

Information based interventions for injury recovery: a rapid review

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An **Evidence Check** review brokered by the Sax Institute
for the Motor Accidents Authority of NSW

July 2011

This rapid review was brokered by the Sax Institute.

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Abbreviations

ACT	Australian Capital Territory
ADLs	Activities of Daily Living
AIS	Abbreviated Injury Scale
ASD	Acute Stress Disorder
CBT	Cognitive Behavioural Therapy
CT	Controlled Trial
DSM	Diagnostic and Statistical Manual of Mental Disorders
DVD	Digital Versatile Disc
ED	Emergency Department
EF	Executive Function
GCS	Glasgow coma score
GP	General Practitioner
HA	Headache
LBP	Lower Back Pain
LOC	Loss of consciousness
LTF	Loss to follow-up
MSK	Musculoskeletal
MTH	Month
MTHS	Months
MVA	Motor Vehicle Accident
MVC	Motor Vehicle Crash
N/A	Not Applicable
n	Sample Size
N	Population Size
N/S	Not Significant
NSW	New South Wales
PCS	Post Concussive Syndrome
PHYSIO	Physiotherapy
PTA	Post traumatic amnesia
PTS (D)	Post-traumatic Stress (Disorder)
QOL	Quality of Life
QLD	Queensland
RCT	Randomized Controlled Trial
RTW	Return to work
SBT	Strength and Balance Training
SCI	Spinal Cord Injury
TBI	Traumatic Brain Injury
TOPS	Teen Online Problem Solving
TV	Television
WAD	Whiplash Associated Disorder
WCC	Workers Compensation Corporation
WEB	World Wide Web
UK	United Kingdom
USA	United States of America
VIC	Victoria
YR/YRS	Year/Years

Executive Summary

Background

Vehicle-related traumatic injuries are a major public health problem. A leading cause of both morbidity and mortality, motor vehicle-related injuries cause a range of physical, cognitive and psychological disabilities that may seriously impact on the quality of life of affected individuals and their families.

There is now substantial evidence that provision of compensation arising from personal injury, such as transport injury, causes harm. A number of local and international research studies now suggest that interaction with the compensation system itself is a source of frustration for those injured and may impact client outcomes. Conversely, within the cohort of people with compensable injury, compensation systems have a unique opportunity to positively impact the client's recovery by providing effective and efficient treatment and rehabilitation services, information and education to the injured person. Compensation authorities are well positioned to promote information and education based interventions to facilitate the recovery of injured persons following transport accidents. In this context it is important to review the academic literature regarding effective information and education based interventions for promoting recovery from injury to determine approaches that may be applicable in the Australian injury compensation setting.

Purpose

This review of information and educational based interventions for health and social outcomes following vehicle and non-vehicle related trauma was undertaken to answer the following questions posed by the Motor Accidents Authority (MAA) of NSW:

1. Do public health strategies/campaigns improve outcomes following traumatic injury?
2. Does targeted early intervention improve outcomes following traumatic injury?
3. Are there public health strategies/campaigns or early interventions that improve outcomes in different populations that could be adopted for the traumatic injury population?

Methods

A comprehensive search for peer review and grey literature was carried out using online library databases and internet search engines. The reference lists of key citations were reviewed for additional references. Five library databases and forty-six websites were searched. Three clinical trial registers were searched for relevant current trials. Citations were downloaded into Endnote X3 and duplicates removed. Each abstract or full text reference was scanned to identify studies that met inclusion criteria arising from the terms of reference. Data from each included study were extracted into evidence tables and each study was rated for the level of evidence and the quality of evidence.

Main findings

Approximately 1800 references were identified and screened for relevance in terms of the scope's inclusion criteria. Fifty-nine articles reporting on fifty-eight primary studies were included in our evidence synthesis of information and education interventions for injury recovery following vehicle and non vehicle-related trauma. Eight systematic or narrative reviews, four study protocols and four clinical trial registrations of relevance were also identified.

Included studies represented a very heterogenous literature with a range of interventions in multiple different participant groups, using a variety of endpoints assessed over a broad range of time periods post-injury and multiple different study designs. The methodological quality of the literature also varied substantially. The vast majority of studies did not report details of the personal injury compensation or health insurance system for the jurisdiction(s) in which the study took place. As such it is difficult to draw generalisable conclusions about effective interventions for promoting recovery from traumatic injury, and very difficult to interpret the results of the review in terms of their applicability to the NSW motor accident compensation environment. Only a single study in a traumatic injury setting included information on the cost of the intervention and thus no conclusions can be drawn regarding cost-effectiveness.

Despite the heterogeneity and diverse methodological quality of the literature reviewed, and the variety of settings in which the studies occurred, it is possible to identify some areas of consistency that provide the basis for potential future information-based interventions in NSW.

Strong evidence was found for the effectiveness of interventions involving regulatory or legislative reform. These were observed to be effective in most studies that reported the impact of such reform.

There was equivocal evidence to support the effectiveness of other interventions. Seven studies reported that self-help information or educational intervention that includes ongoing interaction or participation of a health or care provider facilitated recovery. Interventions delivered via the telephone were found to be effective in all three studies that reported on these. Interventions delivered by video-conferencing and interventions delivered via video or DVD were effective in the majority of studies that reported on these. A number of studies observed that those at increased risk of poor outcome showed the most benefit from the intervention.

In addition, there appears to be strong evidence that early interventions that specifically focus on early de-briefing to prevent the onset of post-traumatic stress may be harmful. Of the four studies reviewed with this specific aim, all showed a negative impact on outcome, including an increased risk of depression and PTSD symptoms at follow-up. Careful and more detailed consideration of the literature in this area should be undertaken before trialling an intervention to prevent the onset of mental health conditions following traumatic injury.

Finally, while the review identified a range of information and educational interventions, there is a lack of published information in some areas. Gaps in the evidence include public health strategies for promoting injury recovery following vehicle related trauma, interventions based in culturally and linguistically diverse populations, interventions aimed at caregivers,

interventions focusing on providing information on the compensation system claims and legal process, cost effectiveness studies, studies reporting the impact of cultural factors and health literacy factors on compliance with interventions, studies examining patient preferences for particular different modes of delivery of intervention (e.g. written versus electronic) and large-scale randomized controlled trials.

Background and Introduction

The burden of vehicle related traumatic injury

Vehicle-related traumatic injuries are a major public health problem. A leading cause of both morbidity and mortality, motor vehicle-related injuries cause a range of physical, cognitive and psychological disabilities that may seriously impact on the quality of life of affected individuals and their families. Depending on the nature and severity of the injuries, the socioeconomic burden following vehicle-related trauma may also be associated with increased health service utilisation, the need for carers, extended loss of workforce participation and medical, rehabilitation and wage replacement compensation payments.

The World Health Organisation (WHO) estimates that 1.2 million people are killed each year in traffic crashes globally, with estimates suggesting anywhere between 20-50 million people being injured annually. The ratio of deaths to injuries requiring hospital admission to minor injuries is 1:15:70. By 2020, WHO estimates that traffic crashes will represent the third leading cause of disability behind heart disease and depression (Peden 2004).

In Australia in 2007, an estimated 50,000 new transport accident compensation claims were submitted (Grant 2009). Vehicle-related trauma is a significant public health problem in NSW. Table 1 and Table 2 outline the frequency and distribution of vehicle-related traumatic injury admissions to NSW hospitals for the 2007-2010 financial years.

Table 1: MVC-related hospital admissions in NSW for vehicle-related trauma according to compensation status for the period 2007-08 to 2009-10 (excludes transfers and statistical discharges)

Compensation status	N	%
Public patient	19772	47.19
Private patient	5974	14.26
NSW workers compensation	2673	6.38
NSW MVA compensation	11133	26.57
Other compensation	56	0.13
Veterans affairs	296	0.71
Other	209	0.50
Missing	1787	4.26

Table 2: MVC-related hospital admissions in NSW for vehicle-related trauma according to gender and type of vehicle related trauma for the period 2007-08 to 2009-10 (excludes transfers and statistical discharges)

	Male		Female		Total	
	N	%	N	%	N	%
Car	7047	16.8	6816	16.3	13863	33.1
Motorcycle	10220	24.4	995	2.4	11215	26.8
Pedal cyclist	6233	14.9	1288	3.1	7521	17.9
Pedestrian	2052	4.9	1299	3.1	3351	8.0
Heavy vehicle transport	549	1.3	34	0.08	583	1.4
Bus	175	0.4	300	0.7	475	1.1
Pickup truck or van	233	0.56	51	0.1	284	0.68
Three wheeled vehicle	27	0.06	5	0.01	32	0.08
Other land transport	1675	4.0	1786	4.3	3461	8.3
Traffic/no traffic spec & MVC (V87-V89)	487	1.2	211	0.50	698	1.7
Other and unspecified transport (V98/V99)	313	0.75	104	0.25	417	1.00
Total	29011	69.24	12889	30.76	41900	100.00

Note: New South Wales (NSW) hospitalisation data includes information on inpatient separations from NSW public and private hospitals, private day procedures, and public psychiatric hospitals. The data were obtained from 1 July 2007 to 30 June 2010. NSW hospitalisation data includes information on episodes of care in hospital that end with the discharge, transfer, or death of the patient; or when the service category for the admitted patient changes. The hospitalisation data were coded using the International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian-modification (ICD-10-AM). Hospitalisations are of NSW residents only. Hospitalisations relating to transfers or statistical discharges were excluded in order to attempt to partly eliminate 'multiple counts', which occur when an individual has more than one hospitalisation for a given injury. Motor vehicle crash-related hospitalisations were identified using a:

- principal diagnosis code of injury (i.e. in the ICD-10-AM range S00-S99 or T00-T14); and
- principal external cause code relating to motor vehicle crashes (i.e. in the ICD-10-AM range V00-V89 or V98-V99).

Many injuries arising from transport crashes do not result in hospitalisation. Data from the no-fault Victorian system suggests that two-thirds of compensable transport accidents result in injuries that do not require hospital admission (Ruseckaite 2011). In NSW between the years 2003-4 and 2009-10 a total of 72,234 compensation claims were lodged under the MAA scheme (Table 3).

Table 3: Motor accident compensation claims in NSW

Accident Year	Total claims	Estimated ultimate claims
2003/04	12,264	12,290
2004/05	11,711	11,757
2005/06	11,086	11,167
2006/07	10,582	10,729
2007/08	9,918	10,220
2008/09	10,927	11,732
2009/10	5,746	7,067
Total	72,234	74,962

Source: MAA Annual report 2009-10 financial years

The economic cost of road crashes in Australia is considerable. Road crashes have been conservatively estimated to annually cost the Australian community approximately \$A18 billion (costs include medical treatment, loss of workplace productivity, vehicle replacement or repair and emergency services) (Bureau of Transportation Economics 2000). Road crashes account for more than half of all severe traumatic brain injury and spinal cord injury. The lifetime costs of new cases of brain and spinal cord injury that occurred in Australia in 2008 is estimated at \$10.5 billion (Access Economics 2009). Insurers regulated by the MAA made \$760 million in claims payments during the 2009/10 financial year and had a total incurred costs of \$6.8 billion between the 2003/4 and 2009/10 financial years (MAA Annual Report, 2009-0).

The impact of compensation and compensation systems

There is now substantial evidence that provision of compensation arising from personal injury, such as transport injury, causes harm. Those who receive personal injury compensation have poorer health and vocational outcomes than those with matched injuries who do not receive compensation (Gabbe 2007). In the past two decades, a number of meta-analyses have described this phenomenon following head injury (Binder 1996) and mild brain injury (Carroll 2004), orthopaedic trauma (Harris 2005), and in those suffering chronic pain (Rohling 1995). The magnitude of the difference in outcomes following compensable and non-compensable injury is striking. A meta-analysis reported in 2005 that included data from more than 20,000 patients found that the odds of an unsatisfactory outcome following surgery was 3.79 time higher for those receiving compensation than for non-compensated patients (Harris 2005). Of the 211 studies included in this meta-analysis only one described improved outcomes in the compensated patients, with 175 describing a worse outcome, 30 describing no difference and five not commenting on the difference. In many of the studies reviewed, compensation was found to be the strongest predictor of poor outcome. In another study, those receiving compensation were half as likely to return to work and twice as likely to demonstrate poor functional outcome when compared to a matched non-compensable

group one year following orthopaedic trauma in the state of Victoria, Australia (Gabbe 2007).

Compensation schemes play an important role in the provision of healthcare and rehabilitation to their clients. They set policy regarding government payment for treatment, services and long-term care needs of clients, which can have a substantial impact on outcomes for injured persons and their carers (Bismark 1997). They also play a substantial role as an interface between government and society in matters of healthcare and how it is financed (Beard 1997). This role can distort the provision of healthcare to the compensable client. For example, those with compensable injury are more likely to be admitted to hospital and undergo surgery (Day 2010, Gundle 2010).

Although the injured person is normally the person most directly affected, compensable injuries can also have long term impacts on family members, co-workers, healthcare providers, employers and a host of other individuals and groups. Aside from the direct physical impact of workplace or transport related injury, individuals often lose financial independence through loss of earnings and dependence on others (Ebel 2004, Boden 1999), develop or exacerbate mental health issues (Vles 2005), and place greater strain on personal relationships (Kennedy 2000). Families are also affected, with disruptions to home life a frequent outcome following injury (Keogh 2000). In a US study, injured workers who have lost more than 28 days of work or received workers' compensation for permanent/partial disability benefits reported reduced abilities to engage in normal family roles, such as household chores, parenting and childcare (Strunin 2004). Similarly, data from the US National Longitudinal Survey indicated that workers who experienced a workplace injury were 25% more likely to divorce than the non-injured workers (Brown 2007). At a community level, injury (including compensable injury) manifests in a change to society's productivity and competitiveness, greater use of social services and increased demand on public and private resources (Brown 2007).

Interaction between compensation systems and the injured person

A number of local and international research studies now suggest that interaction with the compensation system itself is a source of frustration for those injured and may impact client outcomes. Specifically, the compensable clients encounter difficulties dealing with procedural and process issues in the system and this may influence outcomes including return to work (Kirsh 2003, Beardwood 2005). For some, the claims and legal settlement process is a stressful experience (Calvey 2005, Roberts-Yates 2003, Murgatroyd 2010). Injured persons report a lack of information, lack of involvement and rights, and poor communication when interacting with personal injury compensation system (Elbers 2011). The power imbalance between claimants and key stakeholders was noted as a primary factor influencing outcomes in a recent Canadian qualitative study (Lippel 2007). Research also reveals that injured persons believe that the claims process renders injured persons dependent on others (Kirsh 2003, Beardwood 2005). Furthermore, there are different community expectations about injury recovery and concerns about the complexity of compensation schemes (Lippel 2007, Calvey 2005).

Conversely, within the cohort of people with compensable injury, compensation systems have a unique opportunity to positively impact the client's recovery by providing effective and efficient treatment and rehabilitation services, information and education to the injured

person. Because compensation authorities act at the interface of the healthcare system and the injured person, they are well positioned to promote information and education based interventions to facilitate the recovery of injured persons from transport accidents. In this context it is important to review the academic literature regarding effective information and education based interventions for promoting recovery from injury to determine approaches that may be applicable in the Australian injury compensation setting.

Purpose of this review

The purpose of this report was to review the impact and cost effectiveness of:

1. Providing injured people and the community with information about injury recovery and compensation; and
2. Providing early intervention programs to improve outcomes following traumatic injury.

We note that a formal cost-effectiveness evaluation is beyond the scope of this rapid review. The findings of this review will be used to inform the MAA about developing strategic research priority areas with the ultimate aim of improving the claims experience and outcomes for injured persons covered by the Compulsory Third Party (CTP) scheme.

Review questions

The review was conducted to address three questions posed by the MAA, being:

1. Do public health strategies/campaigns improve outcomes following traumatic injury?
2. Does targeted early intervention improve outcomes following traumatic injury? and
3. Are there public health strategies/campaigns or early interventions that improve outcomes in different populations that could be adopted for the traumatic injury population?

Each of the three questions had slightly different requirements necessitating a tailored search strategy for the questions. The following specific information was provided by the MAA to guide the review for each question.

