School of Public Health and Preventive Medicine

VOTOR-TAC Linkage Report

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Research report #:

A joint initiative of

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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 includes describes the findings of the analyses undertaken to address the third VOTOR-TAC Linkage research questions.

2. Research Questions

The research questions were:

1. What has been the impact of the TAC2015 Recovery model on patient-reported and TAC scheme outcomes for VOTOR Recovery clients? Is this consistent for Victorian State Trauma Registry (VSTR) Recovery clients?
2. What is the association between fault (self-reported or police-reported) and client outcomes? Does the direction of disagreement between self-report and police-reported fault impact on patient-reported and TAC scheme outcomes?
3. What are the TAC claim costs for patients who have sustained severe pelvic ring fractures? Does this differ by hospital of treatment or treatment approach?
4. What are the TAC claim costs for patients who have sustained tibial plafond fractures? Does this differ by treatment approach?

These questions were established to extend the early analyses undertaken to established whether the introduction of the Recovery model has impacted on patient-reported outcomes, and to further explore the relationship between clinical management and patient outcomes in key TAC patient groups.

3. Methods

3.1 Inclusion criteria

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

i. Definitive management at The Alfred or RMH

ii. Date of injury from the January 2003 to 31st January 2013

iii. Fund source recorded as TAC and a claim number provided by the hospital.

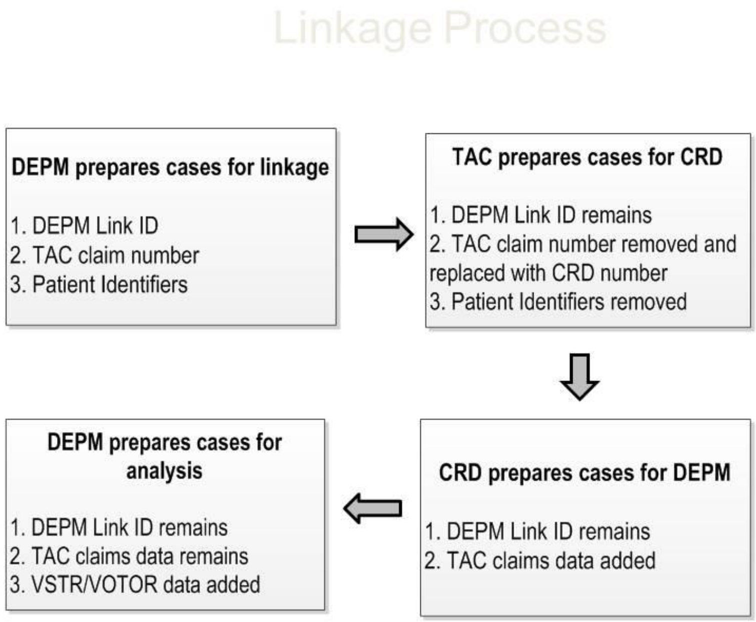
iv. Confirmed as a Recovery model (or Benefit Delivery for cases before the Recovery model implementation) client by the TAC flag.

3.2 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.



3.3 Linkage variables

A list of the linked variables, and their source, can be provided on request. In addition to the variables provided by the CRD, the TAC also provided an additional file with selected data items which were able to be linked using the DEPM ID. The additional items relate to claim segmentation, injury severity and grouping done by the TAC, and flags of psychological injury.

3.4 Data analysis

3.4.1 Evaluation of the impact of the Recovery model

For question 1, the key outcomes of interest were:

i. Complete functional recovery defined as a GOS-E score of eight (upper good recovery) at 6-months and 12-months post-injury (VSTR and VOTOR).

ii. Good functional recovery defined as a GOS-E score of seven (lower good recovery) or eight (upper good recovery) at 6-months and 12-months post-injury.

iii. Return to work defined using the return to work questions collected by VOTOR at 6-months and 12-months post-injury.

iv. Physical health defined as the physical component summary score of the SF-12 (PCS-12) at 6-months and 12-months post-injury.

v. Mental health defined as the physical component summary score of the SF-12 (MCS-12) at 6-months and 12-months post-injury.

vi. Total claim costs at 6-months and 12-months post-injury.

vii. EQ-5D summary score and indicator variables for each of the five EQ-5D items (no problems vs. problems).

The introduction of the Recovery model represents an interrupted time series design, with the introduction constituting a natural experiment. A simple linear or logistic regression approach comparing the association between "pre" and "post" intervention phases and the outcome only allows a comparison of the association before and after, essentially averaging the results over both time periods. In contrast, segmented regression analysis enables assessment, in statistical terms, of how much an intervention changed an outcome of interest, immediately and over time; instantly or with delay; transiently or long-term; and whether factors other than the intervention could explain the change.

A segmented regression analysis with bi-monthly intervals was used to determine the difference between outcomes before and after implementation of the Recovery model. To account for unequal numbers in each segment, the analyses were weighted by the inverse proportion of the number in each segment. The 6 and 12-month periods before the Recovery phase was implemented were excluded from the 6 and 12-month analyses, respectively. All analyses were adjusted for age, gender, injury group, road user group, comorbid status (Charlson Comorbidity Index (CCI) weighting group), pre-injury work status and level of education. The covariates included in the model were those considered *a priori* to influence the outcomes and those that have been shown in the past to be associated with each outcome. The covariates were included in the segmented regression model in the same way as for standard regression analyses. .

The segmented regression enabled estimation of the following:

i. Baseline trend - the change in outcome per time segment that occurred before the Recovery model was implemented.

ii. Level of change after the Recovery model was introduced - the change in the outcome immediately after implementation of the Recovery model.

iii. Trend change after the Recovery model was introduced - the change in outcome per bi-monthly segment after the Recovery model was introduced compared to the bi-monthly trend before the implementation of the Recovery model.

3.4.2 Analysis of fault

Agreement between self-reported and police-reported fault was measured using a Kappa statistic. The Kappa statistic is equal to 0 when the amount 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.

Multivariable linear or logistic regression was performed to quantify the association between each measure 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. The patient-reported measures of function, health-related quality of life, pain, and return to work were fitted as the outcomes, and the fault variable as the predictor. Each model was adjusted for key potential confounders including age, gender, injury group, level of education, pre-injury work status, road user group, and comorbid status. Adjusted odds ratios [AOR (95% CI)], or the adjusted mean difference and 95% CI, were reported to provide an estimate of the strength of association between fault and patient-reported outcomes.

Multivariable regression with a log transformation of costs was performed to quantify the association between costs and a patient's fault classification. Once again models were adjusted for key potential confounders including age, gender, injury group, level of education, pre-injury work status, road user group, and comorbid status. Adjusted percentage change in the mean and 95% CI were reported to provide an estimate of the strength of association between fault and cost at 6 and 12 months.

To establish whether the rate of recovery differed by fault status, multivariable mixed effects models were fitted with an interaction between time post-injury and fault status. Logistic models were used for binary outcomes and linear models for continuous outcomes.

3.4.3 Analysis of the association between claim costs, hospital of management and treatment approach for severe pelvic ring fractures.

Analyses were performed to establish the association between hospital of definitive management (The Alfred or RMH), or treatment approach, and cost outcomes. Summary statistics were used to describe the characteristics of groups and cost outcomes, with categorical variables summarised as frequencies and percentages, and continuous variables as mean and standard deviation (SD) or median and interquartile range (IQR) depending on the distribution of the data.

To model the association between hospital, or treatment approach, a Generalised Linear Model (GLM) was used. The deviance residuals were checked to identify the type of model most appropriate for analysis and a negative binomial model was then used for all analyses. The models were fitted with the key variable of interest alone (univariate) and adjusted for potential confounders of the relationship between the hospital, or treatment approach, and cost outcome. For each model, the incidence rate ratio (IRR) and 95 per cent confidence intervals (95% CI) were calculated.

4. Results

4.1 Brief profile of VOTOR and VOTOR/VSTR TAC Recovery cases

There were 6,973 VSTR and VOTOR cases with a date of injury from 1 January 2007 to 31 January 2013, flagged as TAC Recovery clients and successfully linked. Of these, 5,698 cases were VOTOR cases of which 2,650 (46.5%) were confirmed as major trauma (VSTR) cases. Table 1 shows the demographic and injury profile of VOTOR Recovery clients separated by major trauma status. The VOTOR severity groups showed a similar age and gender profile, although the major trauma cases included a higher proportion with significant pre-existing conditions, a generally lower level of education, a lower proportion working prior to injury, and a higher proportion with pre-injury disability (Table 1).

The VOTOR/VSTR trauma group included a higher proportion of patients injured in motor vehicle collisions, and 55 per cent had sustained spinal column injuries compared to 28 per cent of the VOTOR only group (Table 1). Similarly, the proportion of Recovery cases with injuries to multiple orthopaedic regions was 58 per cent for VOTOR cases meeting major trauma criteria compared to 30 per cent of cases only meeting VOTOR inclusion criteria (Table 1). Only 15 per cent of VOTOR only cases had sustained non-orthopaedic injuries, compared to 78 per cent of VOTOR cases meeting major trauma criteria.

Fifty-four per cent (n=1654) of cases meeting VOTOR only criteria were definitively managed at The Alfred compared to 60 per cent (n=1598) of VOTOR cases who also met major trauma criteria. The median (IQR) length of stay for patients meeting VOTOR criteria only was 3.9 (2.4-7.1) days, with 73 days the longest hospital stay. For the VOTOR cases who also met major trauma criteria, the median (IQR) length of stay was 8.5 (5.1-14.1) days, with 102 days the longest hospital length of stay recorded. At discharge, 58 per cent (n=1534) of VOTOR cases meeting major trauma criteria were discharge to an inpatient rehabilitation facility compared to 29 per cent (n=865) of cases meeting VOTOR only criteria.

The high level TAC injury indicator classified 71 per cent (n=2176) of the VOTOR criteria only cases as “orthopaedic” with 28 per cent (n=838) classified as “other severe”, 0.6 per cent (n=18) as “musculoskeletal” and 0.5 per cent (n=16) as “other injuries”. Seventy-eight per cent (n=2063) of the VOTOR Recovery cases meeting major trauma criteria were classified as “other severe” injuries, 22 per cent (n=583) as “orthopaedic” and 0.2 per cent (n=4) as “other injuries”. At the time the data extraction for this report, 556 (18.2%) of VOTOR only, and 589 (22.2%) of VOTOR major trauma cases, had lodged a common law claim. The median (IQR) claim costs to date were $37,785 ($16,178-$77,877) for VOTOR only cases, and $95,430 ($47,122-$169,681) for VOTOR cases meeting major trauma criteria.

Table 1: Profile of VOTOR Recovery clients (n=5,698)

Population descriptor		***VOTOR only (n=3,048)***	***VOTOR/VSTR (n=2,650)***
Age	Mean (SD) years	40.7 (18.7)	42.1 (19.1)
Gender	N (%)		
	Male	2000 (65.6)	1773 (66.9)
	Female	1048 (34.4)	877 (33.1)
Charlson Comorbidity Index weighting	N (%)		
	None	2564 (84.1)	1777 (67.1)
	1	423 (13.9)	731 (27.6)
	>1	61 (2.0)	142 (5.3)
Level of education[a]	N (%)		
	University degree	577 (22.2)	369 (15.6)
	Advanced diploma/diploma/certificate	761 (29.2)	664 (28.1)
	Completed high school	424 (16.6)	395 (16.7)
	Did not complete high school	832 (32.0)	932 (39.5)
Pre-injury work status[b]	N (%)		
	Not working	649 (23.6)	680 (27.3)
	Working	2098 (76.4)	1810 (72.7)
Self-reported pre-injury disability[c]	N (%)		
	None	2405 (87.8)	2139 (81.7)
	Mild	219 (8.0)	210 (8.5)
	Moderate/marked/severe	116 (4.2)	119 (4.8)
Road user group	N (%)		
	Motor vehicle	1366 (44.8)	1571 (59.3)
	Motorcycle	872 (28.6)	624 (23.6)
	Pedestrian	263 (8.6)	113 (4.3)
	Pedal cyclist	527 (17.3)	336 (12.7)
	Other	20 (0.7)	6 (0.2)
Orthopaedic injury group	N (%)		
	Isolated lower extremity injury	870 (28.5)	310 (11.7)
	Spinal column injuries	649 (21.3)	520 (19.6)
	Isolated upper extremity injury	496 (16.3)	250 (9.4)
	Multiple lower extremity injuries	354 (11.6)	243 (9.2)
	Upper and lower extremity injuries	253 (8.3)	277 (10.5)
	Spinal column and lower extremity injuries	104 (3.4)	383 (14.5)
	Spinal column and upper extremity injuries	86 (2.8)	278 (10.5)
	Spinal column, upper and lower extremity injuries	19 (0.6)	274 (10.3)
	Multiple upper extremity injuries	108 (3.5)	84 (3.2)
	Soft tissue injuries only	109 (3.6)	31 (1.2)
Associated non-orthopaedic injuries	N (%)		
	No	2596 (85.2)	875 (21.7)
	Yes	452 (14.8)	2075 (78.3)

[a] Data missing/not yet collected for n=734 (12.9%); [b] Data missing/not yet collected for n=461 (8.1%); [c] Data missing/not yet collected for n=490 (8.6%);

4.2 Impact of the implementation of the Recovery model – VOTOR cases

4.2.1 6-month outcomes

Table 2 shows the 6-month post-injury patient-reported and cost outcomes of TAC VOTOR cases before and after the implementation of the Recovery model. Report 0213-007-R4C, completed in April 2013, was the first evaluation of the impact of the Recovery model on patient-reported outcomes with the analyses including up to 2,686 claims in the Pre-Recovery group and up to 1,352 in the Post-Recovery group for cost outcomes and up to 1,220 for patient-reported outcomes. The most recent linkage made available up to 2,875 claims for the Pre-Recovery group and 2,266 claims for the costs analyses, and up to 2,068 claims for the patient-reported outcomes, in the Post-Recovery group (Table 2).

The proportion of cases fully recovered, experiencing a good recovery, returning to work, and reporting moderate to severe persistent pain was consistent before and after introduction of the Recovery model, as were the mean SF-12 summary scores and the EQ-5D summary score. The proportion reporting limitations with usual activities and self-care on the EQ-5D questionnaire was higher in the Post-Recovery group. The mean costs were $3,181 lower following implementation of the Recovery model (Table 2).

Table 2: Comparison of outcomes pre and post Recovery model at 6-months post-injury

	N	***Pre-Recovery Outcome* N (%)***	***N***	***Post-Recovery Outcome N (%)***
Good recovery	2514	791 (31.5)	2068	610 (29.5)
Return to work**	1852	1141 (61.6)	1497	884 (59.1)
Complete recovery	2514	422 (16.8)	2068	299 (14.5)
Moderate/severe persistent pain	1973	575 (29.1)	1678	469 (28.0)
EQ-5D mobility limitations	1105	531 (48.1)	2044	976 (47.8)
EQ-5D self-care limitations	1101	209 (19.0)	2041	513 (25.1)
EQ-5D usual activity limitations	1099	701 (63.8)	2033	1437 (70.4)
EQ-5D pain/discomfort	1097	760 (69.3)	2032	1423 (70.0)
EQ-5D anxiety/depression	1086	483 (44.5)	2032	983 (48.4)
		Mean (SD)		***Mean (SD)***
PCS-12	1926	39.0 (11.9)	1568	37.9 (11.9)
MCS-12	1926	48.9 (12.1)	1568	49.5 (11.9)
EQ-5D summary score	1067	0.64 (0.30)	2018	0.64 (0.29)
Cost ($)	2875	63,416 (58,594)	2266	63,502 (57,665)

*Patients with a date of injury in the 6 months prior to the introduction of the Recovery model were excluded from the 6 month summary because their care would be a mixture of the old model and the Recovery model; ** If working prior to injury.

The results of the segmented regression modelling to quantify the impact of the introduction of the Recovery model are summarised in Table 3. The baseline period refers to before the introduction of Recovery model. For each outcome, the log odds of the baseline trend was not significant, indicating stability in patient-reported outcomes and claim costs in the period leading up to introduction of the Recovery model.

The “level change” provides an indication of the immediate impact of the Recovery model. There was a no change in the log odds of each of the patient-reported outcomes at the implementation phase of the Recovery model (Table 3). In contrast, there was an immediate, and significant, 10.4 per cent reduction in 6-month costs immediately after introduction of the Recovery model (Table 3).

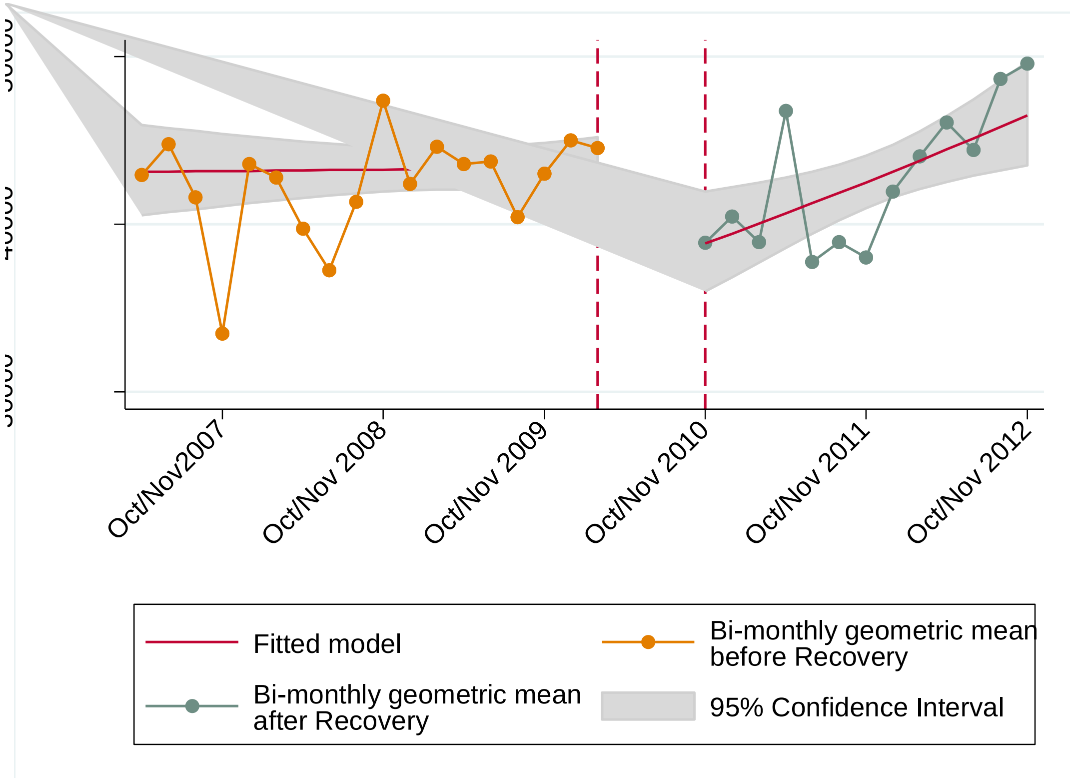
The “trend change” after Recovery provides a measure of the direction and gradient of the slope of each outcome after introduction of the Recovery model. Put simply, this shows the trend in outcomes since the model was introduced. In the previous report (0213-007-R4C), there was evidence of an upward trend in many of the patient-reported outcomes following introduction of the Recovery model, and a downward trend in costs, but the current analyses show that this trend has not been sustained (Table 3). The addition of the EQ-5D instrument shows similar patterns with stability in the log odds of reporting problems on each of the items prior to introduction of the Recovery model, except for a near significant increase for anxiety/depression. At the point of Recovery implementation, there was a significant increase in the log odds of reporting problems with pain or discomfort, and a rise for self-care limitations. The rate of reporting problems with the EQ-5D items showed no significant change after implementation of the Recovery model (Table 3).

Table 3: Impact of the introduction of the Recovery model on 6-month outcomes – results from the multivariable* segmented regression

Outcome	***Baseline trend Log-odds (95% CI)***	***p-value***	***Level change after Recovery Log-odds (95% CI)***	***p-value***	***Trend change after Recovery Log-odds (95% CI)***	***p-value***
Good recovery	-0.01 (-0.03, 0.01)	0.25	-0.01 (-0.27, 0.28)	0.97	0.004 (-0.03, 0.04)	0.81
Return to work**	0.004 (-0.02, 0.02)	0.71	-0.15 (-0.46, 0.16)	0.34	-0.01 (-0.04, 0.03)	0.62
Complete recovery	0.001 (-0.02, 0.02)	0.92	-0.08 (-0.41, -0.25)	0.64	-0.02 (-0.06, 0.02)	0.29
Moderate/severe persistent pain	-0.01 (-0.03, 0.01)	0.46	-0.09 (-0.40, 0.23)	0.59	0.02 (-0.01, 0.06)	0.23
EQ-5D mobility limitations	-0.01 (-0.07, 0.06)	0.83	0.21 (-0.13, 0.55)	0.22	-0.01 (-0.08, 0.06)	0.71
EQ-5D self-care limitations	0.04 (-0.04, 0.12)	0.31	0.34 (-0.03, 0.72)	0.07	-0.05 (-0.13, 0.03)	0.23
EQ-5D usual activity limitations	0.03 (-0.03, 0.09)	0.41	0.19 (-0.14, 0.51)	0.26	-0.02 (-0.09, 0.05)	0.60
EQ-5D pain/discomfort	-0.04 (-0.10, 0.03)	0.27	0.36 (0.03, 0.69)	0.03	-0.06 (-0.12, 0.01)	0.09
EQ-5D anxiety/depression	0.06 (-0.002, 0.12)	0.06	0.02 (-0.28, 0.32)	0.91	0.01 (-0.06, 0.07)	0.87
	Baseline trend (95% CI)		***Level change after Recovery (95% CI)***		***Trend change after Recovery (95% CI)***	
PCS-12	-0.02 (-0.12, 0.08)	0.68	-0.40 (-1.94, 1.14)	0.61	-0.05 (-0.22, 0.13)	0.59
MCS-12	-0.004 (-0.11, 0.10)	0.94	1.05 (-0.55, 2.65)	0.20	-0.10 (-0.29, 0.09)	0.29
EQ-5D summary score	0.002 (-0.01, 0.01)	0.64	-0.02 (-0.06, 0.02)	0.28	0.0003 (-0.01, 0.01)	0.94
	Baseline trend %[a] (95% CI)		***Level change after Recovery %[b] (95% CI)***		***Trend change after Recovery %[c] (95% CI)***	
Cost ($)	0.15 (-0.46, 0.76)	0.64	-10.4 (-18.8, 1.1)	0.03	1.01 (-0.16, 2.18)	0.09

n.b. Patients with a date of injury 6 months prior to the introduction of the Recovery model were excluded from the analysis because their care would be a mixture of the old model and the Recovery model; *All analyses were adjusted for age, gender, road user group, injury group, comorbid status, pre-injury work status and level of education; [a] Percentage change in 6 month costs per 2 month interval; [b] Percentage change in 6 month costs immediately after Recovery was introduced; [c] Percentage change in trend after Recovery compared to percentage change before Recovery was introduced.

To provide a visual representation of the findings from the 6-month segmented regression models, graphs showing the Pre-Recovery, at implementation, and Post-Recovery periods were generated. The gradient of each slope (before and after) provide an indication of the rate of change in each timeframe, the grey shading shows the precision of the estimate of the slope, and the point estimates for each bi-monthly interval are also shown.



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 1: Impact of the Recovery model on 6-month post-injury claim costs for VOTOR clients

The results of the segmented regression modelling cost as the outcome is shown in Figure 1. Before implementation of the Recovery model, claim costs appeared to be stable. At the point of implementation of the Recovery model, there was evidence of significant drop in claim costs (Table 3). Since introduction of the Recovery model, claim costs appeared relatively stable for a period before increasing sharply over time (Figure 1).

The figures for the PCS-12 and MCS-12 scores at 6-months post-injury are provided as Figure 2 and Figure 3. Both figures show a similar trend of stable health-related quality of life prior to introduction of the Recovery model, little change at the point of implementation and little change following introduction of the Recovery model (Figure 2 and Figure 3).

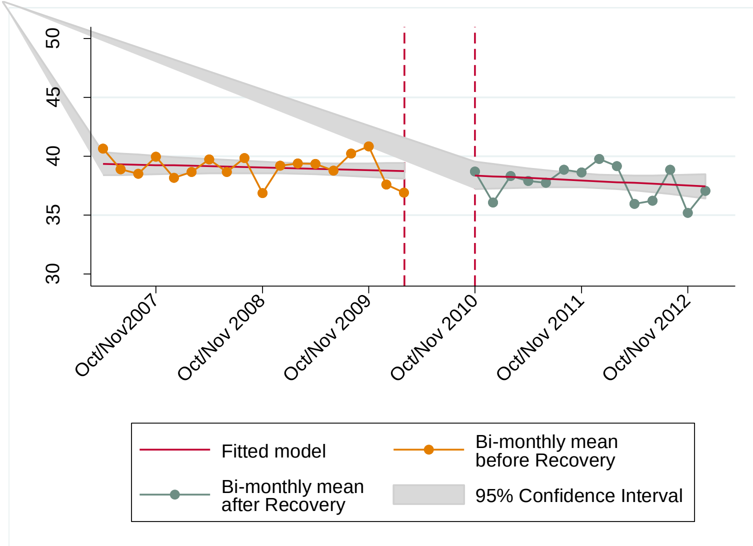


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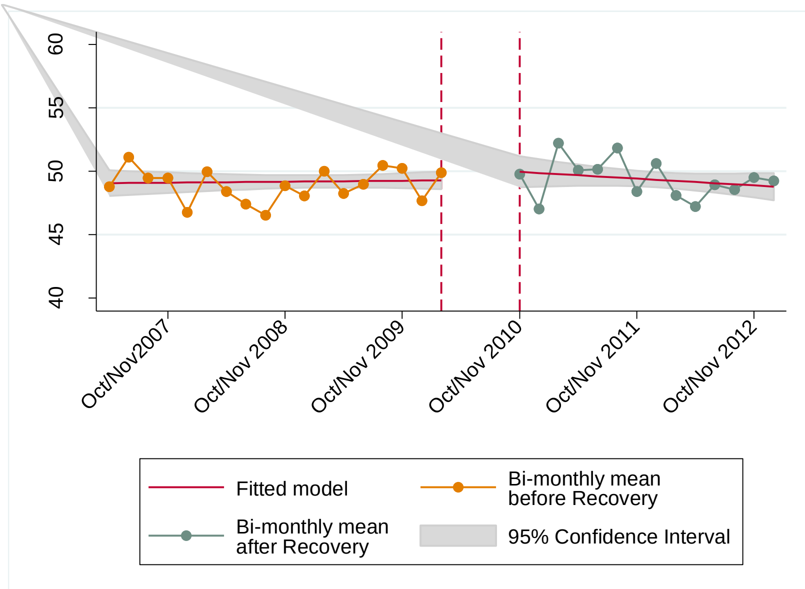
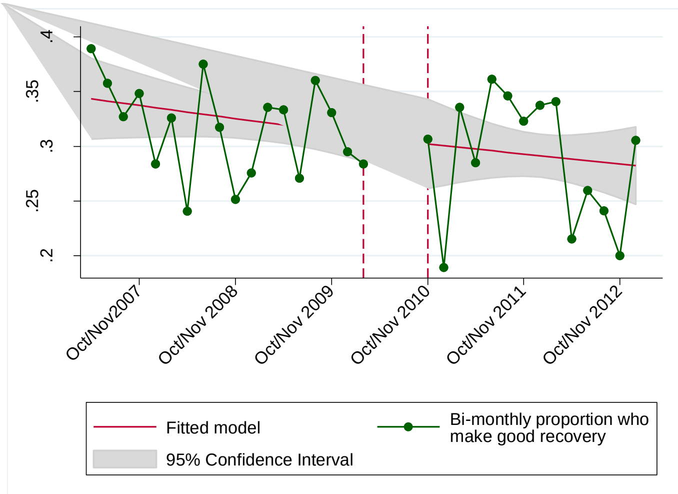
Figure 2: Impact of the Recovery model on physical health at 6-months post-injury of VOTOR clients



n.b. graph refers to time post-injury rather than post claim lodgement

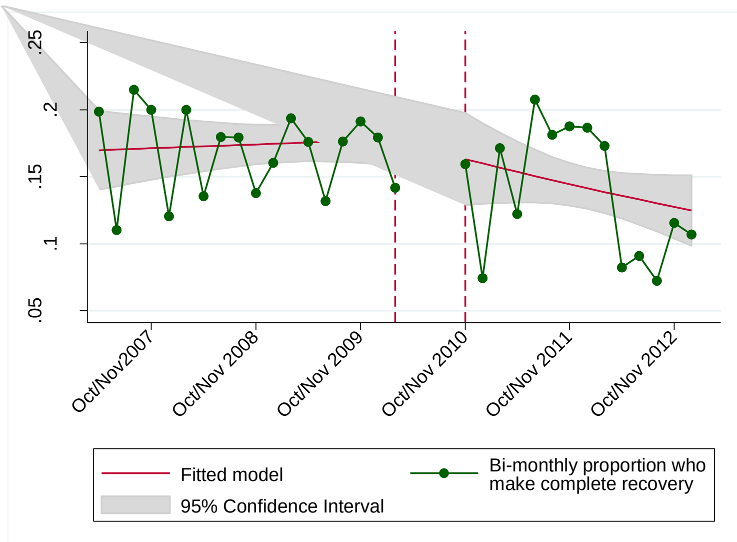
Figure 3: Impact of the Recovery model on mental health at 6-months post-injury of VOTOR clients

Figure 4 and Figure 5 represent the GOS-E good recovery and complete recovery outcomes respectively. There was a trend for declining probability of a good functional recovery prior to implementation of the Recovery model, little change at the point of implementation and persistent decline since the Recovery model introduction (Figure 4). Figure 5 shows stability in the probability of a complete functional recovery prior to the introduction of the Recovery model, a small decline at the point of implementation, and a generalised downward trend since introduction of the Recovery model (Figure 5). For the GOS-E outcomes, there was evidence of improvement in the probability of a better functional outcome in the early period post-implementation of the Recovery model, but a marked decline over the most recent year of claims which has resulted in the overall downward trend (Figure 4 and 5). This is also evident for the claim costs outcome (Figure 1).



n.b. graph refers to time post-injury rather than post claim lodgement

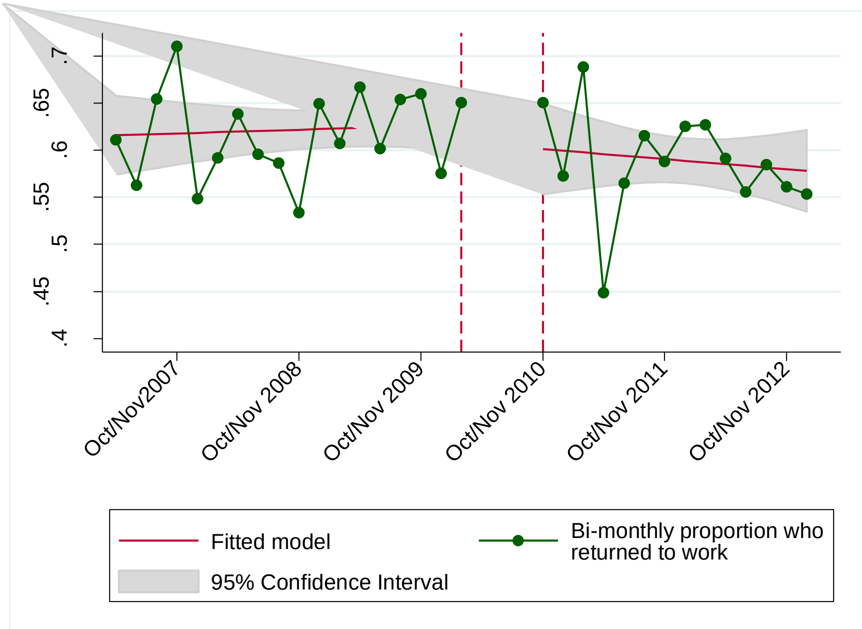
Figure 4: Impact of the Recovery model on functional outcomes (GOS-E good recovery) at 6-months post-injury of VOTOR clients



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 5: Impact of the Recovery model on functional outcomes (GOS-E complete recovery) at 6-months post-injury of VOTOR clients

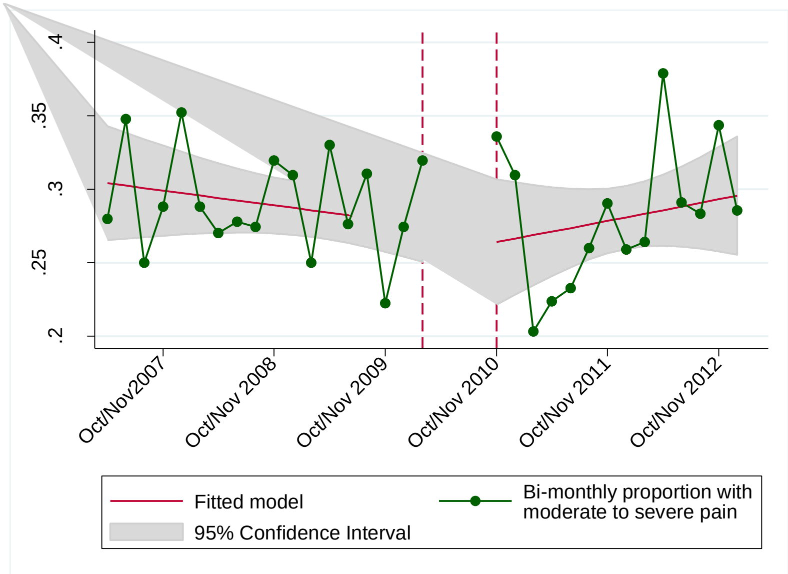
There appears to be little evidence of an impact on 6-month return to work rates for VOTOR clients following implementation of the Recovery model (Table 3 and Figure 6). Consistent with the physical health and functional outcomes, there was a relatievely flat slope of the probability of return to work pre-Recovery, a small decrease at the time of implementation, and relatively little change since implementation of the Recovery model (Figure 6).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 6: Impact of the Recovery model on return to work at 6-months post-injury of VOTOR clients

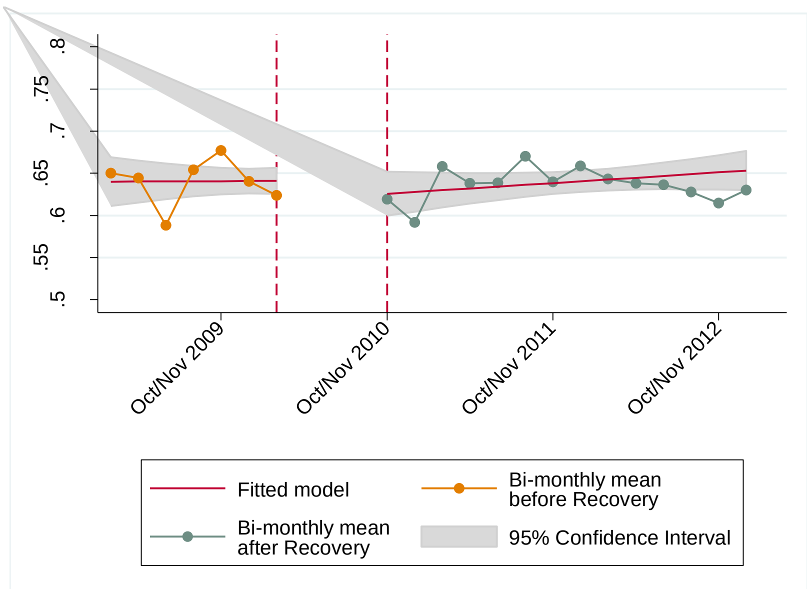
The probability of reporting moderate to severe persistent pain at 6-months was decreasing marginally/stable prior to the implementation of the Recovery model, followed by a small (not significant) decline in the probability of persistent pain at the point of implementation, and a small upward trend since the implementation of the Recovery model (Figure 7).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 7: Impact of the Recovery model on reporting moderate to severe persistent pain at 6-months post-injury of VOTOR clients

The figure for the EQ-5D summary score at 6-months post-injury is provided as Figure 8. Figure 8 shows a stable trend in health status prior to introduction of the Recovery model, a very small decline at the point of implementation, and a slight upward trend in health status since the introduction of the Recovery model (Figure 8).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 8: Impact of the Recovery model on the EQ-5D summary score at 6-months post-injury of VOTOR clients

Consistent with Table 3, the probability of reporting mobility problems at 6-months was relatively stable prior to the introduction of the Recovery model, increases slightly at the point of implementation, and a slight downward trend since the implementation of the Recovery model (Figure 9).

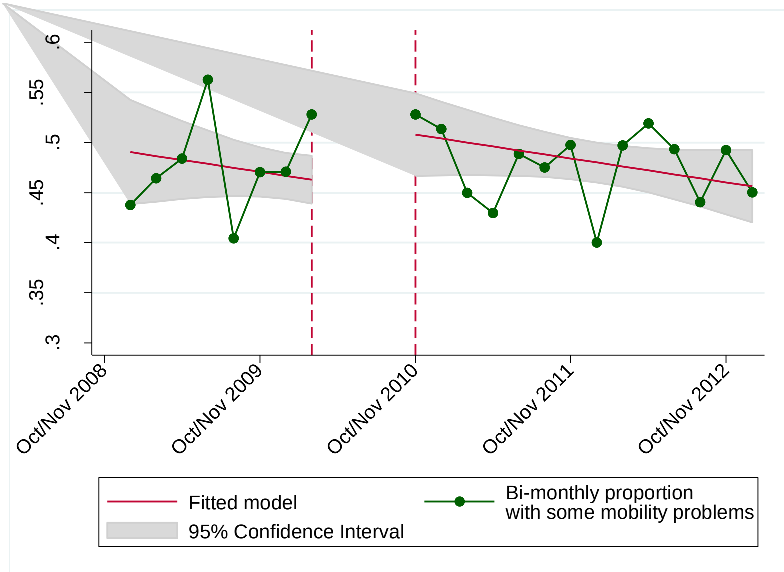


Figure 9: Impact of the Recovery model on reporting problems on the EQ-5D mobility item at 6-months post-injury of VOTOR clients

The self-care item showed a similar pattern to mobility, except for a more marked increase in reporting problems at the point of implementation of the Recovery model (Figure 10).

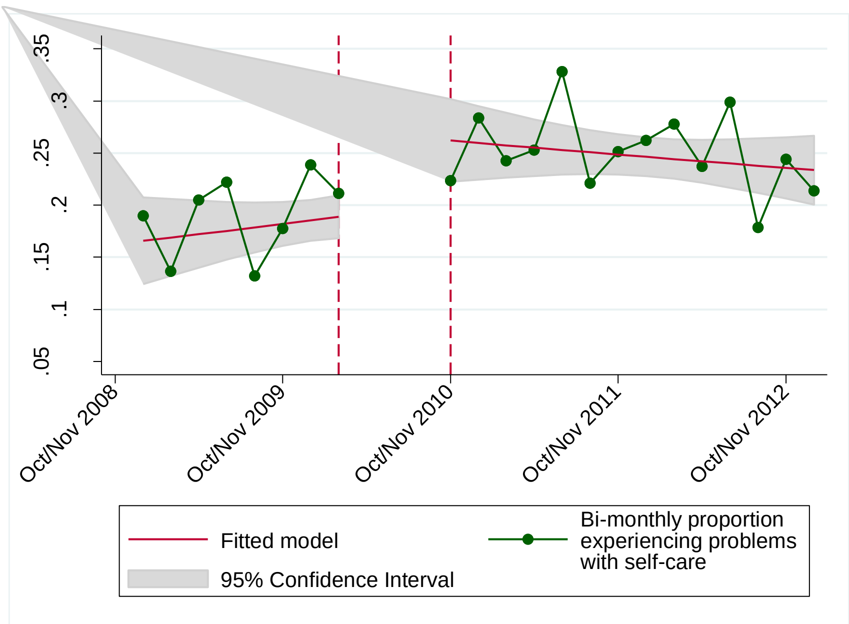


Figure 10: Impact of the Recovery model on reporting problems on the EQ-5D self-care item at 6-months post-injury of VOTOR clients

The probability of reporting problems with usual activities was stable prior to the implementation of the Recovery model, increased (though not significantly) at the point of implementation and has shown a very slight upward trend since implementation (Figure 12).

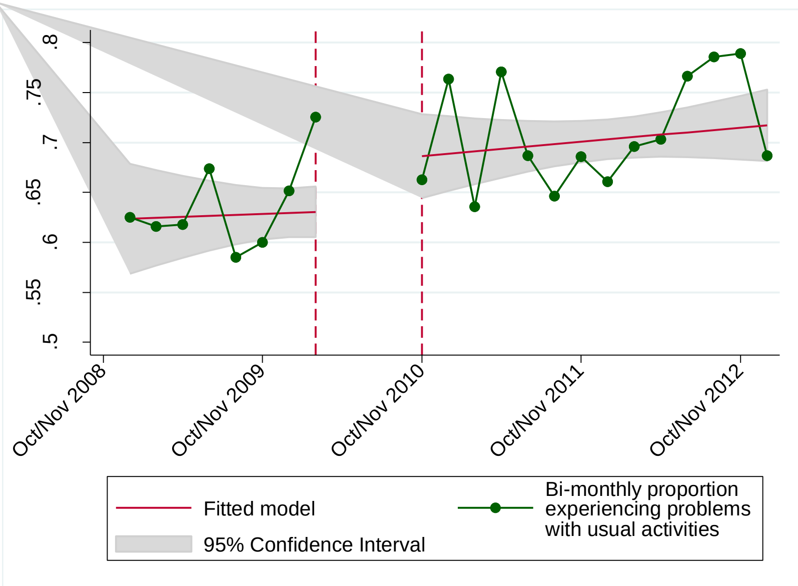


Figure 11: Impact of the Recovery model on reporting problems on the EQ-5D usual activities item at 6-months post-injury of VOTOR clients

The probability of reporting problems with the EQ-5D pain or discomfort item at 6-months was stable prior to implementation of the Recovery model, increased significantly (Table 3) at the point of implementation and has showed a downward trend since the Recovery model was introduced (Figure 12).

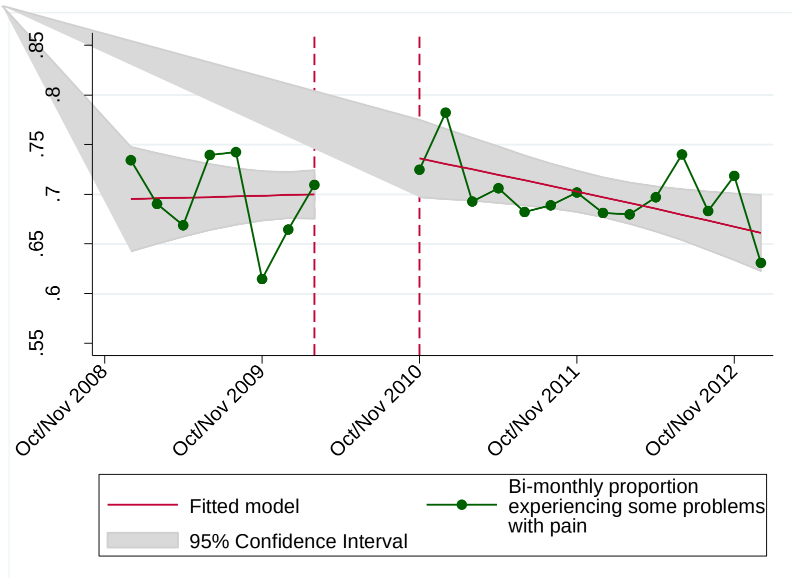


Figure 12: Impact of the Recovery model on reporting problems on the EQ-5D pain/discomfort item at 6-months post-injury of VOTOR clients

The probability or reporting problems with anxiety or depression at 6-months post-injury on the EQ-5D item appeared to be trending upwards prior to introduction of the Recovery model, increased marginally at the point of implementation and has remained stable since (Figure 13).

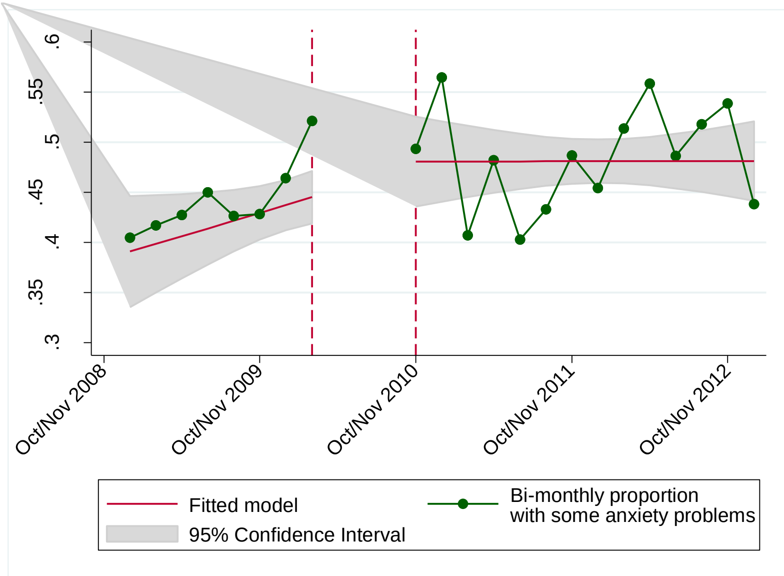


Figure 13: Impact of the Recovery model on reporting problems on the EQ-5D anxiety/depression item at 6-months post-injury of VOTOR clients

4.2.2 12-month post-injury outcomes

In the previous report, the number of cases who were eligible for 12-month outcomes in the Post-Recovery group was small (n=669 in the Post-Recovery phase). Since this report, the number of cases in the Post-Recovery group has increased substantially, ranging from 1,294 cases for the return to work outcomes (due to the focus on patient working prior to injury) to 1,918 cases for the cost outcomes (Table 4). Table 4 shows the outcomes at 12-months post-injury the Pre-Recovery and Post-Recovery groups. The EQ-5D outcomes were excluded from the analyses as the number of Pre-Recovery cases with this outcome was very low as this outcome was added to the VOTOR protocols in 2009.

Table 4: Comparison of outcomes pre and post Recovery model at 12-months

	N	***Pre-Recovery Outcome**** ***N (%)***	***N***	***Post-Recovery Outcome*** ***N (%)***
Good recovery	2063	766 (37.1)	1797	631 (35.1)
Return to work**	1544	1056 (68.4)	1294	887 (68.6)
Complete recovery	2063	413 (20.0)	1797	352 (19.6)
Moderate/severe persistent pain	1587	419 (26.4)	1414	406 (28.7)
		Mean (SD)		***Mean (SD)***
PCS-12	1559	40.8 (12.0)	1327	39.7 (12.2)
MCS-12	1559	48.7 (11.8)	1327	49.4 (11.7)
Cost ($)	2371	73,417 (69,510)	1918	73,419 (69,544)

* Similarly patients with a date of injury in the 12 months prior to the introduction of the Recovery model are excluded from the 12 month summary; ** If working prior to injury.

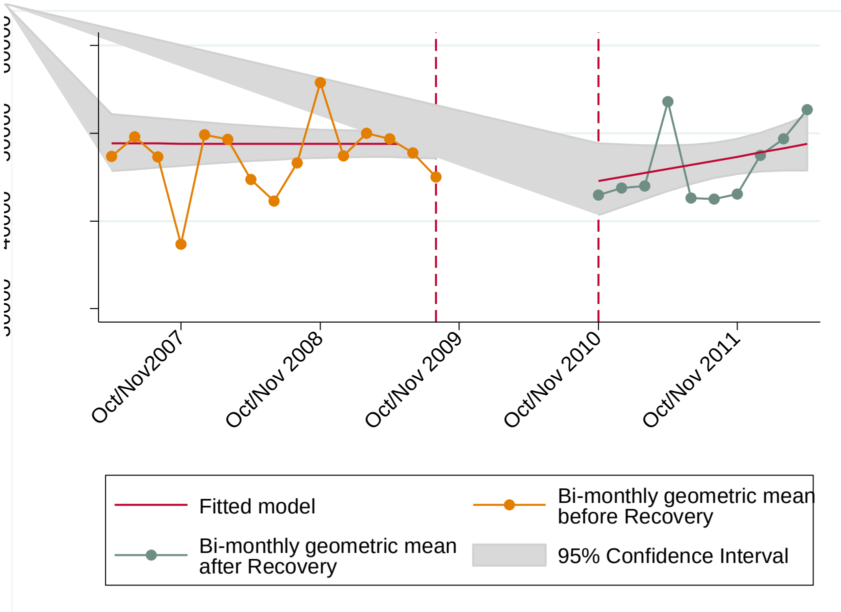
The results of the multivariable segmented regression modelling to quantify the impact of the introduction of the Recovery model on 12-month outcomes are summarised in Table 5. Once again, the baseline period refers to before the introduction of Recovery model. The log odds of the baseline trend showed declining probability of a good functional outcome and increasing probability of reporting moderate to severe persistent pain prior to introduction of the Recovery model (Table 5). There was a no change in the log odds of each of the patient-reported outcomes at the implementation phase of the Recovery model (Table 5). In contrast, there was an immediate 11.4 per cent reduction in costs immediately after introduction of the Recovery model (Table 5). Consistent with the 6-month outcomes in the previous section of the report, there is no evidence of sustained improvement in 12-month outcomes following introduction of the Recovery model (Table 5).

Table 5: Impact of the introduction of the Recovery model on 12-month outcomes – results from the multivariable* segmented regression

Outcome	*Baseline trend Log-odds (95% CI)*	*p-value*	*Level change after Recovery Log-odds (95% CI)*	*p-value*	*Trend change after Recovery Log-odds (95% CI)*	*p-value*
Good recovery	-0.02 (-0.05, -0.001)	0.05	0.16 (-0.13, 0.39)	0.28	0.002 (-0.04, 0.04)	0.92
Return to work**	0.002 (-0.03, 0.03)	0.89	0.11 (-0.25, 0.46)	0.55	-0.02 (-0.07, 0.02)	0.32
Complete recovery	-0.01 (-0.04, 0.02)	0.44	0.29 (-0.06, 0.63)	0.10	-0.03 (-0.08, 0.02)	0.24
Moderate/severe persistent pain	0.03 (0.001, 0.05)	0.04	-0.11 (-0.46, 0.23)	0.52	-0.02 (-0.06, 0.03)	0.48
	Baseline trend (95% CI)		*Level change after Recovery (95% CI)*		*Trend change after Recovery (95% CI)*	
PCS-12	-0.09 (-0.22, 0.05)	0.21	-0.17 (-1.90, 1.57)	0.85	0.03 (-0.21, 0.27)	0.81
MCS-12	-0.02 (-0.16, 0.16)	0.76	1.28 (-0.45, 3.02)	0.15	-0.11 (-0.35, 0.13)	0.37
	Baseline trend[a] (95% CI)		*Level change after Recovery[b] (95% CI)*		*Trend change after Recovery[c] (95% CI)*	
Cost ($)	0.18 (-0.64, 1.02)	0.66	-11.4 (-21.4, -0.02)	0.05	0.98 (-0.70, 2.70)	0.25

n.b. Patients with a date of injury 12 months prior to the introduction of the Recovery model were excluded from the analysis because their care would be a mixture of the old model and the Recovery model; *All analyses were adjusted for age, gender, road user group, injury group, comorbid status, pre-injury work status and level of education; [a] Percentage change in 12 month costs per 2 month interval; [b] Percentage change in 12 month costs immediately after Recovery was introduced; [c] Percentage change in trend after Recovery compared to percentage change before Recovery was introduced.

To provide a visual representation of the findings from the 12-month segmented regression models, graphs showing the Pre-Recovery, at implementation, and Post-Recovery periods were generated. The gradient of each slope (before and after) provide an indication of the rate of change in each timeframe, the grey shading shows the precision of the estimate of the slope, and the point estimates for each bi-monthly interval are also shown.

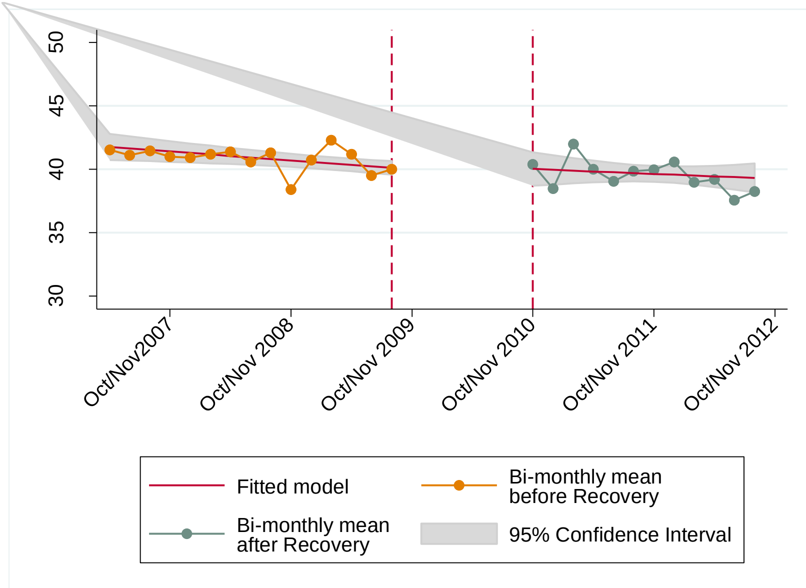


n.b. graph refers to time post-injury rather than post claim lodgement

Figure 14: Impact of the Recovery model on 12-month post-injury claim costs for VOTOR clients

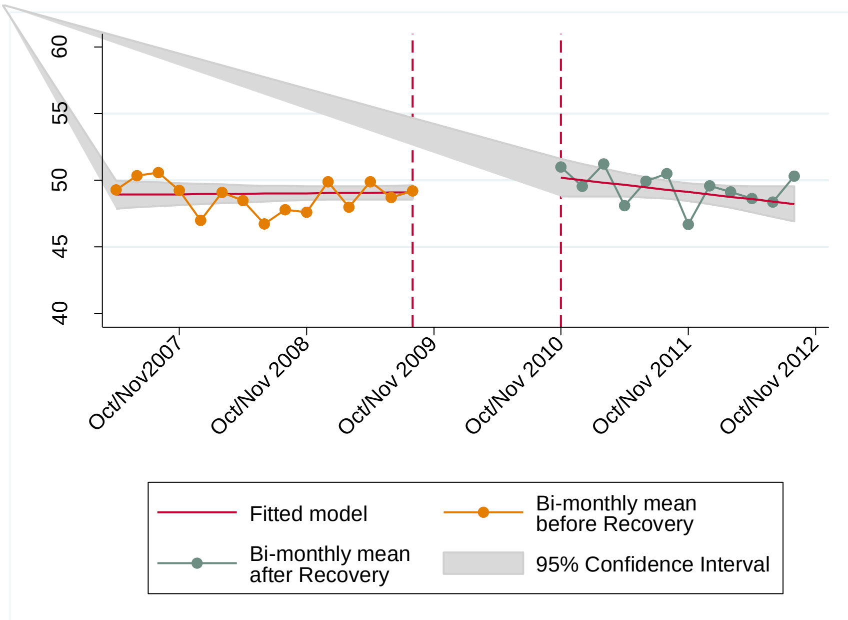
The results of the segmented regression modelling 12-month claim costs as the outcome is shown in Figure 9. Before implementation of the Recovery model, 12-month claim costs appeared were stable. At the point of implementation of the Recovery model, there was evidence of significant drop in claim costs (Table 5). Since introduction of the Recovery model, claim costs appeared relatively stable for a period before increasing sharply in the most recent time periods (Figure 14).

The figures for the PCS-12 and MCS-12 scores at 12-months post-injury are provided as Figure 15 and Figure 16. Both figures show a similar trend of stable or slightly declining health-related quality of life prior to introduction of the Recovery model, little change at the point of implementation and little change following introduction of the Recovery model (Figure 15 and Figure 16).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 15: Impact of the Recovery model on physical health at 12-months post-injury of VOTOR clients

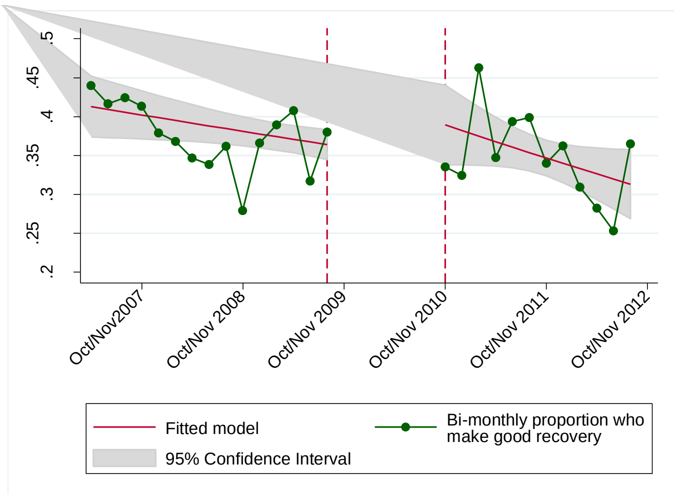


n.b. graph refers to time post-injury rather than post claim lodgement

Figure 16: Impact of the Recovery model on mental health at 12-months post-injury of VOTOR clients

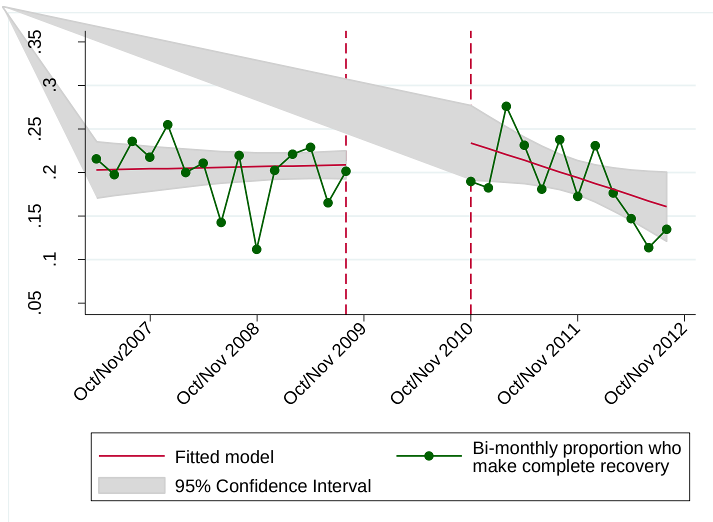
Figure 17 and Figure 18 represent the GOS-E good recovery and complete recovery outcomes at 12-months, respectively. There was a trend for declining probability of a good functional recovery prior to implementation of the Recovery model, slight improvment at the point of implementation and persistent decline since the Recovery model introduction (Figure 17).

Figure 18 shows stability in the probability of a complete functional recovery at 12-months prior to the introduction of the Recovery model, a small improvement at the point of implementation, and a generalised downward trend since introduction of the Recovery model (Figure 18). For the GOS-E outcomes, there was evidence of stable or improving probability of a better 12-month functional outcome in the early period post-implementation of the Recovery model, but a marked decline over the most recent time points which has resulted in the overall downward trend (Figure 17 and 18). Again, this is also evident for the 12-month claim costs outcome (Figure 14).



n.b. graph refers to time post-injury rather than post claim lodgement

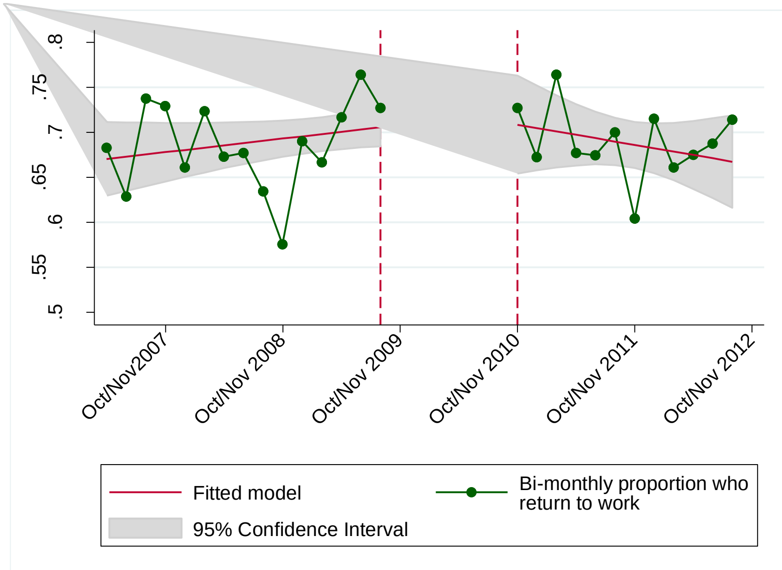
Figure 17: Impact of the Recovery model on functional outcomes (GOS-E good recovery) at 12-months post-injury of VOTOR clients



n.b. graph refers to time post-injury rather than post claim lodgement

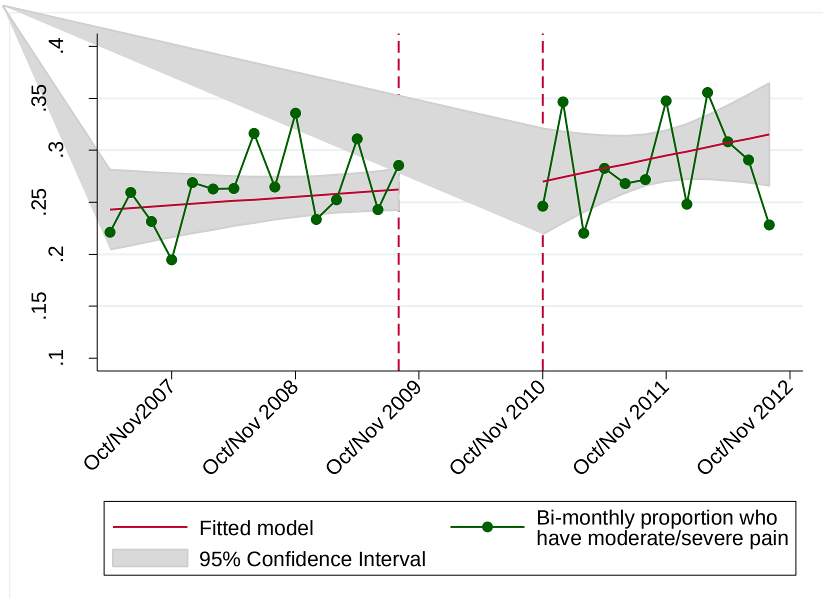
Figure 18: Impact of the Recovery model on functional outcomes (GOS-E complete recovery) at 12-months post-injury of VOTOR clients

There appears to be little evidence of an impact on 12-month return to work rates for VOTOR clients following implementation of the Recovery model (Table 5 and Figure 19). The rate of return to work appeared to be increasing slightly prior to Recovery model implementation, no change at the point of implementation and then a slight downward trajectory since implementation of the Recovery model (Figure 19).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 19: Impact of the Recovery model on return to work at 12-months post-injury of VOTOR clients



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 20: Impact of the Recovery model on reporting moderate to severe persistent pain at 12-months post-injury of VOTOR clients

The probability of reporting moderate to severe persistent pain at 12-months was stable prior to the implementation of the Recovery model, changed little at the point of implementation, and there has been an overall, small upward trend since the implamentation of the Recovery model (Figure 20).

4.3 Impact of the implementation of the Recovery model – VOTOR and VSTR cases

4.3.1 6-month outcomes

Table 6 shows the 6-month post-injury patient-reported and cost outcomes of TAC VOTOR and VSTR cases before and after the implementation of the Recovery model. The VSTR cases added to the models represent major trauma patients without orthopaedic injuries, who were classified as Recovery cases. As most transport-related major trauma cases involve orthopaedic injuries, adding the non-orthopaedic major trauma cases resulted in only a nominal increase in case numbers.

The proportion of VSTR/VOTOR Recovery cases fully recovered, experiencing a good recovery, returning to work, reporting moderate to severe persistent pain, mobility limitations, and anxiety or depression problems was consistent before and after introduction of the Recovery model, as were the mean SF-12 summary scores and the EQ-5D summary score. The proportion reporting problems with self-care and usual activities on the EQ-5D appeared to be higher following the implementation of the Recovery model. The mean costs were $1,542 higher following implementation of the Recovery model (Table 6).

The results of the segmented regression modelling to quantify the impact of the introduction of the Recovery model on VSTR/VOTOR client outcomes are summarised in Table 7. The baseline period refers to before the introduction of Recovery model. For each outcome, the log odds of the baseline trend was not significant, indicating stability in patient-reported outcomes and claim costs in the period leading up to introduction of the Recovery model.

Table 6: Comparison of outcomes pre and post Recovery model at 6-months post-injury – VSTR and VOTOR clients

	N	*Pre-Recovery Outcome* N (%)*	*N*	*Post-Recovery Outcome N (%)*
Good recovery	2828	940 (33.2)	2380	745 (31.3)
Return to work**	2072	1319 (63.7)	1713	1031 (60.2)
Complete recovery	2828	517 (18.3)	2380	366 (15.4)
Moderate/severe persistent pain	2187	613 (28.0)	1929	552 (28.6)
EQ-5D mobility limitations	1229	568 (46.2)	2254	1042 (46.2)
EQ-5D self-care limitations	1225	221 (18.0)	2251	553 (24.6)
EQ-5D usual activity limitations	1224	752 (61.4)	2253	1539 (68.3)
EQ-5D pain/discomfort	1220	839 (68.8)	2243	1529 (68.2)
EQ-5D anxiety/depression	1209	542 (44.8)	2240	1074 (48.0)
		Mean (SD)		*Mean (SD)*
PCS-12	2136	39.6 (12.0)	1808	38.4 (12.1)
MCS-12	2136	48.9 (12.0)	1808	49.3 (12.0)
EQ-5D summary score	3249	0.65 (0.30)	2614	0.64 (0.29)
Cost ($)	1188	61,050 (57,515)	2224	62,592 (57,648)

*Patients with a date of injury in the 6 months prior to the introduction of the Recovery model were excluded from the 6 month summary because their care would be a mixture of the old model and the Recovery model; ** If working prior to injury.

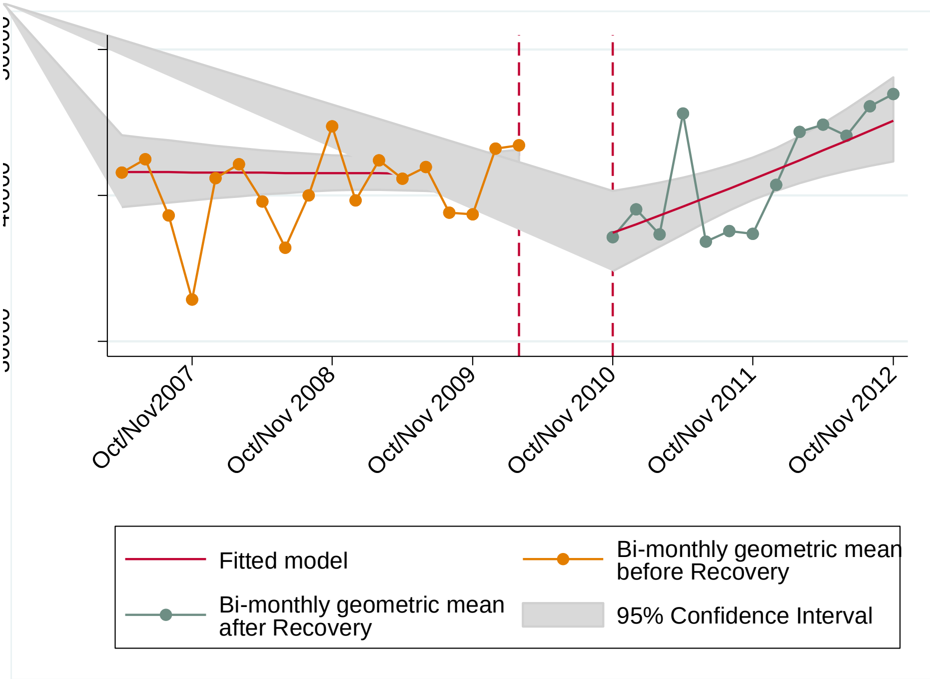
The "level change" provides an indication of the immediate impact of the Recovery model. There was a no change in the log odds of most of the patient-reported outcomes at the implementation phase of the Recovery model (Table 7). Mental health scores (MCS-12) and claim costs approached significance indicating a change at the point of implementation of the Recovery model. There was an immediate 7.7 per cent reduction in 6-month costs immediately after introduction of the Recovery model and a modest increase in MCS-12 scores at this time point (Table 7). All but the anxiety/depression item of the EQ-5D showed a significant, or approaching significant, increase in the probability of reporting problems at the point of implementation of the Recovery model (Table 7).

The "trend change" after Recovery provides a measure of the direction and gradient of the slope of each outcome after introduction of the Recovery model. