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ISCR

Institute for Safety, Compensation
and Recovery Research

VOTOR-TAC Linkage Report

Association between fault status and patient-reported outcomes in hospitalised orthopaedic cases

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1. About this report

The ISCRR Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) project plan includes deliverables related to linkage of VOTOR and TAC claims data at regular intervals. For each linkage, an analysis plan is developed in consultation with the VOTOR-TAC Liaison Group to address priority research questions relevant to the TAC. This report relates to Question 2.1.2 from the VOTOR-TAC Linkage Analysis plan 2015/16.

2. Background

Fault, blame, guilt and responsibility have been proposed as potential explanatory factors for outcomes after injury. Fault, blame and guilt are different concepts but are commonly related. Fault, by definition, is the responsibility for an accident or misfortune, and is often associated with the legal system when considering accidents and injury. A person can be at fault through inattention, ignorance or poor judgement, and being at fault does not necessarily mean that their actions were intentional. Blame is the person's perception that someone (self or other) or something is responsible for the accident or injury, while guilt is the negative feeling caused by knowing that the person has done something to cause the accident or injury.

The association between factors such as fault, blame, guilt and responsibility and outcomes following injury has not been clearly established. While previous studies have shown these factors to be predictive of poorer physical and mental health outcomes, and greater health care utilisation (1-4), others have found limited or no association between fault or responsibility and health outcomes (5-8). The conflicting findings most likely reflect wide variability in the populations studied, how the participants were recruited, methods for measuring the concepts of interest, outcomes of interest and the timing post-injury of assessment. Previous studies have been limited to small sample sizes (1, 3, 5, 7-9), cross-sectional studies (4, 6, 7), focused on health care utilisation only without reference to patient-reported outcomes (2, 6), and none have considered both the legal attribution of fault when interpreting the individual perception of fault.

3. Aims

The aims of this study were to

- i. Quantify the relationship between self-report and police-reported fault status
- ii. Determine the association between fault status and TAC Recovery client outcomes.
- iii. Explore whether the variation between self-report and police-reported fault impacts on patient-reported and TAC scheme outcomes.

4. Methods

4.1 Inclusion criteria

Cases registered by VOTOR meeting the following criteria were extracted for linkage:

- i. Definitive management at The Alfred, RMH, University Hospital Geelong or The Northern Hospital
- ii. Date of injury from the September 2010 to February 2014
- iii. Fund source recorded as TAC and a claim number provided by the hospital.
- iv. Confirmed as a Recovery Division (or Benefit Delivery Division for cases before the Recovery Division implementation) client by the TAC flag.

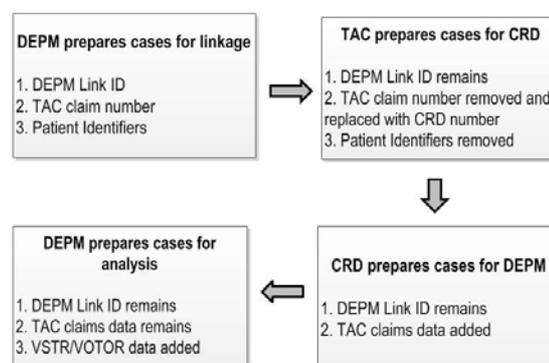
4.2 Linkage process

The Department of Epidemiology and Preventive Medicine (DEPM) first created a unique linkage ID, accessible to a single individual within the DEPM, for each eligible VOTOR and VSTR case. The DEPM data administrator obtained the TAC claim number from the electronic systems of each hospital, and then provided the TAC a file of claims that needed to be matched which included the DEPM Linkage ID, TAC claim number, and patient identifiers (surname, given name, date of birth and date of injury). No clinical or outcomes information from VOTOR/VSTR was provided to TAC. These data were contained in a separate file, held at the DEPM, and not provided to either of the other two organisations involved in this linkage project.

The TAC then matched the claim numbers and identifiers provided by DEPM to those on the TAC claims database. For matching files, the TAC produced a file containing the DEPM Linkage ID, and CRD Linkage ID to the ISCRR investigators. ISCRR did not receive the TAC claim number or clinical/content information from DEPM. Concurrently, the TAC provided the DEPM with a list of TAC claim numbers that matched to the TAC database to allow quality assurance analysis.

For the matching cases, ISCRR appended the relevant TAC claims data to the data file and removed the CRD Linkage ID. The resultant file was provided to the DEPM data administrator who linked the data provided by ISCRR to the VOTOR data using the DEPM Linkage ID. The linked dataset was then provided to the Project Leader (Belinda Gabbe) and DEPM Biostatistician (Pam Simpson) for cleaning and analysis.

Linkage Process



4.3 Definition of fault status

The claimant and police fault items from the TAC claims database were used to classify cases into fault status groups. The question asked by the police is whether another vehicle was at fault for the accident. For the TAC claimant, the question asked is “Do you believe that the accident was the fault of another person or organisation?” For analysis, Recovery claims were divided into four categories for analysis:

- i. Client’s vehicle at fault according to police and the client reports no other person was at fault (“at fault”)
- ii. Client reports no other person was at fault but police reports that their vehicle was not at fault (“own vehicle not at fault and reports no other person at fault”)
- iii. Client reports another person was at fault but police reports client’s vehicle was at fault (“own vehicle at fault but reports another person at fault”)
- iv. Client’s vehicle not at fault according to the police and the client reports another person was at fault (“not at fault”).

4.4 Outcomes

The outcomes of interest at 6 months and 12 months post-injury were:

- i. Complete functional recovery defined as a GOS-E score of eight (upper good recovery).
- ii. Good functional recovery defined as a GOS-E score of seven (lower good recovery) or eight (upper good recovery).
- iii. Return to work defined using the return to work questions collected by VOTOR.
- iv. EQ-5D summary score and indicator variables for each of the five EQ-5D items (no problems vs. problems).
- v. Moderate to persistent pain defined as a score of 5 to 10 on the Numerical Rating Scale for pain.
- vi. Physical health defined as the physical component summary score of the SF-12 (PCS-12).
- vii. Mental health defined as the physical component summary score of the SF-12 (MCS-12).
- viii. Total TAC claim costs.

4.5 Data analysis

Agreement between self-reported and police-reported fault was measured using the percentage agreement and the Kappa statistic. The Kappa statistic is equal to 0 when the degree of agreement is exactly what is expected by chance and 1 when there is perfect agreement. It is interpreted in the following way: <0 Poor, 0-0.2 Slight, 0.2-0.4 Fair, 0.4-0.6 Moderate, 0.6-0.8 Substantial, >0.8 Almost perfect.

Chi-square analyses were used to assess the association between key descriptors of the patient population and fault status. Multivariable linear regression was performed to quantify the association between continuous outcome measures (EQ-5D summary score, PCS-12 and MCS-12) of patient-reported outcome and whether a claimant was classified as at fault, no fault, self-reported fault (but police reporting not at fault) or self-reported not at fault (but police

reporting at fault) at 6 and 12-months post-injury. A multivariable generalised linear model with a negative binomial link function and robust variance estimator was performed to quantify the association between costs and a patient's fault classification. For the GOS-E, return to work, moderate to severe persistent pain and problems on each of the EQ-5D items, the association between fault status and outcome was modelled using modified Poisson regression with a robust variance estimator.

Each model was adjusted for key potential confounders including age group, gender, injury group, major trauma status, associated non-orthopaedic injuries, level of education, pre-injury work status, road user group, geographic remoteness and comorbid status (as measured using the Charlson Comorbidity Index weighting). Adjusted relative risks (ARR) and the corresponding 95% confidence intervals (CI) are presented for the modified Poisson models, and adjusted mean differences and 95% CI for the linear models. For the cost models, the adjusted percentage change (95% CI) in costs was calculated.

5. Results

5.1 Relationship between police report and client self-report of fault status

There were 3,666 VOTOR TAC Recovery clients linked in the timeframe of which 2,605 had both a self-reported and police-reported fault status recorded. In 89.1% (n=2,322) of cases, the police report of vehicle fault status was consistent with the client report of responsibility; 90.7% for motor vehicle drivers, 84.9% for motor vehicle passengers, 88.5% for motorcyclists, 89.9% for pedal cyclists, 86.5% for pedestrians, and 87.8% for other transport cases. Where agreement occurred, the client's vehicle was not at fault in the crash and the client reported another person at fault in 49.6% of cases, though this varied by road user group; 29.0% for motor vehicle drivers, 84.9% for motor vehicle passengers, 37.1% for motorcyclists, 89.9% for pedal cyclists, 76.0% for pedestrians and 60.5% for other transport cases. The kappa coefficient was 0.78 (95% CI: 0.76, 0.81), indicating "substantial" agreement between the sources of fault status. Of the remaining 283 cases, 191 (67.5%) TAC clients reported that another person or organisation was responsible for the crash when the police reported that their vehicle was at fault (Table 1).

Table 1: Comparison of police-reported and self-reported fault

		Police report	
		Client's vehicle not at fault	Client's vehicle at fault
Self-report	Another person at fault	1152	191
	No other person at fault	92	1170

5.2 Relationship between fault status and Recovery client outcomes

5.2.1 Overview of clients in each fault status group

The profile of claimants in each fault status group is shown in Table 2. The notable differences in the fault groups relate to age, injury severity, geographic remoteness, road user group and gender (Table 2). Men were more commonly represented in the "at fault" and "own vehicle at fault but reports another person at fault" groups. A lower proportion of cases in the "not at fault" and "own vehicle at fault but reports another person at fault" groups were major trauma patients, and consistent with this, these groups had a lower proportion of motor vehicle crashes and multiple orthopaedic injuries (Table 2). The "not at fault" and "own vehicle at fault but reports another person at fault" groups also included a higher proportion of clients living in major cities and with a university level of education (Table 2). A higher proportion of "not at fault" cases were injured while pedal cyclists (Table 2).

Table 2: Demographics of adult VOTOR Recovery patients who are eligible for study stratified by fault group

		At Fault (n=1170) N (%)	Own vehicle not at fault and no other person at fault (n=92) N (%)	Own vehicle at fault but reports another person at fault (n=191) N (%)	Not at fault (n=1152) N (%)	p-value
Gender	Male	872 (74.5)	52 (56.5)	129 (67.5)	690 (59.9)	<0.001
Age group	18-24 years	278 (23.8)	18 (19.6)	40 (20.9)	173 (15.0)	<0.001
	25-34 years	223 (19.1)	27 (29.4)	41 (21.5)	231 (20.1)	
	35-44 years	217 (18.5)	17 (18.5)	43 (22.5)	205 (17.8)	
	45-54 years	168 (14.4)	12 (13.0)	21 (11.0)	198 (17.2)	
	55-64 years	130 (11.1)	6 (6.5)	9 (4.7)	151 (13.1)	
	65+ years	154 (13.1)	12 (13.0)	37 (19.4)	194 (16.8)	
Road user group^a	Motor vehicle driver	619 (53.3)	25 (27.2)	67 (35.1)	260 (22.6)	<0.001
	Motor vehicle passenger	38 (3.3)	30 (32.6)	12 (6.3)	232 (20.2)	
	Motorcycle	405 (34.9)	15 (16.3)	66 (34.5)	234 (20.4)	
	Pedestrian	63 (5.4)	15 (16.3)	26 (13.6)	214 (18.6)	
	Pedal cyclist	21 (1.8)	5 (5.4)	16 (8.4)	185 (16.1)	
	Other road transport	16 (1.4)	2 (2.2)	4 (2.1)	24 (2.1)	
Geographic remoteness^b	Major cities	810 (69.2)	62 (67.4)	157 (82.2)	967 (83.9)	<0.001
	Inner regional	293 (25.0)	23 (25.0)	26 (13.6)	159 (13.8)	
	Outer regional/remote	65 (5.6)	7 (7.6)	8 (4.2)	26 (2.3)	
Charlson Comorbidity Index condition	Yes	279 (23.9)	13 (14.1)	35 (18.3)	203 (17.6)	0.001
Orthopaedic injury group	Isolated lower extremity	214 (18.3)	18 (19.5)	44 (23.0)	267 (23.2)	0.19
	Spinal column injuries only	243 (20.7)	16 (17.4)	34 (17.8)	237 (20.5)	
	Isolated upper extremity	172 (14.7)	10 (10.9)	28 (14.7)	160 (13.9)	
	Multiple lower extremity	125 (10.7)	11 (12.0)	18 (9.4)	92 (8.0)	
	Upper and lower extremity	104 (8.9)	8 (8.7)	26 (13.6)	92 (8.0)	
	Spine and lower extremity	88 (7.5)	11 (11.9)	16 (8.4)	86 (7.5)	
	Spine and upper extremity	94 (8.0)	8 (8.7)	7 (3.7)	75 (6.5)	

	Spine, upper and lower extremity	58 (5.0)	6 (6.5)	16 (8.4)	69 (6.0)	
	Multiple upper extremity	49 (4.2)	2 (2.2)	8 (4.2)	45 (3.9)	
	Soft tissue injury	23 (2.0)	2 (2.2)	4 (2.1)	29 (2.5)	
Associated non-orthopaedic injuries	Head	92 (8.0)	9 (9.9)	13 (6.8)	90 (8.0)	0.85
	Chest or abdominal	486 (41.5)	37 (40.2)	70 (36.7)	442 (38.4)	0.35
	Other	328 (28.0)	26 (28.3)	34 (17.8)	263 (22.8)	0.001
Major trauma patient?	Yes	587 (50.2)	48 (52.2)	77 (40.3)	503 (43.7)	0.003
Level of education^c	University degree	175 (16.8)	13 (16.2)	40 (24.1)	292 (29.0)	<0.001
	Advanced diploma or certificate	390 (37.3)	24 (30.3)	49 (29.5)	308 (30.6)	
	Completed high school	159 (15.2)	16 (20.0)	32 (19.3)	137 (13.6)	
	Did not complete high school/other	320 (30.7)	27 (33.8)	45 (27.1)	270 (26.8)	
Working prior to injury?	Yes	846 (77.3)	59 (70.2)	125 (71.8)	811 (74.6)	0.19

^a Data missing for n=14 (0.5%) cases; ^b Data missing for n=2 (0.1%) cases; ^c Data missing for n=308 (11.8%) cases

5.2.2 Functional outcomes

A valid GOS-E score was recorded for 2,324 (89.2%) clients at 6 months, and 2,234 (85.8%) at 12 months post-injury. The proportion who had attained a good or complete recovery at 6 and 12 months was lower in the “not at fault”, and groups where the police and self-report of fault differed (Table 3). After adjusting for key potential confounders, the relative risk of a good (or complete) functional outcome at either 6 or 12 months post-injury was lower for “not at fault” clients when compared to “at fault” clients (Table 3). Similarly, the relative risk of a complete recovery at both 6 and 12 months was also lower for the “own vehicle at fault but reports another person at fault” group compared to the “at fault” group. The association between the “own vehicle not at fault but reports no other person at fault” group and functional outcome varied (Table 3).

Table 3: Association between VOTOR client outcomes and functional (GOS-E) outcomes at 6 and 12 months post injury

		Fault category	N	n (%) with outcome	Adjusted Relative Risk* (95% CI)	p-value
6 months	Good recovery	At fault (reference)	1051	364 (34.6)	1	
		Own vehicle not at fault and no other at fault	79	14 (17.7)	0.52 (0.32, 0.85)	0.01
		Own vehicle at fault but reports another person at fault	169	43 (25.4)	0.68 (0.52, 0.88)	0.004
		Not at fault	1025	294 (28.7)	0.69 (0.60, 0.79)	<0.001
	Complete recovery	At fault (reference)	1051	209 (19.9)	1	
		Own vehicle not at fault and no other at fault	79	8 (10.1)	0.56 (0.28, 1.12)	0.10
		Own vehicle at fault but reports another person at fault	169	15 (8.9)	0.43 (0.26, 0.73)	0.002
		Not at fault	1025	124 (12.1)	0.56 (0.45, 0.70)	<0.001
12 months	Good recovery	At fault (reference)	1010	393 (38.9)	1	
		Own vehicle not at fault and no other at fault	79	23 (29.1)	0.72 (0.50, 1.03)	0.07
		Own vehicle at fault but reports another person at fault	162	62 (38.3)	0.88 (0.72, 1.08)	0.25
		Not at fault	983	337 (34.3)	0.76 (0.67, 0.86)	<0.001
	Complete recovery	At fault (reference)	1010	240 (23.8)	1	
		Own vehicle not at fault and no other at fault	79	13 (16.5)	0.64 (0.37, 1.09)	0.10
		Own vehicle at fault but reports another person at fault	162	22 (13.6)	0.52 (0.35, 0.77)	0.001
		Not at fault	983	159 (16.2)	0.58 (0.48, 0.71)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.3 Return to work outcomes

Of the 2,605 VOTOR Recovery clients, 1841 (70.7%) were working prior to injury and whether the person had returned to work was known for 1,709 (92.8%) clients at 6 months and 1,651 (89.7%) clients at 12 months. Consistent with the GOS-E outcomes, VOTOR TAC Recovery “not at fault” clients were less likely to have returned to work at 6 and 12 months post-injury compared to “at fault” clients (Table 4). The adjusted relative risk of return to work was not different for the “own vehicle not at fault and no other at fault” group when compared to “at fault” clients (Table 4). In contrast, the “own vehicle at fault but reports another person at fault” group were less likely to return to work compared to the “not at fault” group, though this association was only significant at 6 months (Table 4).

Table 4: Association between VOTOR client outcomes and return to work at 6 and 12 months post injury**

	Fault category	N	n (%) with outcome	Adjusted Relative Risk* (95% CI)	p-value
6 months	At fault (reference)	797	493 (61.9)	1	
	Own vehicle not at fault and no other at fault	55	29 (52.7)	0.91 (0.71, 1.16)	0.43
	Own vehicle at fault but reports another person at fault	116	67 (57.8)	0.84 (0.72, 0.99)	0.03
	Not at fault	741	441 (59.5)	0.86 (0.79, 0.94)	0.001
12 months	At fault (reference)	767	539 (70.3)	1	
	Own vehicle not at fault and no other at fault	53	35 (66.0)	0.98 (0.81, 1.19)	0.82
	Own vehicle at fault but reports another person at fault	113	78 (69.0)	0.90 (0.80, 1.03)	0.13
	Not at fault	718	491 (63.4)	0.90 (0.84, 0.97)	0.004

**Working prior to injury only; *Adjusted for age, sex, comorbidities, education level, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.4 EQ-5D outcomes

The EQ-5D questionnaire was completed for 2,318 (88.9%) of VOTOR clients at 6 months and 2,214 (84.9%) at 12 months. Table 5 shows the findings for the EQ-5D summary score which is a utility score of health status where 0 represents a health state equivalent to death, a score of 1 represents perfect health, and a score less than 0 represents a health state worse than death. Consistent with the findings from the analysis of the individual EQ-5D items, the “not at fault” and “own vehicle at fault but reports another at fault” groups demonstrated adjusted mean EQ-5D summary scores 0.07 to 0.10 lower than the “at fault” group at the follow up time points (Table 5). The adjusted mean EQ-5D summary scores for the “own vehicle not at fault and no other at fault” group were lower than the “at fault” group but this failed to reach significance at 6 or 12 months post-injury (Table 5).

Table 5: Association between VOTOR client outcomes and the EQ-5D summary score at 6 and 12 months post injury

	Fault category	N	Mean (SD)	Adjusted difference from at fault group (95% CI)	p-value
6 months	At fault (reference)	1037	0.69 (0.28)	0	
	Own vehicle not at fault and no other at fault	76	0.61 (0.34)	-0.05 (-0.11, 0.02)	0.14
	Own vehicle at fault but reports another person at fault	164	0.60 (0.31)	-0.10 (-0.15, -0.05)	<0.001
	Not at fault	1014	0.62 (0.29)	-0.09 (-0.11, -0.06)	<0.001
12 months	At fault (reference)	996	0.71 (0.28)	0	
	Own vehicle not at fault and no other at fault	77	0.63 (0.30)	-0.06 (-0.13, 0.002)	0.06
	Own vehicle at fault but reports another person at fault	159	0.66 (0.30)	-0.07 (-0.12, -0.03)	0.002
	Not at fault	966	0.65 (0.30)	-0.09 (-0.11, -0.06)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

At both time points after injury, the adjusted relative risk of reporting problems on the mobility, usual activities, pain or discomfort, and anxiety or depression, EQ-5D items was significantly higher in the “not at fault” group when compared to the “at fault” group. The exception was the self-care item at 12 months where the association just failed to reach significance (Table 6). The “own vehicle at fault but reports another at fault” demonstrated a similar pattern of higher adjusted risk of reporting problems on the EQ-5D items when compared to the “at fault” group (Table 6). At 6 months, the relative risk of reporting problems on most of the EQ-5D items was comparable between the “own vehicle not at fault but reports no other at fault” and the “at fault” groups, except for the usual activities item. However, at 12 months, this group demonstrated higher risk of reporting problems on most items of the EQ-5D item when compared to the “at fault” group (Table 6).

Table 6: Association between VOTOR client outcomes and problems on the EQ-5D items at 6 and 12 months post injury

		Fault category	N	n (%) with outcome	Adjusted Relative Risk* (95% CI)	p-value
6 months	Mobility	At fault (reference)	1047	435 (41.6)	1	
		Own vehicle not at fault and no other at fault	79	39 (49.4)	1.16 (0.91, 1.46)	0.23
		Own vehicle at fault but reports another person at fault	168	85 (50.6)	1.18 (1.01, 1.39)	0.04
		Not at fault	1024	503 (49.1)	1.20 (1.09, 1.32)	<0.001
	Self-care	At fault (reference)	1047	210 (20.1)	1	
		Own vehicle not at fault and no other at fault	78	18 (23.1)	1.17 (0.76, 1.80)	0.48
		Own vehicle at fault but reports another person at fault	168	49 (29.2)	1.52 (1.14, 2.03)	0.004
		Not at fault	1023	279 (27.3)	1.42 (1.20, 1.68)	<0.001
	Usual activities	At fault (reference)	1046	645 (61.7)	1	
		Own vehicle not at fault and no other at fault	79	61 (77.2)	1.21 (1.06, 1.38)	0.01
		Own vehicle at fault but reports another person at fault	168	121 (72.0)	1.18 (1.05, 1.32)	0.004
		Not at fault	1024	774 (75.6)	1.27 (1.19, 1.35)	<0.001
	Pain or discomfort	At fault (reference)	1043	632 (60.6)	1	
		Own vehicle not at fault and no other at fault	78	57 (73.1)	1.14 (0.98, 1.32)	0.08
		Own vehicle at fault but reports another person at fault	167	123 (73.7)	1.23 (1.10, 1.37)	<0.001
		Not at fault	1018	733 (72.0)	1.19 (1.11, 1.27)	<0.001
Anxiety or depression	At fault (reference)	1042	408 (39.2)	1		
	Own vehicle not at fault and no other at fault	78	36 (46.2)	1.02 (0.79, 1.32)	0.89	
	Own vehicle at fault but reports another person at fault	165	90 (54.6)	1.42 (1.20, 1.67)	<0.001	
	Not at fault	1021	497 (48.7)	1.28 (1.15, 1.42)	<0.001	
12 months	Mobility	At fault (reference)	1000	351 (35.1)	1	
		Own vehicle not at fault and no other at fault	77	38 (49.1)	1.39 (1.09, 1.78)	0.01
		Own vehicle at fault but reports another person at fault	159	70 (44.0)	1.28 (1.06, 1.54)	0.01
		Not at fault	978	430 (44.0)	1.35 (1.21, 1.52)	<0.001

Self-care	At fault (reference)	1000	172 (17.2)	1	
	Own vehicle not at fault and no other at fault	77	20 (26.0)	1.51 (1.01, 2.48)	0.04
	Own vehicle at fault but reports another person at fault	159	39 (24.5)	1.47 (1.06, 2.13)	0.02
	Not at fault	978	204 (20.9)	1.22 (1.00, 1.59)	0.05
Usual activities	At fault (reference)	1000	531 (53.1)	1	
	Own vehicle not at fault and no other at fault	77	49 (63.6)	1.20 (1.01, 1.43)	0.04
	Own vehicle at fault but reports another person at fault	159	105 (66.0)	1.30 (1.14, 1.49)	<0.001
	Not at fault	977	638 (65.3)	1.26 (1.17, 1.37)	<0.001
Pain or discomfort	At fault (reference)	997	548 (55.0)	1	
	Own vehicle not at fault and no other at fault	77	56 (72.7)	1.27 (1.09, 1.49)	0.002
	Own vehicle at fault but reports another person at fault	159	101 (63.5)	1.20 (1.05, 1.38)	0.01
	Not at fault	973	658 (67.6)	1.27 (1.17, 1.37)	<0.001
Anxiety or depression	At fault (reference)	999	387 (38.7)	1	
	Own vehicle not at fault and no other at fault	77	41 (53.3)	1.25 (1.00, 1.56)	0.05
	Own vehicle at fault but reports another person at fault	159	74 (46.5)	1.27 (1.06, 1.52)	0.01
	Not at fault	972	452 (46.5)	1.20 (1.07, 1.34)	0.002

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.5 Moderate to severe persistent pain

At 6 months, 1,895 (72.7%) VOTOR TAC clients provided a pain score, while 1,782 (68.4%) provided a pain score at 12 months post-injury. The proportion of VOTOR TAC clients reporting moderate to severe persistent pain at follow up was higher in all other fault status groups when compared to the “at fault” group, but the adjusted relative risk was only higher in the “not at fault” and “own vehicle at fault but reports another at person at fault” groups (Table 7).

Table 7: Association between VOTOR client outcomes and moderate to severe persistent pain at 6 and 12 months post injury

	Fault category	N	n (%) with outcome	Adjusted relative risk (95% CI)	p-value
6 months	At fault (reference)	856	189 (22.1)	1	
	Own vehicle not at fault and no other at fault	65	23 (35.4)	1.38 (0.98, 1.95)	0.06
	Own vehicle at fault but reports another person at fault	139	44 (31.7)	1.54 (1.16, 2.05)	0.003
	Not at fault	835	238 (28.5)	1.31 (1.10, 1.56)	0.003
12 months	At fault (reference)	810	187 (23.1)	1	
	Own vehicle not at fault and no other at fault	67	22 (32.8)	1.40 (0.98, 2.00)	0.07
	Own vehicle at fault but reports another person at fault	128	35 (27.3)	1.35 (1.00, 1.83)	0.05
	Not at fault	777	214 (27.5)	1.29 (1.07, 1.55)	0.01

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.6 Physical health (PCS-12)

Seventy per cent (n=1,819) VOTOR TAC clients at 6 months, and 65.1% (n=1,695) at 12 months, had a valid PCS-12. The SF-12 cannot be administered by proxy, as there is no validated version for proxy use, explaining the lower completion rates for this item. Compared to the “at fault” group, all other fault groups reporting significantly lower adjusted mean PCS-12 scores at both follow up time points suggesting worse physical health in these groups (Table 8)

Table 8: Association between VOTOR client outcomes and the PCS-12 at 6 and 12 months post injury

	Fault category	N	Mean (SD)	Adjusted difference from at fault group (95% CI)	p-value
6 months	At fault (reference)	826	40.1 (12.1)	0	
	Own vehicle not at fault and no other at fault	62	35.8 (11.0)	-3.6 (-6.6, -0.7)	0.02
	Own vehicle at fault but reports another person at fault	128	37.5 (11.9)	-3.2 (-5.3, -1.2)	0.002
	Not at fault	803	36.7 (11.4)	-3.7 (-5.0, -2.6)	<0.001
12 months	At fault (reference)	775	41.7 (12.7)	0	
	Own vehicle not at fault and no other at fault	61	38.4 (10.9)	-3.4 (-6.5, -0.4)	0.03
	Own vehicle at fault but reports another person at fault	119	40.7 (12.3)	-2.3 (-4.6, -0.1)	0.04
	Not at fault	740	38.7 (11.8)	-4.1 (-5.4, -2.8)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.6 Mental health (MCS-12)

Seventy per cent (n=1,819) VOTOR TAC clients at 6 months, and 65.1% (n=1,695) at 12 months, had a valid MCS-12. Compared to the “at fault” group, the “not at fault” and “own vehicle at fault but reports another person at fault” groups demonstrated significantly lower adjusted mean MCS-12 scores at both follow up time points suggesting worse mental health in these groups (Table 9).

Table 9: Association between VOTOR client outcomes and the MCS-12 at 6 and 12 months post injury

	Fault category	N	Mean (SD)	Adjusted difference from at fault group (95% CI)	p-value
6 months	At fault (reference)	826	51.4 (11.0)	0	
	Own vehicle not at fault and no other at fault	62	48.6 (12.1)	-1.0 (-4.0, 1.9)	0.49
	Own vehicle at fault but reports another person at fault	128	48.6 (11.5)	-3.6 (-5.7, -1.5)	0.001
	Not at fault	803	49.5 (12.1)	-2.6 (-3.8, -1.4)	<0.001
12 months	At fault (reference)	775	50.8 (11.4)	0	
	Own vehicle not at fault and no other at fault	61	48.9 (12.2)	-1.3 (-4.4, 1.8)	0.41
	Own vehicle at fault but reports another person at fault	119	47.3 (12.0)	-4.5 (-6.8, -2.3)	<0.001
	Not at fault	740	49.0 (12.0)	-2.3 (-3.6, -1.1)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

5.2.6 Total TAC claim costs

Total claim costs could be calculated for 2,596 (99.7%) of VOTOR TAC clients at 6 months and 2,456 (94.3%) at 12 months post-injury. Adjusted for key confounders, total claim costs were 13% higher at 6 months and 18% higher at 12 months for the “not at fault” group compared to the “at fault” group, with similar findings noted for the “own vehicle at fault but reports another person at fault” group (Table 10).

Table 10: Association between VOTOR client outcomes and total TAC claim costs at 6 and 12 months post injury

	Fault category	N	Mean (SD) \$	Adjusted percentage difference (95% CI)	p-value
6 months	At fault (reference)	1167	61,270 (55,618)	1	
	Own vehicle not at fault and no other at fault	92	63,305 (49,968)	5.1 (-8.5, 20.8)	0.48
	Own vehicle at fault but reports another person at fault	189	55,702 (45,785)	12.6 (0.3, 26.4)	0.04
	Not at fault	1148	63,767 (58,322)	12.7 (6.0, 19.9)	<0.001
12 months	At fault (reference)	1111	70,404 (64,758)	1	
	Own vehicle not at fault and no other at fault	89	72,425 (61,126)	3.7 (-10.5, 20.2)	0.63
	Own vehicle at fault but reports another person at fault	169	68,300 (56,233)	14.7 (0.9, 30.4)	0.04
	Not at fault	1087	75,807 (69,770)	18.3 (10.5, 26.7)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, geographic remoteness, injury group, associated injuries, major trauma status and road user group

6. Summary of findings

In this study of 2605 TAC orthopaedic trauma cases, there was consensus between the police report and client perception of fault in 89 per cent of cases. In the remaining cases, two thirds of the time, the client reported that another person was at fault when the police attributed fault to the client's vehicle. There was a clear pattern of association between fault status and client outcomes at both 6 months and 12 months post-injury.

External attribution of responsibility for the accident or blaming others has been suggested as a key reason for why some people do not recover well following injury. Blaming others may negatively impact on mental health due to anger, perceived injustice or victimisation, limiting the capacity to cope following injury or accept what has happened (1, 9). After adjusting for key demographic, socioeconomic and injury factors, the group who the police reported were not at fault and the client reported that another person was at fault for the crash, were at higher risk of poorer functional, return to work, pain, and quality of life outcomes when compared to the group where both the police reported that the client's vehicle was at fault and the client reported that no other person was responsible for the crash. Similarly, clients who considered another person at fault for the crash, even when the police determined their vehicle was at fault, demonstrated poorer outcomes at 6 and at 12 months after injury. While our study was not able to ascertain the reasons for the association, the findings were consistent with previous studies undertaken in road trauma and general injury settings.

Littleton et al studied 193 patients who presented to a single emergency department following a road traffic collision and reported that the group not at fault had poorer mental health in the immediate post-crash period (3). Similarly, Thompson et al, in their study of a random sample of 935 TAC claimants, found that external attribution of responsibility was associated with poorer physical and mental health (4), while Clay et al found that external attribution of responsibility was a strong predictor of the presence and severity of pain 6 months after injury (1). In a study of 30 severe accident victims, blaming others for the accident was associated with poorer coping (9), while a study of 165 motor vehicle accident victims in the US found that external attribution of responsibility was only a risk factor for post-traumatic stress disorder if the person was the driver of the vehicle involved in the crash (7). Our study adds to this body of evidence that attributing fault to others is a key factor in the recovery process following serious injury.

Elbers et al used the TAC claims data to describe the relationship between "blame" and health care utilisation in the first 12 months post-injury (2). The study included 2,940 motor vehicle drivers who were involved in 2-vehicle collisions and found that blaming another for the crash was associated with higher levels of health care utilization, particularly psychology and physiotherapy services. The study included a high proportion of whiplash injury, and the TAC data item used to describe "blame" was the question asking the claimant if another person or organisation was at *fault* for the crash, rather than a specific measure of blame (2). Our findings were also supportive of this study. While health care utilisation per se was not assessed, we explored the association between claim costs and fault status. In our study, adjusted mean claim costs were lower in the group where both police reported the client's vehicle was at fault and the client reported that no other person or organisation was responsible for the crash. In the TAC system, which is largely a

“no fault” compensation system, the potential to lodge a common law claim remains and access to some services may differ based on fault status. However, restrictions on claiming based on fault status only relate to whether loss of earnings payments are paid, and only where the claimant was the driver of the vehicle and over the legal blood alcohol limit for driving at the time of the crash, suggesting a difference in claiming behaviour between the groups. Further supporting the theory that the finding is due to differences in claimant behaviour in accessing services, the group who reported that another person or organisation was at fault when the police deemed their vehicle to be at fault accrued significantly higher claim costs in the first 12 months post-injury when compared to “at fault” group. At 12 months post-injury, it was too soon to determine the impact of making a common law claim as an explanatory factor for the differences in claim costs between the groups, as most common law claims are not lodged until much later post-injury.

While our findings clearly support the external attribution of fault or responsibility as a factor contributing to poorer outcomes after injury, the group who reported that no other person was at fault even though the police deemed their vehicle not to be at fault (an presumably that another vehicle was at fault for the crash), generally experienced poorer outcomes than the “at fault” group. This group was small, limiting the power to determine all but the largest effects. At 6 months, there were few differences between the “at fault” group and the group who reported that no other person was at fault even though their own vehicle was not at fault according to the police, but at 12 months this group demonstrated poorer physical health and EQ-5D outcomes. The reason for this relationship is not clear but could represent a feeling of responsibility for the crash despite no legal responsibility. This group may represent those where those who believed they could have prevented the crash in some way which may be impacting on their capacity to move on from the crash and recover from their injuries (9). There is some evidence in the literature to support this hypothesis. Fitzharris et al studied 57 road transport related cases admitted to a major trauma service for greater than 24 hours (5). Rating scales were used to establish the participants’ perceptions of their and others’ responsibility for the crash, and the participants were followed-up at 6 to 8 weeks post-crash to collect information about health-related quality of life, pain and depression. The authors reported that depression was more prevalent in those who felt responsible for the crash (5). However, the study sample was small, and the proportion of participants who considered themselves responsible for the crash was low (19%), leading to a high possibility of a Type 1 error (finding a significant association when there is no true association). Bulman et al studied 29 spinal cord injured patients resulting from multiple causes, found that the patients who perceived that they could have avoided the accident coped less effectively than those who believed that they could not have avoided the accident (9).

There were a number of strengths to our study when compared to previous studies. This is the largest study to explore the relationship between fault and patient-reported outcomes after injury. While Elbers et al studied 2,940 TAC clients, the outcome assessed was health care utilisation rather than patient-reported outcomes (2). The capacity to explore the agreement between fault in the legal sense and client perception of fault is unique and the ratio of at fault to not at fault cases was roughly 1:1. Patient outcomes were collected at standardised time points post injury in contrast to previous studies (4, 8-10), and the reporting of fault was not collected at the same time as the outcomes (4, 8-10). Nevertheless, there were limitations to the study. Only 71 per cent of linked claims had both a police and client reported fault status. There was loss to follow-up, although the follow-up rates were high and there was no evidence of differential follow-up

between the fault groups. Fault status, rather than blame or responsibility per se, was used and this was collected in a dichotomous way, preventing exploration of the relationship between the degree of perception of fault and outcomes. Finally, as the study was observational, only association was shown and causality cannot be confirmed.

7. Implications for the TAC

The findings of this study show that fault status is an important predictor of longer term outcomes and claim costs for TAC Recovery clients admitted to hospital with orthopaedic trauma. In the vast majority of cases, the client's perception of fault was consistent with the police reported fault status. Those "not at fault" according to self and police report demonstrated consistently poorer longer term functional, return to work, pain and health status outcomes. However, the groups where police reporting of vehicle fault status and the client's perception of fault differed demonstrated different, and generally worse, patterns of outcome than the "at fault" group. Overall the findings are consistent with previous literature that external attribution of responsibility or blaming others leads to poorer health outcomes. Interventions to reduce the external attribution, improve coping, or resolve the negative feelings could lead to better outcomes in the future. Similarly, identifying those whose vehicle was not legally at fault, but perceived no other at fault for the crash, may also benefit from interventions to improve coping skills and resolution of conflicted emotions.

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