Question 1 - Do public health strategies/campaigns improve outcomes following traumatic injury?

- Public health strategies/campaigns are broadly defined to include all types of interventions including but not limited to mass media campaigns, social marketing campaigns and other interventions;
- Outcomes include but are not limited to health and social outcomes (including return to work or usual activities, reduced costs and improved service delivery);
- The interventions of interest are those that focus on or include strategies to inform the target population about injury recovery and or the claims and legal process following vehicle related trauma;
- Traumatic injuries include the full range of injuries that can be incurred in vehicle-related accidents, irrespective of the level of severity of that injury;

- The target populations for these are those involved in vehicle-related trauma. This could include but is not limited to people injured in vehicle related accidents (drivers, passengers or pedestrians), their families or population groups at higher risk of injury (for example young drivers);
- Only studies that evaluate the effect of interventions are of interest. These include before-and-after studies in one group and comparison studies (i.e. comparing intervention and control groups);
- Studies from other parts of Australia or overseas with different models of vehicle-related compensation are to be included, provided that the claims system is adequately described; and
- Studies with different settings are of interest, for example interventions based in primary care, hospital emergency departments, the general community, or in the compensation system itself.

Question 2 - Does targeted early intervention improve outcomes following traumatic injury?

- Interventions include, but are not limited to, information and assistance about injury recovery and/or the claims and legal process, or advice about return to work and normal activity;
- Early intervention is defined as being interventions delivered from the time that injury occurs up to, but not exceeding, six months post-injury; and
- Interventions of interest include those targeted at injured people, or at a group or organisational level.

Question 3 - Are there public health strategies/campaigns or early interventions that improve outcomes in different populations that could be adopted for the traumatic injury population?

- Different populations of interest are those who experience traumatic injury caused by events other than vehicle-related trauma (for example, falls or assaults);
- Public health strategies/campaigns are broadly defined to include all types of interventions including (but not limited to) mass media campaigns, social marketing campaigns and other interventions;
- Interventions include, but are not limited to, information and assistance about injury recovery and/or the claims and legal process, or advice about return to work and normal activity;
- Early intervention is defined as being interventions delivered from the time that injury occurs up to, but not exceeding, six months post-injury;
- Interventions of interest include those targeted at injured people, or at a group or organisational level; and
- Outcomes include, but are not limited to, health and social outcomes (including return to work or usual activities, reduced costs, and improved service delivery).

Additional stated requirements were that the review should:

- Identify areas where there is strong evidence in relation to the review question; where there is equivocal or conflicting evidence; and where there are gaps in the evidence;
- Provide a comprehensive coverage of research in the peer review literature including academic databases (e.g. Cochrane, Medline, PsychINFO);

- Provide a comprehensive review of the grey literature including government reports and agency reports. The MAA will assist, where possible, in facilitating access to relevant government reports; and
- Focus on literature published since 1990.

Additional clarification of the review requirements was that it should:

- Include a search for literature applied to the database:- INFORMIT;
- Not focus on clinical or pharmacological interventions unless they have included a component of information or education;
- Not be restricted by the age of the injured person;
- Include a summary of relevant case studies and case series;
- Include a summary of relevant research studies in low back pain cohorts; and
- Include a limited search of the grey literature.

Following an initial search and review of the literature it was identified that the insurance system was not described for the majority of the identified research studies. Following consultation, this led to the modification of a number of the requirements associated with the review. These are outlined below.

- For review questions 1 and 2:
 - to list the jurisdiction in which the study took place (Country and state/province) rather than the insurance system;
 - to include a separate table/list with a simple description of the compensation systems in the jurisdictions that are represented in the publications reviewed; and
 - to comment specifically (and perhaps in more detail) on those few studies where the comp/insurance system is described or where we can infer the compensation arrangements from the jurisdiction.
- For question 3, to remove the requirement for a description of the compensation / insurance system.

Structure of the Report

The current section introduces the topic of the report. A description of the method used for searching and selecting research papers is then provided. The evidence tables for each of the three review questions are presented in Appendix A-C. The Results considers first the question regarding public health strategies following vehicle-related trauma, second the question regarding early interventions following vehicle-related trauma and finally the question set regarding public health strategies and early interventions following non vehicle-related traumatic injury. A summary discussion and conclusions that focus only on the evidence identified by the modified terms of reference follow and include an analysis of the findings to the NSW context and recommendations for future research projects. Relevant reviews are briefly summarised in Appendix D and relevant study protocols and clinical trial registrations are outlined in Appendices E and F. Summary details of the personal injury compensation systems (where available) associated with the included studies are listed in Appendix G.

Methods

A comprehensive search of peer review and grey literature was carried out via on-line library databases, government websites, national and international compensation authorities, research institutes, injury foundations and search engines. A search of three clinical trial registers was also conducted. The reference lists of key publications were screened for additional publications of relevance. All documents meeting the search criteria that were able to be sourced within the short timeframe of the review were considered for inclusion in the tables of key findings and/or the discussion.

The specified search criteria were for studies that evaluate the effect of interventions. These included:

- Before and after studies in one group;
- Interrupted time series;
- Comparison studies;
- Randomized controlled trials;
- Pseudo randomized or non-randomized controlled trials; and
- Systematic reviews and meta-analyses.

Search terms

Key search terms were sourced from those commonly utilised in key databases e.g. Medline and applied as follows. Medical Subject Headings (MeSH) terms together with text terms were used preferentially in the development of search strategies. In all cases, MeSH terms were exploded and all categories selected. As the use of key terms differed slightly between databases, the exact search strategy conducted for each of the databases differed in some aspects.

- [Injury or wound or trauma or traumatic or whiplash or spinal or fracture or multiple trauma or stress disorders, post-traumatic] AND
- [Automobile or Pedestrian or Motorcycle or Traffic Accidents or Bicycle or Crash] AND
- [Compensation or Insurance or Disability benefits] AND
- [Mass media or Social Media. Or Pamphlet or Leaflet or Marketing or Social Marketing or Radio or Television or Publications or Information Dissemination or Communications media or Health education* or Health Promotion* or Advertising or Marketing of Health Services or Video or Periodicals or Patient Education as Topic]
- [Evaluation studies or Follow-up studies or Intervention studies or Program Evaluation or Prospective Studies or Randomized Controlled Trials or Cost-Benefit Analysis or Controlled Clinical Trials or Cohort Studies or Single-Blind Method or Double-Blind Method or Retrospective studies or Comparative Study or Cohort Studies or Random Allocation]
- [Violence or Assault or Gunshot or Falls or Sports or Work or Drowning or Burns] (Question 3 only)

Interventions were defined as planned intervention programs. Public health campaigns, reforms and strategies were defined as approaches to improve health and social outcomes which did not necessarily occur as part of a planned intervention program.

The following limits were applied to each search:

- English language;
- Humans; and
- Years of Publication: 1990-Current.

Due to the short timeframe of the review, only articles available immediately in full-text were retrieved. Results from all searches were collated utilising Endnote X3 and duplicates removed.

Following consultation, the search for relevant studies was modified to remove terms for compensation. The reason for this was twofold. A preliminary scan of identified papers revealed that the personal injury compensation systems associated with the recruited study participants were rarely described. In relation to scope question 3, with the exception of work-related injuries, most studies of non vehicle-related traumatic injuries are normally not covered by publicly funded injury compensation arrangements.

On-line databases

Initially a search was carried out on the peer review databases nominated in the scoping document. (Medline, PsychINFO, Cochrane). Following consultation, two further databases (PubMed and INFORMIT) were systematically searched for peer review literature applying the search terms as described above. The Cochrane Injuries Group was contacted in relation to other studies of relevance. The literature search also included a review of the personal libraries of the authors and contact with key researchers in their networks.

