial Compensation on Health Outcomes following Musculoskeletal Injury: Systematic Review’ in Chapter 2.
# PRISMA 2009 Checklist

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<tr>
<td><strong>TITLE</strong></td>
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<tr>
<td>Title</td>
<td>Identify the report as a systematic review, meta-analysis, or both.</td>
<td>1</td>
</tr>
<tr>
<td><strong>ABSTRACT</strong></td>
<td></td>
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<tr>
<td>Structured summary</td>
<td>2 Provide a structured summary including: background, objectives, data sources, study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.</td>
<td>2</td>
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<tr>
<td><strong>INTRODUCTION</strong></td>
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<tr>
<td>Rationale</td>
<td>3 Describe the rationale for the review in the context of what is already known.</td>
<td>3</td>
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<tr>
<td>Objectives</td>
<td>4 Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICO).</td>
<td>4</td>
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<tr>
<td><strong>METHODS</strong></td>
<td></td>
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<tr>
<td>Protocol and registration</td>
<td>5 Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.</td>
<td>No</td>
</tr>
<tr>
<td>Eligibility criteria</td>
<td>6 Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.</td>
<td>4.5</td>
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<tr>
<td>Information sources</td>
<td>7 Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.</td>
<td>5</td>
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<tr>
<td>Search</td>
<td>8 Present full electronic search strategy for at least one database, including any limits used, such that it could be replicated.</td>
<td>Appendix 3.1</td>
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<tr>
<td>Study selection</td>
<td>9 State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).</td>
<td>4.5</td>
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<tr>
<td>Data collection process</td>
<td>10 Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.</td>
<td>5.7</td>
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<tr>
<td>Data items</td>
<td>11 List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.</td>
<td>5</td>
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<tr>
<td>Risk of bias in individual studies</td>
<td>12 Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.</td>
<td>7, Table 1</td>
</tr>
<tr>
<td>Summary measures</td>
<td>13 State the principal summary measures (e.g., risk ratio, difference in means).</td>
<td>5.7</td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>14 Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I²) for each meta-analysis.</td>
<td>7, Table 2</td>
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<td>Risk of bias across studies</td>
<td>15</td>
<td>Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).</td>
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<tr>
<td>Additional analyses</td>
<td>16</td>
<td>Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were prespecified.</td>
<td>N/A</td>
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<tr>
<td><strong>RESULTS</strong></td>
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<tr>
<td>Study selection</td>
<td>17</td>
<td>Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.</td>
<td>1.3, Figure 1</td>
</tr>
<tr>
<td>Study characteristics</td>
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<td>Risk of bias within studies</td>
<td>19</td>
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</tr>
<tr>
<td>Results of individual studies</td>
<td>20</td>
<td>For all outcomes considered (benefit or harm), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.</td>
<td>9-12, Table 4</td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>21</td>
<td>Present results of each meta-analysis done, including confidence intervals and measures of consistency.</td>
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<td>Risk of bias across studies</td>
<td>22</td>
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<td>Additional analysis</td>
<td>23</td>
<td>Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression) (see Item 16).</td>
<td>N/A</td>
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<tr>
<td><strong>DISCUSSION</strong></td>
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<td>Summarize the main findings including the strengths of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).</td>
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<tr>
<td>Limitations</td>
<td>25</td>
<td>Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).</td>
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<tr>
<td>Conclusions</td>
<td>26</td>
<td>Provide a general interpretation of the results in the context of other evidence, and implications for future research.</td>
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<tr>
<td><strong>FUNDING</strong></td>
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<tr>
<td>Funding</td>
<td>27</td>
<td>Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.</td>
<td>N/A</td>
</tr>
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</table>

For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org)
## Medline Search Strategy.20.09.12

<table>
<thead>
<tr>
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<th>Search Type</th>
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<td>exp Mortality/</td>
<td>255218</td>
<td>Advanced</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>exp Cohort Studies/</td>
<td>1209955</td>
<td>Advanced</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>exp Follow-up Studies/</td>
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<td>5</td>
<td>prognos*.tw.</td>
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<td>6</td>
<td>predict*.tw.</td>
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<tr>
<td>7</td>
<td>course.tw.</td>
<td>373128</td>
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(work* adj compensat*).tw.
3061 Advanced

Display
More >>
[ ] 16
lawyer.tw.
686 Advanced

Display
More >>
[ ] 17
claim.tw.
14540 Advanced

Display
More >>
[ ] 18
litigation.tw.
4470 Advanced

Display
More >>
[ ] 19
exp Neck Pain/
3803 Advanced

Display
More >>
[ ] 20
exp Back Pain/
26424 Advanced

Display
More >>
[ ] 21
exp Arm Injuries/
29105 Advanced

Display
More >>
[ ] 22
exp Leg Injuries/
65879 Advanced

Display
More >>
23
exp Hip Injuries/ 15093 Advanced

Display
More >>

24
exp Hand Injuries/ 15111 Advanced

Display
More >>

25
exp Back Injuries/ 17446 Advanced

Display
More >>

26
exp Neck Injuries/ 6157 Advanced

Display
More >>

27
exp Spinal Injuries/ 16187 Advanced

Display
More >>

28
exp Soft Tissue Injuries/ 2976 Advanced

Display
More >>

29
exp Sprains/ and Strains.mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] 3455 Advanced

Display

Delete
More >>

30
exp Tendon Injuries/
12964 Advanced

Display
More >>

31
exp Fractures, Bone/
130656 Advanced

Display
More >>

32
exp Multiple Trauma/
9519 Advanced

Display
More >>

33
"soft tissue" adj injur*.tw.
2549 Advanced

Display
More >>

34
(musculoskeletal adj injur*).tw.
1308 Advanced

Display
More >>

35
(back adj injur*).tw.
1050 Advanced

Display
More >>

36
"low back" adj injur*.tw.
305 Advanced

Display
More >>

37
(neck adj injur*).tw.
1198 Advanced

Display
More >>
38 fracture.tw. 90482 Advanced

39 whiplash.tw. 2212 Advanced

40 or/1-7 2489705 Advanced

41 or/8-18 101205 Advanced

42 or/19-39 270301 Advanced

43 40 and 41 and 42 2606 Advanced

44 exp Treatment Outcome/ 564635 Advanced

45 43 and 44 774 Advanced
Embase Search Strategy 18.09.12

'longitudinal study'/exp AND [embase]/lim OR ('prospective study'/exp AND [embase]/lim) OR ('cohort analysis'/exp AND [embase]/lim) OR (prognos* AND [embase]/lim) OR (predict* AND [embase]/lim) OR (course* AND [embase]/lim) AND ('compensation'/exp AND [embase]/lim) OR ('workman compensation'/exp AND [embase]/lim) OR ('social insurance'/exp AND [embase]/lim) OR (compensation AND [embase]/lim) OR (work* NEAR/1 compensat* AND [embase]/lim) OR (lawyer AND [embase]/lim) OR (claim AND [embase]/lim) OR (litigation AND [embase]/lim) AND ('accidental injury'/exp AND [embase]/lim) OR ('whiplash injury'/exp AND [embase]/lim) OR ('limb injury'/exp AND [embase]/lim) OR ('multiple trauma'/exp AND [embase]/lim) OR ('musculoskeletal injury'/exp AND [embase]/lim) OR ('seatbelt injury'/exp AND [embase]/lim) OR ('soft tissue injury'/exp AND [embase]/lim) OR ('occupational accident'/exp AND [embase]/lim) OR ('traffic accident'/exp AND [embase]/lim) OR ('soft tissue' NEAR/1 injur* AND [embase]/lim) OR (musculoskeletal NEAR/1 injur* AND [embase]/lim) OR (back NEAR/1 injur* AND [embase]/lim) OR (low back' NEAR/1 injur* AND [embase]/lim) OR (fracture AND [embase]/lim) OR (whiplash AND [embase]/lim) OR ('neck injury'/exp AND [embase]/lim) OR ('neck pain' AND [embase]/lim) OR ('back pain' AND [embase]/lim)) AND ([article]/lim OR [article in press]/lim OR [conference paper]/lim OR [conference review]/lim OR [review]/lim) AND [humans]/lim

CINAHL Search Strategy 20.09.12

Search ID# Search Terms Search Options Actions S75
S72 and S73 and S74

Search modes - Boolean/Phrase

View Results (362)
View Details
Edit
S74
S50 or S51 or S52 or S53 or S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68 or S69 or S70 or S71

Search modes - Boolean/Phrase

Rerun
View Details
Edit
S73
S44 or S45 or S46 or S47 or S48 or S49

Search modes - Boolean/Phrase

Rerun
S39 or S40 or S41 or S42 or S43

Search modes - Boolean/Phrase

whiplash

Search modes - Boolean/Phrase

fracture

Search modes - Boolean/Phrase

neck N1 injur*

Search modes - Boolean/Phrase

low back N1 injur*

Search modes - Boolean/Phrase

back N1 injur*

Search modes - Boolean/Phrase
S66 musculoskeletal N1 injur*

Search modes - Boolean/Phrase

S65 soft tissue N1 injur*

Search modes - Boolean/Phrase

S64 (MM "Accidents, Traffic")

Search modes - Boolean/Phrase

S63 (MH "Accidents, Occupational+")

Search modes - Boolean/Phrase

S62 (MM "Multiple Trauma")

Search modes - Boolean/Phrase

S61 (MM "Neck Pain")

Search modes - Boolean/Phrase
Rerun
View Details
Edit
☐ S60
(MM "Low Back Pain")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S59
(MH "Sprains and Strains+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S58
(MH "Spinal Injuries+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S57
(MM "Soft Tissue Injuries")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S56
(MM "Occupational-Related Injuries")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S55
(MH "Leg Injuries+")

Search modes - Boolean/Phrase

223
Search modes - Boolean/Phrase

MH "Fractures+")

Search modes - Boolean/Phrase

MH "Dislocations+")

Search modes - Boolean/Phrase

MH "Back Injuries+")

Search modes - Boolean/Phrase

MH "Arm Injuries+")

Search modes - Boolean/Phrase

litigation
Rerun
View Details
Edit
☐ S48
claim

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S47
lawyer

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S46
work* N1 compensat*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S45
compensation

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S44
(MH "Insurance, Disability+)

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S43
course

Search modes - Boolean/Phrase
Rerun
View Details
Edit
☐ S42
predict*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S41
prognos*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
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Search modes - Boolean/Phrase

Rerun
View Details
Edit
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(MH "Prospective Studies+")

Search modes - Boolean/Phrase

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Edit
☐ S38
(MM "Concurrent Prospective Studies")

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View Details
Edit
☐ S37
S34 and S35 and S36

Search modes - Boolean/Phrase
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View Details
Edit
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S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or
S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33

Search modes - Boolean/Phrase

Rerun
View Details
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S6 or S7 or S8 or S9 or S10 or S11

Search modes - Boolean/Phrase

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☐ S34
S1 or S2 or S3 or S4 or S5

Search modes - Boolean/Phrase

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Edit
☐ S33
whiplash

Search modes - Boolean/Phrase

Rerun
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Edit
☐ S32
fracture

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S31
neck N1 injur*
Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S30
low back N1 injur*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S29
back N1 injur*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S28
musculoskeletal N1 injur*

Search modes - Boolean/Phrase

Rerun
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Edit
☐ S27
soft tissue N1 injur*

Search modes - Boolean/Phrase

Rerun
View Details
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Search modes - Boolean/Phrase

Rerun
View Details
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(MH "Accidents, Occupational+")
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Edit
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(MM "Multiple Trauma")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
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Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S22
(MM "Low Back Pain")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S21
(MH "Sprains and Strains+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S20
(MH "Spinal Injuries+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S19
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Search modes - Boolean/Phrase

Rerun
View Details
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☐ S18
(MM "Occupational-Related Injuries")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
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(MH "Leg Injuries+")

Search modes - Boolean/Phrase

Rerun
View Details
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(MH "Hand Injuries+")

Search modes - Boolean/Phrase

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View Details
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☐ S15
(MH "Fractures+")

Search modes - Boolean/Phrase

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View Details
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☐ S14
(MH "Dislocations+")

Search modes - Boolean/Phrase

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(MH "Back Injuries+")
Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S12
(MH "Arm Injuries+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S11
litigation

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S10
claim

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S9
lawyer

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S8
work* N1 compensat*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S7
compensation
Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S6
(MH "Insurance, Disability+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S5
course

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S4
predict*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S3
prognos*

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S2
(MH "Morbidity+")

Search modes - Boolean/Phrase

Rerun
View Details
Edit
☐ S1
(MH "Prospective Studies+")

Search modes - Boolean/Phrase
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</tr>
<tr>
<td></td>
<td>OR Topic=(whiplash) OR Topic=(fracture*) OR (neck)</td>
</tr>
<tr>
<td>#13</td>
<td>DocType=All document types; Language=All languages;</td>
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<td>#11 AND #8 AND #7</td>
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<td>#6 AND #8 AND #7</td>
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<td></td>
<td>Topic=(&quot;workers compensation&quot;)</td>
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<td>DocType=All document types; Language=All languages;</td>
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### S2 Appendix. Description and justification of quality assessment criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Score (Y, N)</th>
<th>Description and justification of criterion for quality scoring</th>
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<tbody>
<tr>
<td><strong>Sample</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Study provided clearly defined inclusion and exclusion criteria</td>
<td></td>
<td>A description of the musculoskeletal injury by timeframe, diagnosis and/or context/mechanism including any other criteria to substantiate the sample. This criterion was necessary to determine the validity of results.</td>
</tr>
<tr>
<td>S2</td>
<td>The stage where initial measures were applied was clearly stated</td>
<td></td>
<td>A description of when baseline measures were taken i.e. timeframe, date or event based such as pre-surgery. This was necessary to determine whether the study was prospective and predictive.</td>
</tr>
<tr>
<td>S3</td>
<td>The study used representative sampling techniques</td>
<td></td>
<td>A description of the sampling frame and referral base for participants was necessary to assess the possibility of selection bias.</td>
</tr>
<tr>
<td>S4</td>
<td>The setting and study site were clearly described</td>
<td></td>
<td>A description of the geographical location and type of recruitment site was required to assess the possibility of selection bias.</td>
</tr>
<tr>
<td><strong>Prognostic factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Clearly defined constructs for what is measured were provided</td>
<td></td>
<td>Reference to how the measures were explicitly defined such as categories, level or duration of exposure, and/or cut off points and that would be reproducible to reduce bias.</td>
</tr>
<tr>
<td>P2</td>
<td>Justification of the measures used was given</td>
<td></td>
<td>Reference to why these measures had been included such as current research evidence, aims and objectives of the study.</td>
</tr>
<tr>
<td>P3</td>
<td>Standardised or validated measures were used</td>
<td></td>
<td>Acceptable standardised and/or validated measures used. If no reference to P1, then difficult to allocate a positive score for P3. This was necessary to reduce misclassification bias.</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Measurement</td>
<td>Clearly defined constructs for what is measured were provided</td>
<td>Reference to how the measures were explicitly defined such as categories, measurement properties, validity and reliability that would be reproducible to reduce bias.</td>
<td></td>
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<tr>
<td>-------------</td>
<td>---------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>O2</td>
<td>Justification of the measures used was given</td>
<td>Reference to why these measures had been included such as current research evidence, aims and objectives of the study.</td>
<td></td>
</tr>
<tr>
<td>O3</td>
<td>Standardised or validated measures were used</td>
<td>Acceptable standardised or validated measures used including those with face validity. If no reference to O1, then difficult to allocate a positive score for O3. This was necessary to reduce misclassification bias.</td>
<td></td>
</tr>
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</table>

**Follow up**

<table>
<thead>
<tr>
<th>F1</th>
<th>The data was complete for at least 80% of the sample measured at baseline</th>
<th>This criterion was necessary to determine the validity of results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2</td>
<td>Clearly described loss to follow up</td>
<td>A description was required to reduce the possibility of bias and ensure both F1 and F3 were assessable.</td>
</tr>
<tr>
<td>F3</td>
<td>There were no important differences between key characteristics and outcomes in participants who completed that study and those who did not</td>
<td>This criterion was necessary to determine the validity of results.</td>
</tr>
</tbody>
</table>

**Analysis**

<table>
<thead>
<tr>
<th>A1</th>
<th>The analysis was sufficiently powered to test the study hypotheses</th>
<th>A description of the power calculation or the ability to calculate the power based on the sample size, collected variables and loss to follow up was required to determine whether there was sufficient data for statistical analysis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Multivariate techniques were used to adjust for potential confounding variables</td>
<td>This criterion was necessary to determine the validity of results.</td>
</tr>
<tr>
<td>A3</td>
<td>Sufficient information was provided to determine that the appropriate multivariate technique was used</td>
<td>To meet this criterion, a description and justification of the statistical model building was required such as stepwise regression including</td>
</tr>
</tbody>
</table>
A description was required reporting measures of association, effect size and cut off points for significance values and how variables entered the model. This criterion was necessary to determine the validity of results.

If insufficient information were provided in A3 and/or A4, it was not possible to meet this criterion. This criterion limits the potential for invalid results.
**S3 Appendix. Excluded papers**

Table: Excluded papers from master list with reasons

Reasons as follows:

1. No predictive statistical model and/or multivariate analysis

2. Compensation related factor not measured as a predictor

3. Retrospective study

4. Compensation only cohort without an additional compensation related factor for comparison

5. No validated health outcome

6. Majority of participants did not have musculoskeletal injuries

<table>
<thead>
<tr>
<th>No.</th>
<th>Paper with master list number</th>
<th>Reason</th>
<th>Full explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15. Atlas SJ, Deyo RA, Keller RB, Chapin AM, Patrick DL, Long JM, et al. The Maine Lumbar Spine Study, part II: 1-Year outcomes of surgical and nonsurgical management of sciatica. Spine. 1996; 21 (15):1777-86.</td>
<td>1</td>
<td>Not looking at predictive factors. Comparing surgery versus non surgery at 1 year. Statistical analysis difficult to follow - conclusion about comp is that equal numbers of comp in both groups and after surgery this remained the same - they conclude that even though other outcomes improved it did not influence whether on comp or not - only proportions in each group shown. No statistical difference between the two groups</td>
</tr>
<tr>
<td>2</td>
<td>16. Atlas SJ, Keller RB, Chang YC, Deyo RA, Singer DE. Surgical and nonsurgical, Management of sciatica secondary to a lumbar disc herniation - Five-year outcomes from the Maine Lumbar Spine Study. Spine. 2001 May 15; 26(10):1179-87.</td>
<td>1</td>
<td>Same as 15 - this is the comparison of surgery versus non surgery at 5 years. No difference in those receiving WC - no regression analysis shown</td>
</tr>
<tr>
<td>4</td>
<td>33. Bekkering GE, Hendriks HJM, van Tulder MW, Knol DL, Simmonds MJ, Oostendorp RAB, et al. Prognostic factors for low back pain in patients referred for physiotherapy: comparing outcomes and varying modeling techniques. Spine. [Comparative Study Research Support, Non-U.S. Gov't]. 2005 Aug 15; 30 (16):1881-6.</td>
<td>2</td>
<td>There is no comp factor included. In the discussion of prognostic factors to be included sickness insurance (public/private) is mentioned however in the table of descriptive baseline stats Health Insurance is mentioned (%public). Sick Leave was not considered an outcome due to low numbers of work at follow up.</td>
</tr>
<tr>
<td>No.</td>
<td>Reference</td>
<td>Type</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
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<td>------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Cameron ID, Rebbeck T, Sindhustake D, Rubin G, Feyer AM, Walsh J, et al. Legislative V change is associated with improved health status in people with whiplash. Spine. 2008 Feb 1; 33(3):250-4.</td>
<td>3</td>
<td>Interrupted time series study. The data is not prospective baseline data was obtained from the insurance database. Data collected for prospective study reported elsewhere.</td>
</tr>
<tr>
<td>8</td>
<td>Carragee E, Alamin T, Cheng I, Franklin T, Hurwitz E. Does minor trauma cause serious low back illness? Spine. 2006; 31(25):2942-9.</td>
<td>2</td>
<td>The prediction model does not use a compensation related predictor but provides an overall prediction combining all variables, doesn't look at comp as a predictor for outcome</td>
</tr>
<tr>
<td>9</td>
<td>Cassidy JD, Carroll L, Cote P, Berglund A, Nygren A. Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. New England Journal of Medicine. 2000; 342(16):1179-86.</td>
<td>5</td>
<td>Outcome - time to claim closure, no validated health measure as an outcome (health outcomes were measured but not used in analysis as outcomes)</td>
</tr>
<tr>
<td>10</td>
<td>Chen C, Hogg-Johnson S, Smith P. The recovery patterns of back pain among workers with compensated occupational back injuries. Occupational &amp; Environmental Medicine. 2007; 64 (8):534-40.</td>
<td>1</td>
<td>There is no multivariate analysis. This is a WC cohort only where 4 cluster groups were formed and compared.</td>
</tr>
<tr>
<td>11</td>
<td>Cole DC, Mondloch MV, Hogg-Johnson S. Listening to injured workers: How recovery expectations predict outcomes - A prospective study. Canadian Medical Association Journal. 2002; 166 (6):749-54.</td>
<td>2</td>
<td>Don’t use predictors for comp in the same way, can’t use stats for review</td>
</tr>
<tr>
<td>12</td>
<td>Cote P, Baldwin ML, Johnson WG, Frank JW, Butler RJ. Patterns of sick-leave and health outcomes in injured workers with back pain. European Spine Journal. 2008; 17(4):484-93.</td>
<td>4</td>
<td>Workers Comp cohort only. The outcome of interest is sick leave, however there is no multivariate analysis done and the focus is not prediction rather to understand the pattern of sick leave. However claim type is categorised into medical only, temporary total disability and permanent loss or disability.</td>
</tr>
<tr>
<td>13</td>
<td>Cassidy JD, Carroll L, Frank JW. The association between neck pain intensity, physical functioning, depressive symptomatology and time-to-claim-closure after whiplash. Journal of Clinical Epidemiology. 2001; 54(3):275-86.</td>
<td>2</td>
<td>Three different cox models - completing the associations is difficult, looking at outcomes compared to time to claim closure, don’t have predictors compared to outcomes</td>
</tr>
<tr>
<td>No</td>
<td>Reference</td>
<td>Validation</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>16</td>
<td>148. Greenough CG, Peterson MD, Hadlow S , Fraser RD. Instrumented posterolateral lumbar fusion: Results and comparison with anterior interbody fusion. Spine. 1998; 23(4):479-86.</td>
<td>retrospective, no baseline data for pre-operative or inception, only post-surgery measures at minimum 1 year post op</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>149. Greenough CG, Taylor L, Fraser RD. Anterior lumbar fusion: A comparison of noncompensation patients with compensation patients. Clinical Orthopaedics and Related Research. 1994(300):30-7.</td>
<td>retrospective, no baseline data collection, appears used prospective data but collected information for this paper retrospectively, large range in follow up time periods</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>166. Henn RF, 3rd, Kang L, Tashjian RZ, Green A. Patients' preoperative expectations predict the outcome of rotator cuff repair. Journal of Bone &amp; Joint Surgery, American Volume. 2007; 89A (9):1913-9.</td>
<td>retrospective study, uses 'prospectively collected data' but used routine patient information collected then analysed data retrospectively, therefore paper stated they required no patient consent</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>167. Henn RF, 3rd, Kang L, Tashjian RZ, Green A. Patients with workers' compensation claims have worse outcomes after rotator cuff repair. Journal of Bone &amp; Joint Surgery, American Volume. 2008; 90(10):2105-13.</td>
<td>same study as 167, although only reference 166, don't describe same level of detail to determine that it is retrospective</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>183. Jamison RN, Matt DA, Parris WC. Effects of time-limited vs unlimited compensation on pain behavior and treatment outcome in low back pain patients. Journal of Psychosomatic Research. [Comparative Study]. 1988; 32(3):277-83.</td>
<td>poor quality intervention study, follow up only approx 12 months with range 3-26 months, small cohort and only 46.4% follow up from 110 initial patients, all males</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>186. Jordan KD, Mayer TG, Gatchel RJ. Should extended disability be an exclusion criterion for tertiary rehabilitation? Socioeconomic outcomes of early</td>
<td>no validated health outcome, looks at RTW, health care use and claims</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Study Design</td>
<td>Commentary</td>
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<tr>
<td>-----------</td>
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<tr>
<td>26</td>
<td>224. MacDougal GA, Todhunter CR. Delamination tearing of the rotator cuff: Prospective analysis of the influence of delamination tearing on the outcome of arthroscopically assisted mini open rotator cuff repair. Journal of Shoulder and Elbow Surgery. 2010; 19 (7):1063-9.</td>
<td>3</td>
<td>retrospective study, not well described but level of evidence in abstract is 'retrospective case series', also issues with selection bias+ b/c case series and only single surgeon, single clinic, surgical paper, poor stats reporting, uses 'prospectively collected data'</td>
</tr>
<tr>
<td>29</td>
<td>234. Mayou R, Bryant B. Outcome of 'whiplash' neck injury. Injury. 1996; 27 (9):617-23.</td>
<td>5</td>
<td>no validated health outcome measure, compensation is not measured for baseline and outcome, only reported on its own</td>
</tr>
<tr>
<td>30</td>
<td>236. Mayou R, Tyndel S, Bryant B. Long-term outcome of motor vehicle accident injury. Psychosomatic Medicine. 1997; 59(6):578-84.</td>
<td>1</td>
<td>Looks at differences in outcomes at 5 years and what those outcomes are but not what predicts the outcomes, also unclear whether all injuries are musculoskeletal or only a proportion, not defined</td>
</tr>
<tr>
<td>31</td>
<td>237. Mayou RA, Ehlers A, Bryant B. Posttraumatic stress disorder after motor vehicle accidents: 3-year follow-up of a prospective longitudinal study. Behaviour Research and Therapy. 2002; 40(6):665-75.</td>
<td>3</td>
<td>PTSD only, also retrospectively collected some data as this study part of another study, questionnaires sent out at 3 years post injury, also only injury severity looked at, not type of injury</td>
</tr>
<tr>
<td>ID</td>
<td>Reference</td>
<td>Grade</td>
<td>Notes</td>
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<td>----</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>32</td>
<td>McKee MD, Yoo DJ. The effect of surgery for rotator cuff disease on general health status. Results of a prospective trial. Journal of Bone and Joint Surgery - Series A. 2010; 82 (7):970-9.</td>
<td>1</td>
<td>Can’t use data because of type of statistical analysis done, not predictors of outcome for our purpose</td>
</tr>
<tr>
<td>35</td>
<td>Moreland DB, Asch HL, Clabeaux DE, Castiglia GJ, Czajka GA, Lewis PJ, et al. Anterior cervical discectomy and fusion with implantable titanium cage: Initial impressions, patient outcomes and comparison to fusion with allograft. Spine Journal. 2004; 4(2):184-91.</td>
<td>3</td>
<td>Not true prospective study, used 'prospectively collected data, with a historical control group, compared outcomes b/w 3 groups of surgical patients but not predictors of outcomes, and only mention WC, don’t include in any multivariate analysis</td>
</tr>
<tr>
<td>36</td>
<td>Namdari S, Green A. Range of motion limitation after rotator cuff repair. Journal of Shoulder &amp; Elbow Surgery. [Comparative Study]. 2010 Mar; 19(2):290-6.</td>
<td>3</td>
<td>3/12 follow up, only for total cohort, selection bias as 12/12 follow up only those with poor outcomes, also retrospective</td>
</tr>
<tr>
<td>38</td>
<td>Nordeman L, Nilsson B, Moller M, Gunnarsson R. Early access to physical therapy treatment for subacute low back pain in primary health care: a prospective randomized clinical trial. Clinical Journal of Pain. [Clinical Trial Comparative Study Randomized Controlled Trial Research Support, Non U.S. Gov’t]. 2006 Jul-Aug; 22(6):505-11.</td>
<td>2</td>
<td>Compensation factor only there to show that groups are similar at baseline, they look at sick leave as an outcome but it is not relevant to our review</td>
</tr>
<tr>
<td>39</td>
<td>Noyes FR, Barber-Westin SD. A comparison of results of arthroscopic - assisted anterior cruciate ligament reconstruction between workers’ compensation and noncompensation patients. Arthroscopy. [Comparative Study Research Support, Non-U.S.</td>
<td>3</td>
<td>appears to be case control or retrospective study, nested in a prospective cohort, with a 'mean' follow up period,</td>
</tr>
<tr>
<td>Page</td>
<td>Reference</td>
<td>Methodology</td>
<td>Findings</td>
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<tr>
<td>40</td>
<td>O'Donnell ML, Creamer MC, McFarlane AC, Silove D, Bryant RA. Does access to compensation have an impact on recovery outcomes after injury? Medical Journal of Australia. 2010; 192(6):328-33.</td>
<td>Not isolated to musculoskeletal injury, only define by ISS and 50% have sustained a TBI</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Ozegovic D, Carroll LJ, David Cassidy J. Does expecting mean achieving? The association between expecting to return to work and recovery in whiplash associated disorders: a population-based prospective cohort study. European Spine Journal. 2009 Jun; 18(6):893-9.</td>
<td>No validated health outcome measures only global perceived recovery, also only looks at comparison of predictors for RTW as outcome, not global recovery, this is only compared to RTW</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Schiltenwolf M, Buchner M, Heindl B, von Reumont J, Muller A, Eich W. Comparison of a biopsychosocial therapy (BT) with a conventional biomedical therapy (MT) of subacute low back pain in the first episode of sick leave: a randomized controlled trial. European Spine Journal. [Comparative Study Randomized Controlled Trial]. 2006 Jul; 15(7):1083-92.</td>
<td>Compensation factor only there to show that groups are similar at baseline, they look at sick leave as an outcome but it is not relevant to our review</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Schultz IZ, Crook J, Berkowitz J, Milner R, Meloche GR. Predicting return to work after low back injury using the Psychosocial</td>
<td>Only 3/12 follow up, measured RTW as outcome only</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Study Title and Details</td>
<td>Type of Study</td>
<td>Notes</td>
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<td>-----------</td>
<td>------------------------</td>
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<tr>
<td>50</td>
<td>Seferlis T, Nemeth G, Carlsson AM, Gillstrom P. Conservative treatment in patients sick-listed for acute low-back pain: a prospective randomised study with 12 months' follow-up. European Spine Journal. [Clinical Trial Randomized Controlled Trial Research Support, Non-U.S. Gov't]. 1998;7 (6):461-70.</td>
<td>Prospective</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Vollenbroek-Hutten MM, Grootenhuis-Oudshoorn KGM, Hermens HJ. Multidisciplinary rehabilitation treatment of patients</td>
<td>Retrospective</td>
<td></td>
</tr>
</tbody>
</table>

All participants were on sick leave at enrolment. They looked at sick leave as one of the outcomes of the intervention, they were not looking at compensation as a predictor of outcome.
|---|---|
Appendix 2

Published paper: The Effect of Compensation on Health Care Utilisation in a Trauma Cohort

This additional published paper ‘The effect of compensation on health care utilisation in a trauma cohort’ has been referenced in Chapter 2.

This chapter is reprinted from:

Statement of Contribution from Authors

Statement from co-authors confirming the authorship contribution of the PhD candidate

As co-authors of the paper ‘The effect of compensation on health care utilisation in a trauma cohort’ we confirm that Danel Murgatroyd has contributed to the following aspects of the manuscript:

- Data analysis and data synthesis
- Manuscript preparation and critical review

Professor Ian Harris
Signed: [Signature]
Date: 23/11/15

Professor Ian Cameron
Signed: [Signature]
Date: 23/11/15

Professor Jane Young
Signed: [Signature]
Date: 23/11/15

Professor Michael Solomon
Signed: [Signature]
Date: [Signature]

This paper has been published as:

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

Iain A Harris, Darrell F Murgatroyd, Ian D Cameron, Jane M Young and Michael J Solomon

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, 385 of 882 potentially contactable patients returned completed questionnaires (response rate, 61%).

Main outcome measures: Health care utilisation, defined as the number of times patients visited specified health care professionals (general practitioner, medical specialists, 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.

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.

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 20% 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. It is calculated from the Abbreviated Injury Scale AIS 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, mean (range)</td>
<td>47.8 (19-79)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 256 (72.1%) Female 99 (27.9%)</td>
</tr>
<tr>
<td>Education (n=348)</td>
<td>Primary school 21 (9.8%) Secondary school 189 (54.3%) Certificate/diploma 96 (26.2%) Bachelor degree or higher 30 (8.5%)</td>
</tr>
<tr>
<td>Annual household income (n=345)</td>
<td>$0-$30000 159 (46.1%) $30001-$50000 63 (24.1%) $50001-$75000 55 (15.9%) $75001+ 46 (13.5%)</td>
</tr>
<tr>
<td>Employment before injury (n=354)</td>
<td>Yes 247 (69.8%) No 107 (30.2%)</td>
</tr>
<tr>
<td>Employment current (n=354)</td>
<td>Yes 161 (45.5%) No 193 (54.5%)</td>
</tr>
<tr>
<td>History of chronic illness</td>
<td>No 146 (41.1%) Yes (≥ 1 illnesses) 209 (58.9%)</td>
</tr>
<tr>
<td>Months since injury, mean (range)</td>
<td>41.0 (12-74)</td>
</tr>
<tr>
<td>Injury Severity Score, mean (range)</td>
<td>24.3 (14-66)</td>
</tr>
<tr>
<td>Intensive care unit admission</td>
<td>No 140 (39.4%) Yes 215 (60.6%)</td>
</tr>
<tr>
<td>Days in intensive care unit, mean (range)</td>
<td>5.5 (0-227)</td>
</tr>
<tr>
<td>Head injury</td>
<td>173 (48.7%)</td>
</tr>
<tr>
<td>Motor vehicle accident</td>
<td>225 (63.4%)</td>
</tr>
<tr>
<td>Motor vehicle Compulsory Third Party insurance</td>
<td>82 (31.4%)</td>
</tr>
<tr>
<td>Both</td>
<td>23 (15.0%)</td>
</tr>
<tr>
<td>Yes</td>
<td>70 (19.8%)</td>
</tr>
<tr>
<td>No</td>
<td>84 (23.7%)</td>
</tr>
<tr>
<td>Yes — settled</td>
<td>48 (31.4%)</td>
</tr>
<tr>
<td>Yes — not settled</td>
<td>53 (34.6%)</td>
</tr>
<tr>
<td>Both</td>
<td>23 (15.0%)</td>
</tr>
</tbody>
</table>

*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. 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, physical therapists, 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 chi-squared 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 chi-squared 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
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 ($p = 0.05$) 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 Committee.

RESULTS

A total of 1150 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 vs 44.5 years), and less time had passed since their injury (mean, 41.0 vs 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 univariate 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 association 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
significantly higher rate of utilisation among patients using a lawyer, allowing, for the effects of time since injury, other compensatory factors, injury severity, demographic factors, and socioeconomic factors. The influence of comorbidity on health care utilisation is well defined in the literature, and factors such as income, age and sex have been associated with health care utilisation in non-trauma populations.

Previous studies have also shown a strong association between compensation factors and health care utilisation. 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, but there has been limited research into the use of a lawyer in relation to health care utilisation. Our Australian study of patients with whiplash neck injuries showed that contacting a lawyer increased health care utilisation after injury.

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 suing 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. 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 (e.g., alcohol consumption, mental status, smoking and body mass index) and treatment processes, were measured.

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 (e.g., age, sex and social structure) and enabling factors (e.g., income and insurance). Our study provides evidence that supports both predisposing factors (e.g., chronic illness) and enabling factors (e.g., compensation) as significant predictors of health care utilisation.

COMPETING INTERESTS
None identified.

AUTHOR DETAILS
Ian A Harris, MB BS, MMSc(Endo), PhD, Professor of Orthopaedic Surgery and Director, Dermal F Mangat, MB BS, PhD, Menopause, Physiotherapy, PhD Candidate, Ian D Cameron, MB BS, BA, BSc, FRANZCO, Chair of Rehabilitation Medicine, Jane M Young, MB BS, MPh, PhD, Executive Director, Michael J Solomon, MB ChB, MSc, FRACS, Director, 1 South West Sydney Clinical School, University of New South Wales, Sydney, NSW. 2 Rehabilitation Studies Unit, Faculty of Medicine, University of Sydney, Sydney, NSW. 3 Surgical Outcome Research Centre, School of Public Health, University of Sydney, Sydney, NSW.

Correspondence: ian.harris@unsw.edu.au

REFERENCES
Appendix 3

Ethical clearance for qualitative study (Chapter 3)
Ethical clearance for qualitative study (Chapter 4)
Ethical clearance for cohort study (Chapters 5-7)
Dear Professor Harris,

HREC reference number: DBLPCL01/49
Local HREC Ref: 08/118

Thank you for submitting the above project which was first considered by the SSWAHS HREC (Western Zone) on 29th July, 2008. This HREC is constituted and operates in accordance with the National Health and Medical Research Council's National Statement on Ethical Conduct in Research Involving Humans and the CRMP/CHM Ethical Conduct in Research Involving Humans and the CRMP/CHM. The following documentation has been reviewed and approved by the HREC:

- Invitation letter – Patient Invitation Letter Version 1. 08.06.08
- Participant letter – Patient Participant Letter Version 1. 08.06.08
- Interview Script

Please note the following conditions of approval:

1. The Principal Investigator will immediately report anything which might warrant review of the project in the specified format, including:
   - any serious or unexpected adverse events; and
   - unforeseen events that might affect continued ethical acceptability of the project.

2. The Principal Investigator will report proposed changes to the research protocol, conduct of the research, or length of HREC approval to the HREC in the specified format, for review.

3. The Principal Investigator will inform the HREC, giving reasons, if the project is discontinued before the expected date of completion.

4. The Principal Investigator will provide an annual report to the HREC and at completion of the study in the specified format.

September 9, 2008

Professor Ian Harris
Orthopaedic Department
Liverpool Hospital
Locked Bag 7103
LIVERPOOL NSW 1871
HREC approval is valid for 12 months from last day of the month when the HREC met and a progress report will be required by 31st July, 2009.

Should you have any queries about your project please contact Mrs Jennie Grech, HREC Executive Officer on the telephone number listed above. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the SSWAHS website:


Please quote the Local HREC reference 06/116 in all correspondence.

The HREC wishes you every success in your research

Yours faithfully

[Signature]

Professor Hugh Dickson
Chairperson

SSWAHS Human Research Ethics Committee
1 December 2008

Professor Ian Harris
Orthopaedic Department
Liverpool Hospital
Locked Bag 7103
LIVERPOOL BC 1871

Dear Professor Harris

Title: Injury Recovery Focus Groups (Ref. No. 11545)

PhD Student: Ms Darnel Murgatroyd

Your application was reviewed by the Executive Committee of the Human Research Ethics Committee (HREC), and in doing so has ratified your study to include the PhD student – Ms Darnel Murgatroyd.

The Executive Committee acknowledges your right to proceed under the authority of Sydney South West Area Health Service HREC (Western Zone).

Please note, this ratification has been given only in respect of the ethical content of the study.

Any modifications to the study must be approved by Sydney South West Area Health Service HREC (Western Zone) before submission to the University of Sydney Human Research Ethics Committee.

Yours sincerely

Gail Briody
Manager
Ethics Administration

cc Ms Darnel Murgatroyd, 6/125 Ocean St, Edgecliff NSW 2027
Ethical clearance for qualitative study (Chapter 4)

26 October, 2010

Professor Ian Cameron
Head Rehabilitation Studies Unit
Northern Clinical School Sydney Medical School
The University of Sydney
PO Box 6
RYDE NSW 2112

Dear Professor Cameron,

HREC Ref No.: HREC/09/CRGH/233 CH62/6/2009-187
Project title: Improving health for people with compensable injuries - Phase 1

Thank you for your correspondence of 22 October 2010, addressing questions raised by the Expedited Ethical Review Panel.

I am pleased to advise that the following documents have been approved on behalf of the Sydney South West AHS Human Research Ethics Committee – CRGH Zone:

- Qualitative Interview Sub-study Protocol Version 22 October 2010
- Patient Invitation Letter Version 22 October 2010
- Participant Letter Version 22 October 2010

This lead HREC is constituted and operates in accordance with the National Health and Medical Research Council’s National Statement on Ethical Conduct in Research Involving Humans and the CPMP/ICH Note for Guidance on Good Medical Practice.

Please quote the above Concord Hospital File No. in all correspondence.

Yours sincerely,

Virginia Turner
Executive Officer
SSWAHS Human Research Ethics Committee – CRGH
Dear Dr Harris,

Project No 2007/047 - An Investigation into the influence of compensation factors on health outcomes following injury in a motor vehicle crash

The SSWAHS Human Research Ethics Committee wishes to acknowledge receipt of your correspondence with regards to the above project.

As all of the issues raised by the Committee have now been satisfactorily addressed, formal approval is hereby granted for this study to proceed as a Category A Project. The committee has reviewed and approved the following amended documentation:

Patient Information Sheet Version 3. 14.08.07

Ethics clearance is granted for periods of up to twelve months. This project will be due for renewal on 31st March, 2008 and you must provide a Progress Report (attached) or final report by this date. If no report is supplied, ethics clearance for this project may be cancelled.

Your attention is drawn to the attached document Guidelines for Investigators which sets out not only the principles under which research should be conducted, but also the conditions under which Ethics approval is granted by the Committee. Also enclosed for your information, is a copy of the document Guidelines for Responsible Practice in Research and Dealing with Problems of Research Misconduct.

Please note that the Committee must be notified IMMEDIATELY of any untoward or unexpected complications or side affects arising during the project or of any ethical or medicolegal problems that may arise. Also, any changes to the original protocol must be submitted to the Committee for approval.

Would you please quote the above project number in all future correspondence relating to this project.

Yours sincerely,

PROFESSOR MICHAEL FROMMER
Chairperson
SSWAHS Human Research Ethics Committee

For: Mr Mike Wallace
Chief Executive, SSWAHS

Category A: Projects with limited risk potential, including quality assurance surveys.

Category B: Projects with significant patient risks.

Category C: Drug trials (international/national) sponsored by drug companies and already covered for risk evaluation and monitoring of adverse reactions.
20 February 2008

Dr Ian Harris
PO Box 906
Caringbah NSW 2229

Dear Dr Harris

HREC reference number: 08/STG/5
Project title: An investigation into the influence of prognostic factors on health outcomes following injury in a motor vehicle crash

I refer to your application dated 13 December 2007. Thank you for submitting the above project, which was first considered by the SESIAHS HREC - Central Network at its meeting held on 29 January 2008.

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's National Statement on Ethical Conduct in Research Involving Humans and the CPMP/ICH Note for Guidance on Good Clinical Practice.

I am pleased to advise that the Committee has granted ethical approval of this research project. The documents reviewed and approved include:

<table>
<thead>
<tr>
<th>Document</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td></td>
<td>13 December 2007</td>
</tr>
<tr>
<td>Patient Information Sheet/Consent Form</td>
<td>2</td>
<td>11 February 2008</td>
</tr>
<tr>
<td>Initial Questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow Up Questionnaire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You are reminded that this letter constitutes ethical approval only. You must not commence this research project at a site until separate authorisation from the Chief Executive or delegate of that site has been obtained.

The HREC requires annual reports from the date of this approval letter. These reports should include the following minimum information:
(a) progress to date or outcome in the case of completed research;
(b) maintenance and security of records;
(c) compliance with the approved protocol;
(d) compliance with any conditions of approval; and
(e) be accompanied by abstracts of any articles or publication (if any) arising out of the study.
A report giving reasons should also be immediately provided to the HREC if the research is discontinued before the expected completion date.

The Human Research Ethics Committee is Constituted And Operates In Accordance With The National Health And Medical Research Council's National Statement On Ethical Conduct in Research Involving Humans
The Investigator should also report immediately to the Ethics Committee anything which might affect the ethical acceptance of the protocol including:

- Immediate reporting of serious or unexpected adverse events on subjects
- Proposed changes in the protocol
- Unforeseen events that might affect continued acceptability of the project

Please note that approval for you to conduct this study is granted up to November 2012 at the St. George Public Hospital. If your study is not completed by this date, you will need to apply for an extension along with your final progress report. Failure to do so may result in withdrawal of the Committee’s approval for this study after this date.

The HREC wishes you every success in your research.

Yours sincerely

Dr. Winston Lieu
Chairperson
South Eastern Sydney and Illawarra Area Health Service
Human Research Ethics Committee – Central Network
12 November 2007

Dr Ian Harris
Department of Orthopaedics
Liverpool Hospital
Locked Bag 7103
LIVERPOOL BC 1817

Dear Dr Harris

Title: An investigation into the influence of compensation factors on health outcomes following injury in a motor vehicle crash (Ref. No. 10543)

PhD Student: Ms Darnel Murgatroyd

Your application was reviewed by the Executive Committee of the Human Research Ethics Committee (HREC), and in doing so has ratified your study to include the PhD student – Ms Darnel Murgatroyd.

The Executive Committee acknowledges your right to proceed under the authority of the Sydney South West Area Health Service Human Research Ethics Committee (Western Zone).

Please note, this ratification has been given only in respect of the ethical content of the study.

Any modifications to the study must be approved by the Sydney South West Area Health Service Human Research Ethics Committee (Western Zone) before submission to the University of Sydney Human Research Ethics Committee.

Yours sincerely

Gail Briody
Senior Ethics Officer
Ethics Administration

cc Ms Darnel Murgatroyd, 447A Cleveland St, Redfern NSW 2016.
Appendix 4

Baseline questionnaire for cohort study (Chapters 5-7)
6 month follow up questionnaire for cohort study (Chapters 5-7)
12 month follow up questionnaire for cohort study (Chapters 5-7)
24 month follow up questionnaire for cohort study (Chapters 5-7)
Baseline questionnaire for cohort study (Chapters 5-7)

PARTICIPANT ID NUMBER ☐ ☐ ☐ ☐ DATE

INITIAL QUESTIONNAIRE

Please use a black or blue pen to answer each question. Write the answer in the space provided or tick the appropriate box.

1. First name _______________________ Last name _______________________
2. Age __________________ years
3. Date of birth ___/___/___
4. Residential post code ☐ ☐ ☐ ☐
5. Gender ☐ Male ☐ Female
6. Marital status ☐ Single ☐ Married/defacto ☐ Divorced/widowed/separated
7. Education ☐ Postgraduate degree
☐ Graduate diploma or graduate certificate
☐ Bachelor degree
☐ Advanced diploma or diploma
☐ Certificate
☐ Secondary education
☐ Primary education
☐ Pre-primary education
8. Occupation ________________________________
9. Occupation Group ☐ Managers or administrators
☐ Professionals
☐ Associate Professionals
☐ Tradespersons or related workers
☐ Advanced clerical or service workers
☐ Intermediate clerical, sales or service workers
☐ Intermediate production or transport workers
☐ Elementary clerical, sales or service workers
10. Before the motor vehicle accident what was your work status?
   □ Working
   □ Not working

   AND if you were working was it
   □ Full duties
   □ Modified duties e.g. lifting restrictions, reduced hours

   AND if you were working how many hours did you work in an average week?  _________ hrs/wk

11. If you were working before the motor vehicle accident, how satisfied were you with your job?
   □ Very satisfied
   □ Satisfied
   □ Dissatisfied
   □ Very Dissatisfied

12. If you were working before the motor vehicle accident, do you think you will recover enough to return to your usual job?
   □ Yes
   □ No

13. How long do you think it will take for you to return to your usual activities?
   □ Days  (approximately how many) _________
   □ Weeks (approximately how many) _________
   □ Months (approximately how many) _________
   □ Years  (approximately how many) _________
   □ Never

14. Do you speak a language other than English at home?  □ Yes
                                                       □ No

15. How many people aged 15 years and over live in your house (including yourself)? ______ (number)

16. How many children aged under 15 years live in your house? ______ (number)
17. What is your total **household** yearly income **before tax**?

**Income**
- □ Negative or zero income
- □ $1 - $9,999......................... ($1 - $189 per week)
- □ $10,000 - $19,999................. ($190 - $379 per week)
- □ $20,000 - $29,999................ ($380 - $579 per week)
- □ $30,000 - $39,999............... ($580 - $769 per week)
- □ $40,000 - $49,999................. ($770 - $959 per week)
- □ $50,000 - $59,999............... ($960 - $1149 per week)
- □ $60,000 - $79,999............... ($1150 - $1529 per week)
- □ $80,000 - $99,999............... ($1530 - $1919 per week)
- □ $100,000 - $124,999........... ($1920 - $2399 per week)
- □ $125,000 - $149,999........... ($2400 - $2879 per week)
- □ $150,000 or more.............. ($2880 or more per week)

18. What is your weight in kilograms? ________ kg

19. What is your height in centimetres or feet? ________ cm ________ feet

20. **Before** the motor vehicle accident how would you describe your general health?

**Health**
- □ Excellent
- □ Very good
- □ Good
- □ Fair
- □ Poor

21. **Smoking history**
- □ Current smoker – daily
- □ Current smoker – other (less than daily)
- □ Ex-smoker – daily
- □ Never smoked
22. Have you had any of the following conditions for the last 6 months or expect to have them for the next 6 months?

Health condition
☐ Asthma
☐ Cancer
☐ Heart or circulatory condition
☐ Diabetes
☐ Arthritis
☐ Osteoporosis
☐ Mental and behavioural problems
☐ Neck and back problems/disorder/pain

Other please state ________________________________________

23. Have you taken medication in the last 2 weeks for asthma, arthritis, osteoporosis, heart or circulatory conditions, diabetes, high sugar levels or mental well-being?

Medication
☐ Yes
☐ No

24. Have you had a recent injury (other than in the motor vehicle accident) in the last 4 weeks that resulted in medical consultation, treatment or a decrease in your usual activities?

Recent injury
☐ Yes
☐ No

25. In past year, how often did you have a drink containing alcohol?

☐ Never
☐ Monthly or less
☐ 2-4 times a month
☐ 2-3 times a week
☐ 4 or more times a week
26. In the past year, how many standard drinks containing alcohol did you have on a typical day when you were drinking? To assist you please refer to the standard drink guide below e.g. 2 cans of beer = 3 standard drinks, 2 stubbies = 3 standard drinks.

Number of drinks ______________________

27. In the past year, how often did you have 6 or more standard drinks containing alcohol on 1 occasion? To assist you please refer to the standard drink guide above e.g. 2 cans of beer = 3 standard drinks, 2 stubbies = 3 standard drinks.

☐ Never
☐ Less than monthly
☐ Monthly
☐ Weekly
☐ Daily or almost daily

28. What was the date of your motor vehicle accident? ____/____/____

29. In the accident were you the ☐ Driver/rider at fault
☐ Driver/rider not at fault
☐ Passenger/pylon passenger
☐ Pedestrian

30. Type of vehicle ☐ Motor vehicle
☐ Motorcycle
☐ Bicycle

OR
☐ Pedestrian
31. **Before** the accident did you have neck pain in the last 6 months?  

- Yes  
- No

32. If yes, please answer the following questions. If no please go to question 33.

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only ONE box which applies to you. We realise you may consider that two of the statements in any one section relate to you, but please mark the box which clearly describes your problem.

**Section 1 – Pain Intensity**

- I have no pain at the moment.  
- The pain is very mild at the moment.  
- The pain is moderate at the moment.  
- The pain is fairly severe at the moment.  
- The pain is very severe at the moment.  
- The pain is the worst imaginable at the moment.

**Section 2 – Personal Care (Washing, Dressing etc)**

- I can look after myself normally, without causing extra pain.  
- I can look after myself normally, but it causes extra pain.  
- It is painful to look after myself and I am slow and careful.  
- I need some help, but manage most of my personal care.  
- I need help every day in most aspects of self care.  
- I do not get dressed, I wash with difficulty and stay in bed.

**Section 3 – Lifting**

- I can lift heavy weights without extra pain.  
- I can lift heavy weights but it gives extra pain.  
- Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.  
- Pain prevents me from lifting heavy weights, but I can manage if they are conveniently positioned.  
- I can lift very light weights.  
- I cannot lift or carry anything at all.
Section 4 – Reading

☐ I can read as much as I want to with no pain in my neck.

☐ I can read as much as I want with slight pain in my neck.

☐ I can read as much as I want to with moderate pain in my neck.

☐ I cannot read as much as I want because of moderate pain in my neck.

☐ I can hardly read at all because of severe pain in my neck.

☐ I cannot read at all.

Section 5 – Headaches

☐ I have no headaches

☐ I have slight headaches which come infrequently.

☐ I have moderate headaches which come infrequently.

☐ I have moderate headaches which come frequently.

☐ I have severe headaches which come frequently.

☐ I have headaches almost all the time.

Section 6 – Concentration

☐ I can concentrate fully when I want to with no difficulty.

☐ I can concentrate fully when I want to with slight difficulty.

☐ I have a fair degree of difficulty in concentrating when I want to.

☐ I have a lot of difficulty in concentrating when I want to.

☐ I have a great deal of difficulty in concentrating when I want to.

☐ I cannot concentrate at all.

Section 7 – Work

☐ I can do as much work as I want to.

☐ I can only do my usual work, but no more.

☐ I can do most of my usual work, but no more.

☐ I cannot do my usual work.

☐ I can hardly do any work at all.

☐ I cannot do any work at all.
Section 8 – Driving

☐ I can drive my car without any neck pain.
☐ I can drive my car as long as I want with slight pain in my neck.
☐ I can drive my car as long as I want with moderate pain in my neck.
☐ I cannot drive my car as long as I want because of moderate pain in my neck.
☐ I can hardly drive at all because of severe pain in my neck.
☐ I cannot drive my car at all.

Section 9 – Sleeping

☐ I have no trouble sleeping.
☐ My sleep is slightly disturbed (less than 1 hour sleepless)
☐ My sleep is mildly disturbed (1-2 hours sleepless)
☐ My sleep is moderately disturbed (2-3 hours sleepless)
☐ My sleep is greatly disturbed (3-5 hours sleepless)
☐ My sleep is completely disturbed (5-7 hours sleepless)

Section 10 – Recreation

☐ I am able to engage in all of my recreational activities with no neck pain at all.
☐ I am able to engage in all of my recreational activities with some pain in my neck.
☐ I am able to engage in most, but not all of my usual recreational activities because of pain in my neck.
☐ I am able to engage in a few of my usual recreational activities because of pain in my neck.
☐ I can hardly do any recreational activities because of pain in my neck.
☐ I cannot do any recreational activities at all.

33. Do you have neck pain now? ☐ Yes
☐ No

34. Mark on this line your current level of neck pain. The closer to the right, the greater the pain level.

Pain Visual Analogue Scale (VAS)

__________________________________________________________________________

No neck pain                                      Neck pain as bad as it could possibly be
35. It would be helpful if you can give us your mobile phone number so we can contact you for the follow up questionnaires.

Mobile phone number ________________________________

THIS IS THE END
THANK YOU FOR COMPLETING THESE QUESTIONS!
FOLLOW UP QUESTIONNAIRE

Please use a black or blue pen to answer each question. Write the answer in the space provided and tick the appropriate box.

Name __________________________________________

Age _______________ years                       Date of birth ___/___/

Date of accident ___/___/___
This part of the questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. For each of the following questions, please mark an ✑ in the one box that best describes your answer.

1. **In general, would you say your health is:**

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>✑</td>
<td>✑</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

2. **Compared to one year ago, how would you rate your health in general now?**

<table>
<thead>
<tr>
<th>Much better now than one year ago</th>
<th>Somewhat better now than one year ago</th>
<th>About the same as one year ago</th>
<th>Somewhat worse now than one year ago</th>
<th>Much worse now than one year ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>✑</td>
<td>✑</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

3. The following questions are about activities you might do during a typical day? Does your health now limit you in these activities? If so, how much?

<table>
<thead>
<tr>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>✑</td>
<td>✑</td>
<td>✑</td>
</tr>
</tbody>
</table>

- **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf .......................................................... ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Lifting or carrying groceries** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Climbing several flights of stairs** .......................................................... ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Climbing one flight of stairs** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Bending, kneeling, or stooping** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Walking more than a kilometre** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Walking several hundred metres** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Walking one hundred metres** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
- **Bathing or dressing yourself** ................................................................. ☐ 1 ............ ☐ 2 ............ ☐ 3
4. **During the past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

<table>
<thead>
<tr>
<th>Problem</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down on the amount of time you spent on work or other activities</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>b. Accomplished less than you would like</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>c. Were limited in the kind of work or other activities</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>d. Had difficulty performing the work or other activities (for example, it took extra effort)</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

5. **During the past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

<table>
<thead>
<tr>
<th>Problem</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down on the amount of time you spent on work or other activities</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>b. Accomplished less than you would like</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>c. Did work or other activities less carefully than usual</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

6. **During the past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td></td>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>
7. How much bodily pain have you had during the past 4 weeks?

<table>
<thead>
<tr>
<th>None</th>
<th>Very mild</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ 6</td>
</tr>
</tbody>
</table>

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
</tbody>
</table>

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
</tbody>
</table>


b. Have you been very nervous? ................................. ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

c. Have you felt so down in the dumps that nothing could cheer you up? ......................................................... ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

d. Have you felt calm and peaceful? ................................. ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

e. Did you have a lot of energy? ........................................... ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

f. Have you felt downhearted and depressed? ................................. ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

g. Did you feel worn out? ........................................... ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

h. Have you been happy? ........................................... ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5

i. Did you feel tired? ........................................... ☐ 1 .............. ☐ 2 .............. ☐ 3 .............. ☐ 4 .............. ☐ 5
10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

11. How TRUE or FALSE is each of the following statements for you?

<table>
<thead>
<tr>
<th>Definitely true</th>
<th>Mostly true</th>
<th>Don’t know</th>
<th>Mostly false</th>
<th>Definitely false</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

a. I seem to get sick a little easier than other people
b. I am as healthy as anybody I know
c. I expect my health to get worse
d. My health is excellent

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(IQOLA SF-36v2 Standard, Australia (English))
Below is a list of problems and complaints that people sometimes have in response to stressful experiences. Please read each one carefully, put an X in the box to indicate how much you have been bothered by that problem.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all (1)</th>
<th>A little bit (2)</th>
<th>Moderately (3)</th>
<th>Quite a bit (4)</th>
<th>Extremely (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Repeated, disturbing <em>memories, thoughts, or images</em> of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Repeated, disturbing <em>dreams</em> of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Suddenly <em>acting or feeling</em> as if the accident <em>were happening again</em> (as if you were reliving it)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Feeling very upset when something reminded you of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Having <em>physical reactions</em> (e.g. heart pounding, trouble breathing, sweating) when something reminded you of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Avoiding <em>thinking about or talking about</em> the accident or avoiding having feelings related to it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Avoiding <em>activities or situations</em> because they reminded you of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Trouble remembering <em>important parts</em> of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Loss of interest in activities that you used to enjoy?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Feeling distant or cut off from other people?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Feeling <em>emotionally numb</em> or being unable to have loving feelings for those close to you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Feeling as if your future will somehow be cut short?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Trouble <em>falling or staying asleep</em>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Feeling irritable or having angry outbursts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Having difficulty concentrating?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Being &quot;super-alert&quot; or watchful or on guard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Feeling <em>jumpy</em> or easily startled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Do you have neck pain now?  □ Yes
□ No

If yes, please answer the following questions. If no, please go to question 3

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only ONE box which applies to you. We realise you may consider that two of the statements in any one section relate to you, but please mark the box which clearly describes your problem.

Section 1 – Pain Intensity

□ I have no pain at the moment.
□ The pain is very mild at the moment.
□ The pain is moderate at the moment.
□ The pain is fairly severe at the moment.
□ The pain is very severe at the moment.
□ The pain is the worst imaginable at the moment.

Section 2 – Personal Care (Washing, Dressing etc)

□ I can look after myself normally, without causing extra pain.
□ I can look after myself normally, but it causes extra pain.
□ It is painful to look after myself and I am slow and careful.
□ I need some help, but manage most of my personal care.
□ I need help every day in most aspects of self care.
□ I do not get dressed, I wash with difficulty and stay in bed.

Section 3 – Lifting

□ I can lift heavy weights without extra pain.
□ I can lift heavy weights but it gives extra pain.
□ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.
□ Pain prevents me from lifting heavy weights, but I can manage if they are conveniently positioned.
□ I can lift very light weights.
□ I cannot lift or carry anything at all.
Section 4 – Reading

☐ I can read as much as I want to with no pain in my neck.

☐ I can read as much as I want with slight pain in my neck.

☐ I can read as much as I want to with moderate pain in my neck.

☐ I cannot read as much as I want because of moderate pain in my neck.

☐ I can hardly read at all because of severe pain in my neck.

☐ I cannot read at all.

Section 5 – Headaches

☐ I have no headaches

☐ I have slight headaches which come infrequently.

☐ I have moderate headaches which come infrequently.

☐ I have moderate headaches which come frequently.

☐ I have severe headaches which come frequently.

☐ I have headaches almost all the time.

Section 6 – Concentration

☐ I can concentrate fully when I want to with no difficulty.

☐ I can concentrate fully when I want to with slight difficulty.

☐ I have a fair degree of difficulty in concentrating when I want to.

☐ I have a lot of difficulty in concentrating when I want to.

☐ I have a great deal of difficulty in concentrating when I want to.

☐ I cannot concentrate at all.

Section 7 – Work

☐ I can do as much work as I want to.

☐ I can only do my usual work, but no more.

☐ I can do most of my usual work, but no more.

☐ I cannot do my usual work.

☐ I can hardly do any work at all.

☐ I cannot do any work at all.
Section 8 – Driving

☐ I can drive my car without any neck pain.
☐ I can drive my car as long as I want with slight pain in my neck.
☐ I can drive my car as long as I want with moderate pain in my neck.
☐ I cannot drive my car as long as I want because of moderate pain in my neck.
☐ I can hardly drive at all because of severe pain in my neck.
☐ I cannot drive my car at all.

Section 9 – Sleeping

☐ I have no trouble sleeping.
☐ My sleep is slightly disturbed (less than 1 hour sleepless)
☐ My sleep is mildly disturbed (1-2 hours sleepless)
☐ My sleep is moderately disturbed (2-3 hours sleepless)
☐ My sleep is greatly disturbed (3-5 hours sleepless)
☐ My sleep is completely disturbed (5-7 hours sleepless)

Section 10 – Recreation

☐ I am able to engage in all of my recreational activities with no neck pain at all.
☐ I am able to engage in all of my recreational activities with some pain in my neck.
☐ I am able to engage in most, but not all of my usual recreational activities because of pain in my neck.
☐ I am able to engage in a few of my usual recreational activities because of pain in my neck.
☐ I can hardly do any recreational activities because of pain in my neck.
☐ I cannot do any recreational activities at all.

2. Mark on this line your current level of neck pain. The closer to the right, the greater the pain level.

Pain Visual Analogue Scale (VAS)

[______________________________]

No neck pain  Neck pain as bad as it could possibly be
3. How many days have you spent in hospital in the last 6 months? (do not include your time in hospital after the accident) __________ (approximate number of days)

4. How many times have you visited the emergency department/outpatients/day clinic in the last 6 months? __________ (approximate number of visits)

5. Since discharge from hospital how many visits have you made to the following health professionals?

<table>
<thead>
<tr>
<th>Health professional</th>
<th>Approximate number of visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioner (GP)</td>
<td></td>
</tr>
<tr>
<td>Medical specialist</td>
<td></td>
</tr>
<tr>
<td>Psychiatrist</td>
<td></td>
</tr>
<tr>
<td>Psychologist</td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td></td>
</tr>
<tr>
<td>Other please state</td>
<td></td>
</tr>
</tbody>
</table>

6. How do you rate your health now, compared to your usual level of health prior to the accident? On a scale of -5 to 5, tick the most appropriate box.

- □ -5 Vastly worse
- □ -4
- □ -3
- □ -2
- □ -1
- □ 0 Unchanged
- □ 1
- □ 2
- □ 3
- □ 4
- □ 5 Completely recovered

7. How long do you think it will take for you to return to your usual activities?

- □ Already returned to usual activities
- □ Days (approximately how many) __________
- □ Weeks (approximately how many) __________
- □ Months (approximately how many) __________
- □ Years (approximately how many) __________
- □ Never
8. What is your current work status?

☐ Working

☐ Not working

AND if you are working, is it

☐ Full duties

☐ Modified duties e.g. lifting restrictions, reduced hours

AND if you are working, what was the date you returned to work after the accident?

Date ___/___/

AND if you are working, how many hours do you work in an average week? __________ hours/week

AND if you are working, how satisfied are you with your job?

☐ Very satisfied

☐ Satisfied

☐ Dissatisfied

☐ Very Dissatisfied

9. Do you think you will recover enough to return to your usual job?

☐ Yes

☐ No

☐ Already returned to usual job

10. Was your ability to return to work after the accident related to your injury? ☐ Yes ☐ No

11. Have you changed your occupation since the accident? ☐ Yes ☐ No

12. Have you made a compensation claim for your injuries in the accident? ☐ Yes ☐ No

13. If yes, what type of claim? ☐ Compulsory Third Party (CTP)

☐ Workers compensation

☐ Other please state ____________________
14. Has your claim been accepted?  
☐ Yes  
☐ No  
☐ Don’t know  

15. Do you have a lawyer for your claim?  
☐ Yes  
☐ No  

THIS IS THE END  

THANK YOU VERY MUCH FOR COMPLETING THESE QUESTIONS AND ASSISTING US WITH OUR RESEARCH!
12 month follow up questionnaire for cohort study (Chapters 5-7)

PARTICIPANT ID NUMBER _______________ DATE _______________

12 MONTH FOLLOW UP QUESTIONNAIRE

Please use a black or blue pen to answer each question. Write the answer in the space provided and tick the appropriate box.

Name ___________________________________________________________________

Age __________________ years  Date of birth ___/___/___

Date of accident ___/___/___
This part of the questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. For each of the following questions, please mark an □ in the one box that best describes your answer.

1. In general, would you say your health is:

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

2. Compared to one year ago, how would you rate your health in general now?

<table>
<thead>
<tr>
<th>Much better now than one year ago</th>
<th>Somewhat better now than one year ago</th>
<th>About the same as one year ago</th>
<th>Somewhat worse now than one year ago</th>
<th>Much worse now than one year ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

3. The following questions are about activities you might do during a typical day? Does your health now limit you in these activities? If so, how much?

<table>
<thead>
<tr>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
</tr>
</tbody>
</table>

- **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports ................................................................. □ 1 .... □ 2 .... □ 3
- **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.......................................................... □ 1 .... □ 2 .... □ 3
- Lifting or carrying groceries .......................................................... □ 1 .... □ 2 .... □ 3
- Climbing several flights of stairs .................................................. □ 1 .... □ 2 .... □ 3
- Climbing one flight of stairs .......................................................... □ 1 .... □ 2 .... □ 3
- Bending, kneeling, or stooping ......................................................... □ 1 .... □ 2 .... □ 3
- Walking more than a kilometre ........................................................ □ 1 .... □ 2 .... □ 3
- Walking several hundred metres ....................................................... □ 1 .... □ 2 .... □ 3
- Walking one hundred metres ................................................................ □ 1 .... □ 2 .... □ 3
- Bathing or dressing yourself ................................................................ □ 1 .... □ 2 .... □ 3
4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

<table>
<thead>
<tr>
<th></th>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down on the amount of time you spent on work or other activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. Accomplished less than you would like</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. Were limited in the kind of work or other activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. Had difficulty performing the work or other activities (for example, it took extra effort)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

5. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

<table>
<thead>
<tr>
<th></th>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down on the amount of time you spent on work or other activities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. Accomplished less than you would like</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. Did work or other activities less carefully than usual</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
7. **How much bodily pain have you had during the past 4 weeks?**

<table>
<thead>
<tr>
<th>None</th>
<th>Very mild</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
<td>□ 6</td>
</tr>
</tbody>
</table>

8. **During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

9. **These questions are about how you feel and how things have been with you during the past 4 weeks.** For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
<td>□ 5</td>
</tr>
</tbody>
</table>

  a. Did you feel full of life? ........................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  b. Have you been very nervous? .......................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  c. Have you felt so down in the dumps that nothing could cheer you up? ...................................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  d. Have you felt calm and peaceful? ....................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  e. Did you have a lot of energy? ........................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  f. Have you felt downhearted and depressed? ............................. □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  g. Did you feel worn out? ..................................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  h. Have you been happy? ...................................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
  i. Did you feel tired? .......................................................... □ 1 ........ □ 2 .......... □ 3 .......... □ 4 ........ □ 5
10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

11. How TRUE or FALSE is each of the following statements for you?

<table>
<thead>
<tr>
<th>Definitely true</th>
<th>Mostly true</th>
<th>Don’t know</th>
<th>Mostly false</th>
<th>Definitely false</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

a. I seem to get sick a little easier than other people

☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

b. I am as healthy as anybody I know

☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

c. I expect my health to get worse

☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

d. My health is excellent

☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5
Below is a list of problems and complaints that people sometimes have in response to stressful experiences. Please read each one carefully, put an X in the box to indicate how much you have been bothered by that problem.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all (1)</th>
<th>A little bit (2)</th>
<th>Moderately (3)</th>
<th>Quite a bit (4)</th>
<th>Extremely (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Repeated, disturbing <em>memories, thoughts, or images</em> of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Repeated, disturbing <em>dreams</em> of the accident?</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Suddenly <em>acting</em> or <em>feeling</em> as if the accident were happening again* (as if you were reliving it)?</td>
<td></td>
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<tr>
<td>4</td>
<td>Feeling very upset when <em>something reminded</em> you of the accident?</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>Having <em>physical reactions</em> (e.g. heart pounding, trouble breathing, sweating) when <em>something reminded</em> you of the accident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Avoiding <em>thinking about</em> or <em>talking about</em> the accident or avoiding having feelings related to it?</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Avoiding activities or situations because they <em>reminded</em> you of the accident?</td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>8</td>
<td>Trouble remembering <em>important parts</em> of the accident?</td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td><em>Loss of interest</em> in activities that you used to enjoy?</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>Feeling distant or <em>cut off</em> from other people?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>Feeling <em>emotionally numb</em> or being unable to have loving feelings for those close to you?</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>Feeling as if your <em>future</em> will somehow be <em>cut short</em>?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td>Trouble <em>falling</em> or <em>staying asleep</em>?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td>Feeling <em>irritable</em> or having <em>angry outbursts</em>?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Having <em>difficulty concentrating</em>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Being “super-alert” or watchful or on guard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Feeling <em>jumpy</em> or easily startled?</td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
1. Do you have neck pain now? □ Yes
□ No

If yes, please answer the following questions. If no, please go to question 3

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only ONE box which applies to you. We realise you may consider that two of the statements in any one section relate to you, but please mark the box which clearly describes your problem.

Section 1 – Pain Intensity

□ I have no pain at the moment.
□ The pain is very mild at the moment.
□ The pain is moderate at the moment.
□ The pain is fairly severe at the moment.
□ The pain is very severe at the moment.
□ The pain is the worst imaginable at the moment.

Section 2 – Personal Care (Washing, Dressing etc)

□ I can look after myself normally, without causing extra pain.
□ I can look after myself normally, but it causes extra pain.
□ It is painful to look after myself and I am slow and careful.
□ I need some help, but manage most of my personal care.
□ I need help every day in most aspects of self care.
□ I do not get dressed, I wash with difficulty and stay in bed.

Section 3 – Lifting

□ I can lift heavy weights without extra pain.
□ I can lift heavy weights but it gives extra pain.
□ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.
□ Pain prevents me from lifting heavy weights, but I can manage if they are conveniently positioned.
□ I can lift very light weights.
□ I cannot lift or carry anything at all.
Section 4 – Reading

☐ I can read as much as I want to with no pain in my neck.
☐ I can read as much as I want with slight pain in my neck.
☐ I can read as much as I want to with moderate pain in my neck.
☐ I cannot read as much as I want because of moderate pain in my neck.
☐ I can hardly read at all because of severe pain in my neck.
☐ I cannot read at all.

Section 5 – Headaches

☐ I have no headaches
☐ I have slight headaches which come infrequently.
☐ I have moderate headaches which come infrequently.
☐ I have moderate headaches which come frequently.
☐ I have severe headaches which come frequently.
☐ I have headaches almost all the time.

Section 6 – Concentration

☐ I can concentrate fully when I want to with no difficulty.
☐ I can concentrate fully when I want to with slight difficulty.
☐ I have a fair degree of difficulty in concentrating when I want to.
☐ I have a lot of difficulty in concentrating when I want to.
☐ I have a great deal of difficulty in concentrating when I want to.
☐ I cannot concentrate at all.

Section 7 – Work

☐ I can do as much work as I want to.
☐ I can only do my usual work, but no more.
☐ I can do most of my usual work, but no more.
☐ I cannot do my usual work.
☐ I can hardly do any work at all.
☐ I cannot do any work at all.
Section 8 – Driving

☐ I can drive my car without any neck pain.

☐ I can drive my car as long as I want with slight pain in my neck.

☐ I can drive my car as long as I want with moderate pain in my neck.

☐ I cannot drive my car as long as I want because of moderate pain in my neck.

☐ I can hardly drive at all because of severe pain in my neck.

☐ I cannot drive my car at all.

Section 9 – Sleeping

☐ I have no trouble sleeping.

☐ My sleep is slightly disturbed (less than 1 hour sleepless)

☐ My sleep is mildly disturbed (1-2 hours sleepless)

☐ My sleep is moderately disturbed (2-3 hours sleepless)

☐ My sleep is greatly disturbed (3-5 hours sleepless)

☐ My sleep is completely disturbed (5-7 hours sleepless)

Section 10 – Recreation

☐ I am able to engage in all of my recreational activities with no neck pain at all.

☐ I am able to engage in all of my recreational activities with some pain in my neck.

☐ I am able to engage in most, but not all of my usual recreational activities because of pain in my neck.

☐ I am able to engage in a few of my usual recreational activities because of pain in my neck.

☐ I can hardly do any recreational activities because of pain in my neck.

☐ I cannot do any recreational activities at all.

2. Mark on this line your current level of neck pain. The closer to the right, the greater the pain level.

Pain Visual Analogue Scale (VAS)

________________________________________________________________________________________

No neck pain                                      Neck pain as bad as it could possibly be

3. How many days have you spent in hospital in the last 6 months? (do not include your time in hospital after the accident) ______________ (approximate number of days)
4. How many times have you visited the emergency department/outpatients/day clinic in the last 6 months? 
____________ (approximate number of visits)

5. Since discharge from hospital how many visits have you made to the following health professionals?

<table>
<thead>
<tr>
<th>Health professional</th>
<th>Approximate number of visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioner (GP)</td>
<td></td>
</tr>
<tr>
<td>Medical specialist</td>
<td></td>
</tr>
<tr>
<td>Psychiatrist</td>
<td></td>
</tr>
<tr>
<td>Psychologist</td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td></td>
</tr>
<tr>
<td>Other please state</td>
<td></td>
</tr>
</tbody>
</table>

6. How do rate your health now, compared to your usual level of health prior to the accident? On a scale of -5 to 5, tick the most appropriate box.

- □ -5 Vastly worse
- □ -4
- □ -3
- □ -2
- □ -1
- □ 0 Unchanged
- □ 1
- □ 2
- □ 3
- □ 4
- □ 5 Completely recovered

7. How long do you think it will take for you to return to your usual activities?

- □ Already returned to usual activities
- □ Days (approximately how many) __________
- □ Weeks (approximately how many) __________
- □ Months (approximately how many) __________
- □ Years (approximately how many) __________
- □ Never
8. What is your current work status?

- Working
- Not working

AND if you are working is it

- Full duties
- Modified duties e.g. lifting restrictions, reduced hours

AND if you are working, what was the date you returned to work after the accident?

Date ___/___/_____

AND if you are working, many hours do you work in an average week? _________ hours/week

AND if you are working, how satisfied are you with your job?

- Very satisfied
- Satisfied
- Dissatisfied
- Very Dissatisfied

9. Do you think you will recover enough to return to your usual job?

- Yes
- No
- Already returned to usual job

10. Was your ability to return to work after the accident related to your injury?

- Yes
- No

11. Have you changed your occupation since the accident?

- Yes
- No
12. Please indicate in your opinion how strongly you agree or disagree with each of the following statements

a. I am suffering because of someone else's negligence
   - Agree strongly
   - Agree moderately
   - Agree slightly
   - Disagree slightly
   - Disagree moderately
   - Disagree strongly

b. Most people don't understand how severe my condition is
   - Agree strongly
   - Agree moderately
   - Agree slightly
   - Disagree slightly
   - Disagree moderately
   - Disagree strongly

c. People are entitled to fair compensation
   - Agree strongly
   - Agree moderately
   - Agree slightly
   - Disagree slightly
   - Disagree moderately
   - Disagree strongly

d. Having a lawyer helps people with compensation manage their claim
   - Agree strongly
   - Agree moderately
   - Agree slightly
   - Disagree slightly
   - Disagree moderately
   - Disagree strongly
e. People with a compensation claim receive better medical treatment

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly

f. Insurance companies are helpful if you have a compensation claim

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly

13. Have you made a compensation claim for your injuries in the accident?  ☐ Yes
☐ No

☐ Workers compensation
☐ Other please state ___________________

15. Has your claim been accepted?  ☐ Yes
☐ No
☐ Don’t know

16. Do you have a lawyer for your claim?  ☐ Yes
☐ No

THIS IS THE END

THANK YOU VERY MUCH FOR COMPLETING THESE QUESTIONS AND ASSISTING US WITH OUR RESEARCH!
PARTICIPANT ID NUMBER □□□□ DATE

24 MONTH FOLLOW UP QUESTIONNAIRE

Please use a black or blue pen to answer each question. Write the answer in the space provided and tick the appropriate box

Name ______________________________________________________

Age ________________ years                                      Date of birth ___/___/___

Date of accident ___/___/___
This part of the questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. For each of the following questions, please mark an in the one box that best describes your answer.

1. **In general, would you say your health is:**

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. **Compared to one year ago, how would you rate your health in general now?**

<table>
<thead>
<tr>
<th>Much better now than one year ago</th>
<th>Somewhat better now than one year ago</th>
<th>About the same as one year ago</th>
<th>Somewhat worse now than one year ago</th>
<th>Much worse now than one year ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

3. **The following questions are about activities you might do during a typical day? Does your health now limit you in these activities? If so, how much?**

<table>
<thead>
<tr>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

   a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports ........................................... 1 ............ 2 ........................ 3

   b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf ........................................ 1 ............ 2 ........................ 3

   c. Lifting or carrying groceries ................................................................. 1 ............ 2 ........................ 3

   d. Climbing **several** flights of stairs ................................................... 1 ............ 2 ........................ 3

   e. Climbing **one** flight of stairs ............................................................... 1 ............ 2 ........................ 3

   f. Bending, kneeling, or stooping ................................................................. 1 ............ 2 ........................ 3

   g. Walking **more than a kilometre** ............................................................ 1 ............ 2 ........................ 3

   h. Walking **several hundred metres** .......................................................... 1 ............ 2 ........................ 3

   i. Walking **one hundred metres** ................................................................ 1 ............ 2 ........................ 3

   j. Bathing or dressing yourself ...................................................................... 1 ............ 2 ........................ 3
4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
</tr>
</tbody>
</table>

a. Cut down on the amount of time you spent on work or other activities ........................................ 1 .... 2 .... 3 .... 4 .... 5

b. Accomplished less than you would like ................................................................. 1 .... 2 .... 3 .... 4 .... 5

c. Were limited in the kind of work or other activities ........................................... 1 .... 2 .... 3 .... 4 .... 5

d. Had difficulty performing the work or other activities (for example, it took extra effort) .................. 1 .... 2 .... 3 .... 4 .... 5

5. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
</tr>
</tbody>
</table>

a. Cut down on the amount of time you spent on work or other activities ........................................ 1 .... 2 .... 3 .... 4 .... 5

b. Accomplished less than you would like ................................................................. 1 .... 2 .... 3 .... 4 .... 5

c. Did work or other activities less carefully than usual ........................................... 1 .... 2 .... 3 .... 4 .... 5

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
<td>◯</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
7. **How much bodily pain have you had during the past 4 weeks?**

<table>
<thead>
<tr>
<th>None</th>
<th>Very mild</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

8. **During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

9. **These questions are about how you feel and how things have been with you during the past 4 weeks.** For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the **past 4 weeks**...

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

a. Did you feel full of life? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

b. Have you been very nervous? ........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

c. Have you felt so down in the dumps that nothing could cheer you up? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

d. Have you felt calm and peaceful? ........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

e. Did you have a lot of energy? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

f. Have you felt downhearted and depressed? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

g. Did you feel worn out? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

h. Have you been happy? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

i. Did you feel tired? ...........................................  □ 1 ..............  □ 2 ..............  □ 3 ..............  □ 4 ..............  □ 5  

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10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

<table>
<thead>
<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
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<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

11. How TRUE or FALSE is each of the following statements for you?

<table>
<thead>
<tr>
<th>Definitely true</th>
<th>Mostly true</th>
<th>Don't know</th>
<th>Mostly false</th>
<th>Definitely false</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
<td>▼</td>
</tr>
</tbody>
</table>

a. I seem to get sick a little easier than other people ................. ☐ 1 ............. ☐ 2 .......... ☐ 3 .......... ☐ 4 ............. ☐ 5

b. I am as healthy as anybody I know .......................... ☐ 1 ............. ☐ 2 .......... ☐ 3 .......... ☐ 4 ............. ☐ 5

c. I expect my health to get worse ........................................... ☐ 1 ............. ☐ 2 .......... ☐ 3 .......... ☐ 4 ............. ☐ 5

d. My health is excellent .................................................. ☐ 3 ............. ☐ 2 .......... ☐ 3 .......... ☐ 4 ............. ☐ 5
Below is a list of problems and complaints that people sometimes have in response to stressful experiences. Please read each one carefully, put an X in the box to indicate how much you have been bothered by that problem.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all (1)</th>
<th>A little bit (2)</th>
<th>Moderately (3)</th>
<th>Quite a bit (4)</th>
<th>Extremely (5)</th>
</tr>
</thead>
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<tr>
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<td>Repeated, disturbing dreams of the accident?</td>
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<tr>
<td>3</td>
<td>Suddenly acting or feeling as if the accident were happening again (as if you were reliving it)?</td>
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<tr>
<td>4</td>
<td>Feeling very upset when something reminded you of the accident?</td>
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<td>5</td>
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<td></td>
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<td>11</td>
<td>Feeling emotionally numb or being unable to have loving feelings for those close to you?</td>
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<td>12</td>
<td>Feeling as if your future will somehow be cut short?</td>
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<tr>
<td>13</td>
<td>Trouble falling or staying asleep?</td>
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<tr>
<td>14</td>
<td>Feeling irritable or having angry outbursts?</td>
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<tr>
<td>15</td>
<td>Having difficulty concentrating?</td>
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<tr>
<td>16</td>
<td>Being “super-alert” or watchful or on guard?</td>
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<tr>
<td>17</td>
<td>Feeling jumpy or easily startled?</td>
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</tbody>
</table>
1. Do you have neck pain now?  □ Yes  
□ No

If yes, please answer the following questions. If no, please go to question 3

This questionnaire has been designed to give us information as to how your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only ONE box which applies to you. We realise you may consider that two of the statements in any one section relate to you, but please mark the box which clearly describes your problem.

Section 1 – Pain Intensity

□ I have no pain at the moment.
□ The pain is very mild at the moment.
□ The pain is moderate at the moment.
□ The pain is fairly severe at the moment.
□ The pain is very severe at the moment.
□ The pain is the worst imaginable at the moment.

Section 2 – Personal Care (Washing, Dressing etc)

□ I can look after myself normally, without causing extra pain.
□ I can look after myself normally, but it causes extra pain.
□ It is painful to look after myself and I am slow and careful.
□ I need some help, but manage most of my personal care.
□ I need help every day in most aspects of self care.
□ I do not get dressed, I wash with difficulty and stay in bed.

Section 3 – Lifting

□ I can lift heavy weights without extra pain.
□ I can lift heavy weights but it gives extra pain.
□ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.
□ Pain prevents me from lifting heavy weights, but I can manage if they are conveniently positioned.
□ I can lift very light weights.
□ I cannot lift or carry anything at all.
Section 4 – Reading

☐ I can read as much as I want to with no pain in my neck.

☐ I can read as much as I want with slight pain in my neck.

☐ I can read as much as I want to with moderate pain in my neck.

☐ I cannot read as much as I want because of moderate pain in my neck.

☐ I can hardly read at all because of severe pain in my neck.

☐ I cannot read at all.

Section 5 – Headaches

☐ I have no headaches

☐ I have slight headaches which come infrequently.

☐ I have moderate headaches which come infrequently.

☐ I have moderate headaches which come frequently.

☐ I have severe headaches which come frequently.

☐ I have headaches almost all the time.

Section 6 – Concentration

☐ I can concentrate fully when I want to with no difficulty.

☐ I can concentrate fully when I want to with slight difficulty.

☐ I have a fair degree of difficulty in concentrating when I want to.

☐ I have a lot of difficulty in concentrating when I want to.

☐ I have a great deal of difficulty in concentrating when I want to.

☐ I cannot concentrate at all.

Section 7 – Work

☐ I can do as much work as I want to.

☐ I can only do my usual work, but no more.

☐ I can do most of my usual work, but no more.

☐ I cannot do my usual work.

☐ I can hardly do any work at all.

☐ I cannot do any work at all.
Section 8 – Driving

☐ I can drive my car without any neck pain.

☐ I can drive my car as long as I want with slight pain in my neck.

☐ I can drive my car as long as I want with moderate pain in my neck.

☐ I cannot drive my car as long as I want because of moderate pain in my neck.

☐ I can hardly drive at all because of severe pain in my neck.

☐ I cannot drive my car at all.

Section 9 – Sleeping

☐ I have no trouble sleeping.

☐ My sleep is slightly disturbed (less than 1 hour sleepless)

☐ My sleep is mildly disturbed (1-2 hours sleepless)

☐ My sleep is moderately disturbed (2-3 hours sleepless)

☐ My sleep is greatly disturbed (3-5 hours sleepless)

☐ My sleep is completely disturbed (5-7 hours sleepless)

Section 10 – Recreation

☐ I am able to engage in all of my recreational activities with no neck pain at all.

☐ I am able to engage in all of my recreational activities with some pain in my neck.

☐ I am able to engage in most, but not all of my usual recreational activities because of pain in my neck.

☐ I am able to engage in a few of my usual recreational activities because of pain in my neck.

☐ I can hardly do any recreational activities because of pain in my neck.

☐ I cannot do any recreational activities at all.

2. Mark on this line your current level of neck pain. The closer to the right, the greater the pain level.

Pain Visual Analogue Scale (VAS)

[ ]

No neck pain

Neck pain as bad as it could possibly be

3. How many days have you spent in hospital in the last 6 months? (do not include your time in hospital after the accident) __________ (approximate number of days)
4. How many times have you visited the emergency department/ outpatients/day clinic in the last 6 months? 
____________ (approximate number of visits)

5. Since discharge from hospital how many visits have you made to the following health professionals?

<table>
<thead>
<tr>
<th>Health professional</th>
<th>Approximate number of visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioner (GP)</td>
<td></td>
</tr>
<tr>
<td>Medical specialist</td>
<td></td>
</tr>
<tr>
<td>Psychiatrist</td>
<td></td>
</tr>
<tr>
<td>Psychologist</td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td></td>
</tr>
<tr>
<td>Other please state</td>
<td></td>
</tr>
</tbody>
</table>

6. How do rate your health now, compared to your usual level of health prior to the accident? On a scale of -5 to 5, tick the most appropriate box.

-5 Vastly worse
-4
-3
-2
-1
0 Unchanged
1
2
3
4
5 Completely recovered

7. How long do you think it will take for you to return to your usual activities?

- Already returned to usual activities
- Days (approximately how many) __________
- Weeks (approximately how many) __________
- Months (approximately how many) __________
- Years (approximately how many) __________
- Never
8. What is your current work status?
   - [ ] Working
   - [ ] Not working

   AND if you are working is it
   - [ ] Full duties
   - [ ] Modified duties e.g. lifting restrictions, reduced hours

   AND if you are working, what was the date you returned to work after the accident?
   - Date ___/___/___

   AND if you are working, how many hours do you work in an average week? ________ hours/week

   AND if you are working, how satisfied are you with your job?
   - [ ] Very satisfied
   - [ ] Satisfied
   - [ ] Dissatisfied
   - [ ] Very Dissatisfied

9. Do you think you will recover enough to return to your usual job?
   - [ ] Yes
   - [ ] No
   - [ ] Already returned to usual job

10. Was your ability to return to work after the accident related to your injury?
    - [ ] Yes
    - [ ] No

11. Have you changed your occupation since the accident?
    - [ ] Yes
    - [ ] No
12. Please indicate in your opinion how strongly you agree or disagree with each of the following statements

a. I am suffering because of someone else's negligence

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly

b. Most people don't understand how severe my condition is

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly

c. People are entitled to fair compensation

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly

d. Having a lawyer helps people with compensation manage their claim

☐ Agree strongly
☐ Agree moderately
☐ Agree slightly
☐ Disagree slightly
☐ Disagree moderately
☐ Disagree strongly
e. People with a compensation claim receive better medical treatment

- Agree strongly
- Agree moderately
- Agree slightly
- Disagree slightly
- Disagree moderately
- Disagree strongly

f. Insurance companies are helpful if you have a compensation claim

- Agree strongly
- Agree moderately
- Agree slightly
- Disagree slightly
- Disagree moderately
- Disagree strongly

g. Having a medicolegal assessment by a doctor helps people with compensation resolve their claim

- Agree strongly
- Agree moderately
- Agree slightly
- Disagree slightly
- Disagree moderately
- Disagree strongly

13. Have you made a compensation claim for your injuries in the accident?  
- Yes
- No

14. If yes, what type of claim?  
- Compulsory Third Party (CTP)
- Workers compensation
- Other please state ____________________
15. Has your claim been accepted? ☐ Yes
   ☐ No
   ☐ Don’t know

16. Do you have a lawyer for your claim? ☐ Yes
   ☐ No

17. Has your claim settled? ☐ Yes
   ☐ No

THIS IS THE END

THANK YOU VERY MUCH FOR COMPLETING THESE QUESTIONS AND ASSISTING US WITH OUR RESEARCH!