Grey literature

Google was utilised to search for additional grey literature. Organisations with potentially relevant key grey literature were individually searched. There included:

- Compensation Authorities in Australia:
 - Transport Accident Commission (VIC)
 - Motor Accidents Authority (NSW)
 - Lifetime Care and Support Authority (NSW)
 - Motor Accident Insurance Commission (QLD)
 - Motor Accident Commission (SA)
 - Motor Accident Insurance Board (TAS)
 - Territory Insurance Office (TIO)
 - Insurance Commission of Western Australia (WA)
 - WorkSafe Victoria (VIC)
 - Workcover New South Wales (NSW)
 - Workcover South Australia (SA)
 - Office of Industrial Relations, Chief Minister's Department (ACT)
 - NT WorkSafe (NT)
 - Q-COMP (QLD)

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- Workplace health and safety Queensland (QLD)
 - Workers Rehabilitation and Compensation tribunal (TAS)
 - Workcover WA (WA)
 - Comcare (National)
 - Heads of Workers Compensation Authorities (National)
 - SafeWork Australia (National)
 - Department of Veterans Affairs (National).
- International Compensation Authorities:
 - Accident Compensation Corporation (NZ)
 - Workplace Safety Insurance Board of Ontario (Ontario, Canada)
 - WorkSafe BC (British Columbia, Canada)
 - Workers' Compensation Board of Alberta (Alberta, Canada)
 - Commission de la santé et de la sécurité du travail du Québec (Quebec, Canada)
 - California State Compensation Insurance Fund (California, USA)
 - Washington State Department of Labor and Industries (Washington, USA)
 - Swedish Transport Board (Sweden).
- Health Services in Australia:
 - Department of Health (NSW)
 - Department of Health (VIC)
 - Queensland Health (QLD)
 - Department of Health (SA)
 - Department of Health (WA)
 - Department of Health and Human Services (TAS)
 - Department of Health (ACT)
 - Department of Health and Families (NT)
 - Department of Health and Ageing (National).
- Research Institutes and Injury Foundations:
 - Institute for Work and Health (Canada)
 - Ontario Neurotrauma Foundation (Canada)
 - Rick Hansen Spinal Cord Foundation (Canada)
 - Liberty Mutual Research Institute for Safety (USA)
 - IRSST (Quebec, Canada)
 - EMGO Institute (Netherlands)
 - School of Population Health, University of British Columbia (Vancouver, Canada)
 - Global Evidence Mapping Initiative (Australia).

Clinical trial registers

The following clinical trial registers were searched for relevant trials for which no publication of the trial outcomes was currently available:

- WHO International Clinical Trials Registry Platform;
- Clinical Trials.gov (USA); and
- Australian and New Zealand Clinical Trials Registry.

Quality of evidence

A first level of assessment was made to grade the quality of the intervention according to the study design. The following guidelines from the National Health and Medical Research Council (NHMRC) were applied.

Table 4: NHMRC additional levels of evidence and grades*

Level	Intervention 1
I	A systematic review of level II studies.
II	A randomized controlled trial.
III-1	A pseudo randomized controlled trial: (alternate allocation or some other method).
III-2	A comparative study with concurrent controls: <ul style="list-style-type: none"> • Non-randomized, experimental trial; • Cohort study; and • Interrupted time series with a control group.
III-3	A comparative study without concurrent controls or unexposed groups: <ul style="list-style-type: none"> • Historical control study; • Two or more single arm study; and • Interrupted time series without a parallel control group.
IV	Case series with either post-test or pre-test/post-test outcomes. Descriptive only with no significance testing.

* from: NHMRC additional levels of evidence and grades

http://www.nhmrc.gov.au/guidelines/consult/consultations/add_levels_grades_dev_guidelines2.htm

The methodological quality of included primary studies was assessed using seven criteria adopted from a published systematic review (Franché 2005). To address the scope of the review, an additional item on personal injury compensation system and health insurance systems was added (item 3). The quality assessment for individual studies is provided in the evidence tables reported in Appendix A-C.

Table 5: Methodological Quality Assessment Criteria

1	Source population is well identified.
2	Inclusion and exclusion criteria are described and appropriate.
3	The compensation system is appropriately described OR the general insurance-health care system is described.
4	Follow-up is reported and loss to follow-up is less than 40% or there are no major differences between dropouts and participants remaining in the analysis.
5	The interventions, programs or legislative changes are sufficiently described as to allow reasonable replication.
6	Outcomes are defined and measurable.
7	Design of the study including the baseline sample size is appropriate to answer the study questions about the literature reviews primary outcomes.
8	No other serious flaws were identified by the reviewers for this study, for example the use of inappropriate statistical tests, low participation rate.
	Total score out of 8

Based on the total score, studies were classed as very high, high, moderate or low quality. Studies classed as low quality were not included in the review. Due to the high risk of bias associated with low quality studies, meaningful data are unlikely to be obtained.

An intervention was assessed as having a positive impact if it was associated with statistically or clinically significant improvements in at least one of the outcomes measured in the study. A finding that was not statistically significant ($p < 0.05$) may indicate clinically significant improvement.

Due to the short time frame for the review, the systematic and narrative reviews selected for inclusion were not appraised for the quality of evidence and only a limited amount of data was extracted.

The following studies of interventions were not included in this review:

- Case series were not included unless the study included an intervention of potential relevance to this review (i.e.: one to form the basis of a RCT intervention study);
- Clinical or pharmacological interventions;
- Psychological interventions that involved psycho-education unless the psycho-education formed a standalone component of a collaborative clinical care approach; and
- Primary injury prevention intervention studies.

Results

Approximately 1800 potentially relevant references were identified and screened for relevance. The majority of these references were peer reviewed publications. The websites of 46 national and international compensation authorities, health departments and research institutes were searched for potentially relevant references; however, very little grey literature of relevance was identified. Relevant grey literature that was identified included clinical practice guidelines and literature reviews. Three clinical trial registers were searched for randomized controlled trials relevant to the review scope.

Each abstract or full text article was reviewed in order to determine its relevance. In addition, the references lists of all included citations were scanned to identify further potentially relevant sources of information. Following the completion of this lengthy review process, 58 primary studies and eight reviews were identified that fitted within the scope questions and were available in full text. The evidence tables provided in Appendix A-C summarise the main details of these studies grouped according to the scope question and the types of information or education based interventions. Summary details of the included reviews are reported in Appendix D.

A number of potentially relevant studies evaluating the impact of information or education based interventions were excluded as the time-period at which the intervention was delivered did not fall in the first six months post injury. A number of references were excluded because the study design was inappropriate for an intervention study. Four protocols for studies in progress were identified and the search of clinical trials registers identified four relevant randomized clinical trials for which the study outcomes are yet to be finalised. These are outlined in Appendix E.

While the objective was to provide a comprehensive review of the literature relating to vehicle-related traumatic injury it is possible that potentially relevant references were not obtained. This is due to the range of potential traumatic injury mechanisms in particular with respect to scope question 3, the limitations associated with searching for grey literature and the variety of information sources. In addition, due to the timeframe for the review only articles available as full text were retrieved. The authors' personal experience is that some programs and interventions trialled by personal injury compensation systems are not published due to the proprietary nature of the material or not published in accessible documents. Therefore, while providing an extensive review of published information and educational interventions for injury recovery following both vehicle and non vehicle related traumatic injury, it is possible that a number of studies fulfilling the inclusion criteria are not discussed.

Question 1 – Do public health strategies / campaigns improve outcomes following traumatic injury?

Four studies of public health strategies to improve outcomes following traumatic injury were identified. These studies are summarised in Appendix A. All studies were of whiplash trauma, three carried out in Canada and one in New South Wales.

Three studies examined the impact of legislative or regulatory change. Legislative change in one study involved a shift from a tort system to a no fault system that removed payments for

pain and suffering (Cassidy 2000). In the second study based in NSW, four legislative changes that occurred together were evaluated. These were removal of payment for non-economic loss, introduction of clinical practice guidelines, earlier acceptance of compensation claims and earlier access to treatment (Cameron 2008). In Alberta Canada, regulatory change to implement evidence based treatment protocols, cap the damage available for pain and suffering and improve access to care was evaluated in one study (Sulzenko-Laurie 2010). All three studies compared outcomes between groups injured before and after the legislative / regulatory change, and all three reported better outcomes in the 'after' group. While this study design lacks some rigour, the population based nature of the studies increases its external validity. Two studies reported compensation claim relevant outcomes including claim incidence, time to claim closure, claim costs, health care utilisation and incidence of claim disputes. The third study (Cameron 2008) reported outcomes including reduced functional disability, improved and health and wellbeing and improved physical functioning.

The final study evaluated a government policy of funding community and hospital based fitness training and multidisciplinary rehabilitation (Cassidy 2007). This population based cohort study demonstrated that the policy of funding community and hospital based fitness training and multidisciplinary rehabilitation was not effective in improving whiplash recovery.

Perhaps surprisingly, no studies evaluating the impact of mass media campaigns, social marketing or advertising campaigns on injury outcomes, costs or health service utilisation were identified. This was despite also contacting the authors' research networks including researchers with expertise on work-related mass media campaigns. Australia is a world leader in primary intervention road safety mass media campaigns as well as the evaluation of these campaigns. To date, published evaluation of the impact of these campaigns on injury outcomes has not occurred.

Question 2 – Does targeted early intervention improve outcomes following traumatic injury?

Summary

Details of targeted early information and educational interventions pertaining to vehicle related trauma or to cohorts that included vehicle related trauma are summarised in the Evidence Table in Appendix B. Thirty-two primary studies were identified.

The majority of these studies were randomized controlled trials (n=25), from seven countries and conducted in a range of acute, rehabilitative and community settings. The remaining studies were before-and-after studies in single groups or controlled trials that did not involve randomisation. Five of the 32 studies were conducted in Australia (Cox 2009, Kenardy 2008, Ponsford 2001, Ponsford 2002, Rebbeck 2006). The most common injury cohort was whiplash trauma followed by traumatic brain injuries, mild head injuries, spinal cord injuries and acute stress disorders. For the remaining studies, the injuries were not well specified. While the review search strategy identified a number of information interventions in spinal injury cohorts, these studies were often excluded because the intervention was not delivered early post-injury (up to six months). The majority of studies focused on mild to moderate injuries, however three studies involved persons with moderate to severe traumatic brain injury (Wade 2010, Sander 2009, Bombardier 2009).

In 18 studies, the intervention was compared to usual care. Only four studies reported on co-interventions (Wade 1997, Bunketorp 2006, Paniak 1998, Scholten-Peeters 2006). Adults were the targets in the intervention(s) in 28 studies. The remaining four studies involved children or young adolescents (Cox 2009, Wade 2010, Kenardy 2008, Ponsford 2001). In five studies the intervention targeted at parents or caregivers (Kenardy 2008, Cox 2010, Elliott 2008, Elliott 2009, Sander 2009). Only one study was identified that targeted a health care provider – physiotherapist (Rebbeck 2006). The review did not identify any interventions that focused on persons with non-English speaking backgrounds, older persons or children under the age of five.

The time period of participant follow-up was relatively short, falling between 13 and 26 weeks post baseline in 21 studies and extending to 12 months or longer for nine studies. Two studies did not report the time post baseline at which follow-up measurements were made (Marsac 2010, McClune 2003).

More than 35 different measures of outcome were assessed across the 32 studies reviewed. The majority of outcomes reflected aspects of symptom frequency and severity, mental health, physical health, quality of life, health service utilisation. Satisfaction with the intervention and increased knowledge following the intervention were also measured. The impact of the intervention on employment status was assessed in only four studies (Oliviera 2006, Ferrari 2005, Kongsted 2008, Bunketorp 2006).

Of the 32 included studies, 17 reported a positive impact of the intervention on at least one of the outcomes assessed; 11 reported that the intervention did not have a statistically significant effect, while four studies reported a negative impact of the intervention.

A variety of information and education based interventions formed the basis of the studies. These are outlined in the evidence table in Appendix B. The mode of intervention delivery included the internet or videoconferencing (N=6 studies), telephone (N=2), video or DVD (N=2), paper based pamphlets books and manuals (N=10) and in person education (N=12). In four studies, the information or education intervention involved more than one mode of delivery (Marsac 2010, Phillips 2001, Scholten-Peeters 2006, Kongsted 2008). One study reported a multidimensional intervention involving face-to-face contact, a writing task and telephone contact (Bugg 2008). Results arising from these categories of intervention will be discussed in turn below.

Methodological quality

The methodological quality of the reviewed studies varied substantially. A number of methodological issues occurred in many of the studies. The majority of studies had small sample sizes, for 13 studies the sample size at baseline in the intervention arm(s) was less than 50 persons. Study dropout was a significant problem in around half of the studies; some of these studies had small sample sizes at baseline. For 12 studies, it is not possible to make a conclusion about the effectiveness of the intervention as the study lacked a usual care control group. For self-help interventions, compliance with the interventions was infrequently documented. Approaches to statistical analyses varied greatly. The validity of many studies was affected by a low recruitment rate and an increased likelihood of a type 1 error.

Consequently, the results of the studies must be interpreted with caution. These methodological limitations must be considered when interpreting the following summary of the review results.

Further, and highly relevant to this review, very limited information on the personal injury compensation system of, nature of injuries and the type of vehicle related trauma was available for the majority of studies included in the review. Only one study provided any description of the personal injury compensation system under which the recruited cohort operated (Brison 2005). A further two studies while not describing the compensation system reported the proportion of participants engaged in litigation for compensation (Mittenberg 1996, Ghaffar 2006).

Finally, only one study made an assessment of the cost of the intervention (Rebbeck 2006) and thus it is not possible to comment on the cost-effectiveness of the interventions included in the review.

Types of Interventions

Paper-based interventions (N=10 studies)

A total of 10 studies examining the impact of paper-based interventions were reviewed. These interventions ranged in size from a one page pamphlet to a 64 page manual. Four of the studies focussed on participants with head injury/mild traumatic brain injury, three were aimed at alleviating symptoms of PTSD, two studies focussed on WAD and one study recruited participants with a range of traumatic injury. Overall, five of the studies reported a positive impact of the intervention, two reported potentially adverse impact, and three reported no impact.

Of the three studies focussed on PTSD, two reported the intervention resulted in potentially adverse outcomes (increase in levels of depression at six months post injury (Turpin 2005) or greater number of requests for treatment at follow-up (Ehlers 2003). The third reported no effect of the intervention (Scholes 2007).

Of the four studies focussed on TBI, three focussed on adult populations reported a positive impact (Wade 1997, Mittenberg 1996, Ponsford 2002) including a reduction in post-concussion symptoms. The fourth study provided an information booklet on mild TBI symptoms and coping strategies to children 6-15 years old, but did not demonstrate an impact on post-concussion symptoms (Ponsford 2001).

In WAD, one study demonstrated a positive impact of a 28 page booklet on beliefs about whiplash (McClune 2003) while the second observed that a one page educational pamphlet did not have an impact on self-reported recovery, symptoms, activities of daily living or a range of other outcomes.

Face-to-face or 'in-person' interventions (N=12 studies)

Twelve studies examined the impact of 'in person' education or information. These interventions ranged from single sessions to multiple sessions conducted over different time-periods. Four of the studies focussed on patients with WAD, three involved TBI patients, two were in SCI, two aimed at alleviating psychological and stress related disorders following traumatic injury. One study did not specify the types of injuries studied (Hobbs 1996). Of the 12 studies reviewed, four studies demonstrated a positive impact of the intervention on the patient group, six observed no impact of the intervention and two identified a negative impact.

Of the four studies in WAD groups, two demonstrated a positive impact of interventions that included exercise therapy and education provided by a clinician (Bunketorp 2006, Scholten-Peeters 2006). The remaining two studies found no impact of patient based education (Kongsted 2008) or clinician focused education (Rebbeck 2006) on patient outcomes. The Rebbeck (2006) study did identify an increase in the frequency of guidelines consistent practice.

None of the TBI studies were able to demonstrate an impact of the intervention on patient outcomes. All three studies were focussed on mild TBI. Interventions included single session education provided in the hospital emergency department, face-to-face clinic based education about post-concussion disorder and information provided at hospital discharge by a nurse about symptoms and prognosis.

One of the SCI studies demonstrated a positive impact of a mixed mode intervention (problem solving training sessions, educational materials, telephone contact) aimed at caregivers (Elliott 2009). The second study reported no change in problem solving skills in a small group of SCI patients who received an educational program within a rehabilitation hospital setting (May 2006).

Finally, one study observed that a course of CBT including education about trauma stress response resulted in a positive impact on the injured person (Bisson 2004), while a second study that required those with traumatic injury and acute stress disorder to write about their injury for 20 minutes on three consecutive days had no impact on patients ratings of depression, anxiety, PTSD symptoms or quality of life (Bugg 2008).

Electronic (internet-based) interventions (N=5 studies)

Four of the studies examining internet-based interventions reported a positive impact on the target outcome. The fifth demonstrated a trend towards significance. Three of these studies were RCTs while the remaining two employed poorer quality study designs. The interventions involved provision of web-based information and interaction web-based education or training.

Three studies were targeted at TBI populations and these demonstrated improvements in cognition and problem solving behaviour among adolescents (Wade 2010), a near significant reduction in anxiety among children and adolescents (Cox 2009) and a perceived improvement in knowledge of everyday problems encountered by caregivers of persons with TBI (Sander 2009).

The remaining two studies observed an anticipated decline in depression among caregivers of patients with SCI (Elliott 2008) and an improvement in the knowledge of positive recovery strategies and trauma stress reactions among parents of children with traumatic injury (Marsac 2010). However, the lack of a control group in the Marsac study limits interpretation of the findings. The findings of the study by Elliott (2008) were affected by substantial study dropout.

Telephone interventions (N= 2 studies)

One RCT identified a positive impact of seven scheduled 30-45 minute telephone session provided over nine months to a group of patients with mild to severe TBI (Bombardier 2009). The intervention was associated with reduction in depression symptoms at follow up.

A second RCT identified a positive impact of a nine week, nurse-led educational intervention delivered via video-conferencing or telephone to a group of patients with SCI (Phillips 2001). The intervention was associated with reduced mean annual hospital stay and higher ratings of quality of life. Both video-conferencing and telephone delivery of the education resulted in positive impacts relative to usual care ($p < 0.10$).

Video or DVD intervention (N=2 studies)

One RCT identified a positive impact of a 20 minute educational video sent to the patient's home in a group of patients with WAD (Brison 2005). The intervention was associated with improved self-rating of pain frequency, severity and location.

A second RCT observed a positive impact of a 12 minute educational video viewed at the bedside (in hospital) in patients with acute cervical strain (Oliveira 2006). The intervention was associated with reduced pain ratings, less time away from work, less narcotic use and less health service utilisation.

Reviews

In Appendix D, brief details of two narrative reviews relating to vehicle related trauma are outlined. The review by Brillhart (2007) suggests that those affected by spinal cord injury and at increased risk of isolation as a result of their injuries can benefit from education delivered via the internet. The review by Holland (1998) provides a comprehensive outline of self help written material and electronic resources for those affected by traumatic brain injury. In addition, a Cochrane review of nine trials by Crotty (2010) included two trials of educational or motivational interventions, one of which improved the self-efficacy of patients with hip fracture at six months post injury. However Crotty concluded that there was insufficient evidence to recommend changes to current practice in patients with hip fracture.

Clinical trials and study protocols

Abstracts for study protocols of information based interventions following motor vehicle related traumatic injuries are listed in Appendix E. At the time of writing this review, no publications could be identified that reported on the findings from the completed studies. In addition, summary information for relevant clinical trials of information interventions for which there are no identified publications of the trial outcomes are listed in Appendix E.

Question 3 - Are there public health strategies / campaigns or early interventions that improve outcomes in different populations that could be adopted for the traumatic injury population?

Summary

Details of studies of public health strategies and campaigns or early interventions addressing the review question are summarised in the evidence table in Appendix C. These were studies of information based and education interventions as well as public health strategies to improve outcomes following non vehicle-related traumatic injury. Twenty-two primary studies were included in the review.

The broad range of possible injury mechanisms that encompass non vehicle-related trauma and the strong focus of potentially relevant work related back and neck pain research was such that it was not feasible to review all of the potential literature. Furthermore, many injury outcome studies focus on injury mechanisms with low potential application to a vehicle related trauma setting (for example, those associated with falls prevention in the elderly). Therefore the studies summarised in Appendix C were chosen to provide a range of interventions and settings with broad applicability to vehicle related trauma.

Half of these studies were randomized controlled trials (N=11), with the remaining studies being controlled trials (N=4), controlled or uncontrolled before-and-after studies (N=6) and a single cohort study. The studies arose from seven countries including three from Australia.

The cohorts included musculoskeletal and other acute work-related injuries arising in workers' compensation settings (N=12 studies), musculoskeletal disorders including back pain arising in primary care settings (N=4), hospitalised patients (N=2), those presenting to hospital emergency department or sports clinic (N=1), those seeking physical therapy providers (N=1), older persons living in the community (N=1) and victims of violence from a USA district attorney's office (N=1).

The time period of participant follow-up varied greatly between studies, ranging from one hour to five years post intervention, however the majority of included studies reported outcomes in the three to 12 months following the intervention. One study did not report the time post baseline at which follow-up measurements were made (Yardley 2007).

A wide range of primary outcomes were reported including impact on employment status and ability to work, costs of workers' compensation claims, healthcare costs, pain beliefs, health care utilisation, level of disability and pain, functional indicators including exercise participation, symptoms, knowledge of best-practice clinical management practices, attitudes of healthcare practitioners, incidence of safety promoting behaviour, quality of life and productivity.

Of the 22 studies included, 14 reported a positive impact of the intervention on at least one of the outcomes assessed, five reported that the intervention did not have a statistically significant effect, while three studies reported a potentially adverse impact of the intervention (Hill 2009, Linton 2006, Cherkin 1998). For two of the studies associated with a potentially harmful effect, the study did not include a usual care group which limits the conclusions that can be made on the potential for harm (Linton 2006, Cherkin 1998).

A variety of public health strategies and early interventions formed the basis of the studies. These are outlined in the evidence table in Appendix C. The strategies included regulatory reform (N=5 studies), paper based pamphlets books and manuals (N=6), combined clinical and education interventions (N=5), mass media campaigns (N=2), DVD or video based interventions (N=2), telephone based interventions (N=1) and internet based interventions (N=1). Results arising from these categories of intervention will be discussed in turn below.

Methodological quality

The methodological quality of the included studies was variable. A number of studies used study designs with an increased risk of bias. Small sample sizes and high study dropout was a problem for almost half of the studies. Once again compliance with the self help interventions was infrequently reported. In one study where there was trend to improvement in outcomes it was noted that compliance with the intervention declined with time following hospital discharge (Haines 2009). The lack of a usual care control group in the studies by Linton (2006) and Cherkin (1998) limits the conclusions that can be drawn on the effectiveness of the intervention. Non-significant findings may be due to studies where the intervention arm lacked contrast when compared to usual care. The five studies that examined the effect of regulatory reform and relied on workers compensation data were not affected by study dropout or sample size issues.

Types of Interventions

Regulatory reform (N=5)

Five studies examined the impact of regulatory reform on the outcome of injuries arising in workers' compensation settings. Four of these studies were US based and the fifth was from Canada. Outcome measures were relatively consistent between studies, consisting of time away from work (lost time) and/or costs of workers compensation claims. Four studies reported outcomes before-and-after the intervention. The final study was a cohort study that compared outcomes post-intervention to pre-intervention benchmark data.

All five studies examined the impact of alternative health-care provider arrangements on the workers compensation system. These included two studies of healthcare provider networks (Bernacki 2005, Bernacki 2006) and two studies of managed care interventions (Linz 2001, Green-Mackenzie 1998). The fifth study examined a staged approach to healthcare provision and use of a decision making tool to promote evidence-based healthcare decision making (Stephens 2006). All reported reductions in days lost from work and a reduction in claim costs.

Interventions involving printed / written material (N=6)

All studies recruited participants from health care settings. The interventions were targeted at patients in five studies and at healthcare practitioners in a single study. All studies were focused on the issue of acute back pain.

Five of the studies were RCTs. Of these, three reported a positive impact on outcomes that included reduction in pain and dysfunction (Little 2001), improved beliefs about back pain among musculoskeletal practitioners (Evans 2010), and improved beliefs about back pain in

patients with acute low back pain (Burton 1999). Two studies observed no change in outcome (Derebery 2009, Cherkin 1995).

The final study was a controlled study of the impact of a book provided by the GP to the patient on the risk of reporting persistent back pain (Coudevire 2007). A lower relative risk was observed in the intervention group compared to the control group. No impact was observed on other outcome measures.

Combined clinical and education interventions (N=5)

Five studies reported on interventions that combined clinical care and education or compared a clinical intervention with an information intervention. Three studies were RCT's while two used a less methodologically rigorous design in the form of a nonrandomized controlled clinical trial. Three studies focused on acute low back pain, one on neck and shoulder disorders and one on ankle sprains. In two studies of acute lower back pain (Linton 2006, Cherkin 1998) the clinical intervention was associated with better outcomes than the information intervention. In the third study; a cluster RCT of (sub) acute lower back pain in workers, the intervention which included treatment, ergonomic adjustment and tailored education was not associated with improvements in outcome measures when compared to usual care (Ijzelenberg 2007).

Ekberg (1994) compared active rehabilitation with traditional rehabilitation in a non-randomized controlled trial in workers presenting with neck and shoulder disorders. The active rehabilitation intervention which included "back school" education was not more effective at improving outcomes than the traditional rehabilitation which did not include "back school" education.

The final study was a randomized controlled study of persons with an ankle strain (Bleakley 2010). The intervention included accelerated early treatment and exercise and included a DVD that demonstrated the exercises. The intervention was compared to a control group receiving standard care. While both groups demonstrated good functional recovery, the overall treatment effect was greater in those receiving the intervention.

Public health mass media campaigns (N=2)

One before-and-after study conducted in Victoria, Australia examined the impact of a mass media campaign on beliefs about back pain (in patients and general practitioner) and incidence of workers compensation claims for back pain (Buchbinder 2001). The intervention involved a series of TV advertisements based on "The Back Book". The TV advertisements provided explicit advice about back pain, and resulted in an increase in positive back pain beliefs among both patients and GPs.

A second study in two Canadian provinces examined the impact of a similar mass media campaign (but delivered via radio, posters and billboards) on beliefs about back pain, health care utilisation and work-related disability (Gross 2010). The campaign resulted in a small increase in beliefs to stay active if you have back pain.

DVD or video based interventions (N=2)

Two Australian studies examined the effect of DVD or video based interventions to deliver falls prevention exercise education to older persons. Both studies used RCT study designs. Haines (2009) compared the effect of a DVD, workbook and home visit by a physiotherapist to usual care. Both the intervention and control groups were associated with decreasing quality of life at follow-up; the intervention was associated with a non-significant trend in the rate of falls.

A second study by Hill (2009) conducted in two states of Australia compared two modes of delivery of a falls prevention education intervention to older persons. The study included two intervention arms (DVD vs. workbook) and a control arm that received usual care. The intervention delivered via DVD was associated with greater confidence and motivation to engage in self-protective strategies. However, the DVD intervention was potentially harmful as it was associated with a greater perceived risk of falling.

Telephone based interventions (N=1)

One secondary prevention study examined the impact of a telephone intervention to educate female victims of intimate partner violence on how to improve their safety promoting behaviours (McFarlane 2004). Six telephone calls from a nurse were made over an eight week period to the intervention group. When compared to the control group who received usual services but no phone calls, the intervention was associated with women practising more safety behaviours at follow-up (McFarlane 2004).

Internet based interventions (N=1)

One randomized controlled trial conducted in the United Kingdom (Yardley 2007) compared the effect of an interactive internet program that offered tailored advice on exercises to reduce the risk of falling in older persons with a website that providing general advice. When compared with the general program, the tailored program was considered more relevant and associated with an increase in participant confidence regarding their intention to perform the exercises and their perceived ability to do the recommended exercises.

Reviews

In Appendix D, brief summary details of five systematic reviews with potential application to vehicle related trauma are outlined. Two reviews examined the effect of individual education or back school education on outcomes for patients with non-specific lower back pain. A Cochrane review by Engers (2011) concluded that there is strong evidence that individual education is as effective as non educational interventions in the acute stage but not in the chronic stage. Heymans (2011) concluded that there is moderate evidence that back school education can be effective in reducing disability for patients with chronic lower back pain. Haines (2009) examined the effect of patient education for improving outcomes following neck pain and found no evidence for the effectiveness of educational interventions in neck pain cohorts.

Mustard (2007) reviewed evaluations of social marketing campaigns in occupational injury, disease or disability prevention and concluded that there was emerging evidence that

social marketing methods can be effective for improving the health of workers but there was a need for further research to establish the components of social marketing that are effective. The review reported on the evaluations of 56 campaigns; of these only seven addressed disability following a work related injury.

In the final review, Tompa (2008) found moderate evidence for the financial merits of interventions for occupational disability management that included an education component.

Discussion

Summary

Fifty-nine articles reporting on 58 primary studies were included in our evidence synthesis of information and education interventions for injury recovery following vehicle and non vehicle-related trauma. Eight systematic or narrative reviews, four study protocols and four clinical trial registrations of relevance were also identified.

Our synthesis identified a broad range of interventions including self-help written material, information delivered by DVD or video, telephone and internet-based interventions, mass media campaigns and regulatory reforms. The majority of traumatic injury studies addressed cohorts with whiplash trauma, traumatic brain injury, and acute stress disorder. The most common type of information intervention was based on self-help written material. In around half of the studies, the intervention was associated with a positive improvement in at least one of the outcomes measured. More than 40 different outcomes were measured in studies included in the review.

Although many of the studies were RCTs, most recruited small groups of participants, limiting the ability of the RCT to estimate the relative effectiveness of an intervention. Other studies were not included due to inappropriate study design or the high probability of bias. Large randomized controlled trials are the most appropriate design for testing the safety and effectiveness of interventions.

Methodological limitations, or failure to report important aspects of the study design limit the usefulness of many studies that formed part of the review, and subsequently our ability to generalise conclusions on the basis of the literature reviewed. These included the heterogeneity of interventions (different modes, administration, durations, intensities), heterogeneity of outcome measures (more than 40 identified), heterogeneity of injury populations studied, failure to adequately define source target and study populations (diagnostic criteria were seldom reported), failure to describe the mechanism of injury, failure to monitor or report on compliance with the intervention or any co-intervention, low participation rate and retention rates and in some studies the lack of an appropriate control condition (e.g. usual care).

In summary, this was a very heterogenous literature with a range of interventions in multiple different participant groups, using a variety of endpoints assessed over a broad range of time periods post-injury and multiple different study designs. The methodological quality of the studies also varied substantially. The vast majority of studies did not report details of the personal injury compensation or health insurance system for the jurisdiction(s) in which the study took place. As such it is difficult to draw generalisable conclusions about effective interventions for promoting recovery from traumatic injury, and very difficult to interpret the results of the review in terms of their applicability to the NSW motor accident compensation environment. However a number of consistent and/or noteworthy findings did emerge. These are discussed in turn for each of the three review questions.

Question 1 – Do public health strategies / campaigns improve outcomes following traumatic injury?

There are very few published studies focussing on the impact of interventions in groups with traumatic injury arising exclusively from motor vehicle crash. The four studies included in this review were all evaluation of regulatory reforms enacted on a jurisdiction wide basis. While all demonstrated a positive impact of the reform on the outcomes assessed, the study designs varied considerably. Two studies used self-reported data to measure injury recovery, including one based in NSW (Cameron, 2008) while the remaining two studies used claims information as a proxy for injury recovery data.

Considering the burden of traumatic injury and of injury resulting from MVA in particular, the lack of intervention studies is surprising. This represents a substantial opportunity for future research.

Question 2 – Does targeted early intervention improve outcomes following traumatic injury?

Thirty-two studies examining the impact of early intervention (within six months post-injury) were identified and included in the review. Just over half of these (17 / 32) reported at least one positive impact of the intervention, while 11 reported no impact of the intervention and four reported a negative impact of the intervention.

The largest volume of studies focussed on face-to-face (N=12) and paper-based (N=10) interventions. Results were highly variable among this group of studies with no discernible patterns emerging. Further more detailed analysis of these studies is warranted prior to design of future, similar interventions. For example, one interpretation of the paper-based intervention studies is that provision of 'generic' material is an ineffective early-intervention tool but that information tailored to the injured person, or delivered at the hospital bedside, may be more effective. Other interpretations of these studies are also possible and hence the need for more detailed consideration before embarking on similar studies in the future.

In contrast, a relatively consistent finding was observed in those studies examining internet-based interventions, where four of the five studies reported a positive outcome (Cox 2009, Wade 2010, Marsac 2010, Elliott 2008, Sander 2009). These interventions included a diverse range of content and were delivered in different settings including the emergency department, the hospital ward and the patient's home. This was perhaps the most consistent positive finding of the intervention 'types' reviewed.

However, the most striking result was that all four studies that exclusively focussed on debriefing the injured person to prevent post-traumatic stress resulted in a negative outcome. While the studies used different modes of delivery of the education or information, the adverse effect of the information intervention was noted in all four (Mayou 2000, Hobbs 1996, Turpin 2005, Ehlers 2003).

Question 3 - Are there public health strategies / campaigns or early interventions that improve outcomes in different populations that could be adopted for the traumatic injury population?

Twenty-two studies examining the impact of public health strategies or early interventions on traumatic injury other than injury arising from MVA were reviewed.

Consistent with the results for Question 1, all of those studies that examine the impact of regulatory reform on injury recovery reported positive findings. This set of five studies arose from US and Canadian workers' compensation settings and all examine the impact of alternative health-care provider arrangements on those receiving workers compensation. As with two of the regulatory reform studies identified in Question 1, all chose to examine system-relevant outcomes (e.g. claim costs, time away from work) rather than collect recovery data direct from the injured person.

A group of five studies compared information interventions to clinical interventions or examined the impact of combined clinical/education interventions. These studies observed that information-based interventions were either less effective than clinical interventions or had no greater benefit.

There were too few studies in the other categories of intervention identified to allow conclusions to be drawn.

Methodological considerations

Resource and feasibility constraints limited consideration of the evidence to the published peer review literature identified in five databases and to the publications identified in the grey literature search. Only a preliminary search and screen of the grey literature was feasible in the timeframe provided for the review. Accessing the grey literature systematically offers challenges given the variety of potential sources and the proprietary nature of some of the knowledge. Although a large set of search terms was used to search the library databases, given that only full text articles were retrieved, it remains possible that it failed to capture studies of relevance.

Relevance to the NSW context

The studies included in this review arose from eight countries. Of those from English-speaking countries (N=50), 13 were from the UK, 18 from the USA, 10 from Canada and nine from Australia. The personal injury compensation and healthcare arrangements in these countries vary greatly, and can vary substantially between jurisdictions in the USA, Canada and Australia which all have state/provincial based injury compensation arrangements. Appendix G provides a brief summary of the characteristics of the various personal injury compensation arrangements in the jurisdictions involved in the studies included in this review. This table was developed by the authors as this information was not included in the majority of studies reviewed. The Motor Accidents Authority of NSW is a common law motor accident scheme with claims management provided by six private sector insurers.

The studies reviewed took place in jurisdictions with a range of motor accident and workers compensation arrangements, including a mix of common law and no-fault schemes, with

claims management or insurance operations provided by a mix of state-based systems or private insurers. The authors were not able to discern any patterns in the studies that might suggest, for example, that interventions are more effective in one type of compensation system compared to another.

Further, there are substantial social and demographic differences between these jurisdictions which make interpretation of research findings in the NSW context difficult. For example, the USA and UK have a much higher proportion of immigrants and people who do not speak English as their first language. These factors limit the extent to which the outcomes of the studies reviewed can be directly translated to the NSW context.

We also note that none of the studies reviewed examined interventions focusing on providing information on the compensation system, claims and/or legal processes. This is a substantial gap in the current research literature and is an area worthy of further investigation.

The review identified four study protocols and four clinical trial registrations of information and education based interventions for injury recovery that are either underway or where the findings from the study are not yet published. Of note is one RCT located in the Netherlands that evaluates an internet intervention, the aim of which is to empower personal injury claimants by improving their understanding of the claims settlement process (Elbers 2011).

Cost-effectiveness of interventions

Only three of the studies reviewed included information on the cost of the intervention (Rebbeck 2006, Linton 2006, IJzelenberg 2007). Two of these studies were conducted in acute low back pain work-related cohorts, and thus it is not possible to comment conclusively on the cost-effectiveness of information based interventions. Some studies included the impact on compensation claim cost as an outcome. This was most often the case in the studies of regulatory interventions, however these studies did not report the cost of the intervention (which presumably would have been substantial given it involved a jurisdiction wide alteration to public policy and practices).

We note that it is increasingly common to include cost-effectiveness studies on RCTs. It is more difficult to evaluate cost-effectiveness with other study designs. This may have impacted on the studies included in this review which included a range of methodological approaches.

Conclusions / Future directions

Despite the heterogeneity and diverse methodological quality of the literature reviewed, and the variety of settings in which the studies occurred, it is possible to identify some areas of consistency that provide the basis for potential future information-based interventions in NSW. The methodological limitations of the studies reviewed (described in the text above) should be considered when interpreting these recommendations. In our opinion, the evidence for the following 'types' of intervention can be divided into strong, equivocal or lacking in evidence due to an evidence gap:

Strong evidence

- Regulatory or legislative reform. This was observed to be effective in most studies that reported the impact of such reform. Most studies of this type report reduction in claim costs or claim duration. Only one reported a positive impact on functional capacity and level of disability. We note that these reforms are difficult to achieve and that the study design (before-and-after assessment of outcome in different samples) while necessary given the population based nature of the reforms, is not ideal for determining the impact of such interventions.
- Early interventions that specifically focus on de-briefing to prevent the onset of post-traumatic stress may be harmful. Of the four studies reviewed with this aim, all showed a negative impact on outcome, including an increased risk of depression and PTSD symptoms at follow-up. Careful and more detailed consideration of the literature in this area should be undertaken before trialling an intervention to prevent the onset of mental health conditions following traumatic injury.

Equivocal evidence

Despite small sample sizes and small numbers of studies of similar interventions, there is promising evidence for the following interventions. These types of interventions warrant further investigation.

- Information or education based interventions that involved more than one interactive session with a health or care provider. For some studies the provider delivered the intervention, in others the provider was part of the intervention. This was reported to be effective by seven studies. In these studies, the interventions provided education on self-care, information on problem solving and cognitive behaviour guidance.
- Interventions directed to cohorts at increased risk of a poor outcome. Four studies reported that individuals at increased risk of poor outcome showed the most benefit from the intervention. In one of these studies, the identification of an 'increased-risk' group was conducted pre-hoc; in the remaining studies the identification of the increased-risk group was carried out post-hoc as part of the analysis. A note of caution must be added given the small samples on which these conclusions are based.

- Interventions delivered via the telephone were found to be clinically effective in all three studies that reported on these. Interventions delivered by videoconferencing showed a trend to effectiveness.
- Interventions delivered by video or DVD were associated with positive outcomes or a trend to improved outcomes in the five studies that reported on these interventions. These interventions covered a range of content and were delivered to both injured persons and caregivers and in a variety of settings including the emergency department, the hospital ward and the patient's home.
- Interventions involving a single education session with a health or care provider either as a stand-alone intervention or as part of multifaceted intervention were less effective than interventions involving more than one interactive session.
- Some studies of paper based interventions were associated with positive outcomes while for other studies; there was no evidence of effect. Further study is needed of the components of written material interventions associated with improvements in injury recovery outcomes.

Evidence gaps

Finally, while the review identified a range of information and educational interventions, there is a lack of published information in some areas. These include:

- Public health strategies to promote injury recovery;
- Interventions based in culturally and linguistically diverse population;
- Interventions aimed at caregivers;
- Interventions targeted to health care providers;
- Interventions focusing on providing information on the compensation system claims and legal process;
- Studies of cost effectiveness;
- Studies reporting the impact of cultural factors and health literacy factors on compliance with interventions;
- Studies examining patient preferences for different modes of delivery of intervention (e.g. written versus electronic); and
- Large-scale randomized controlled trials.

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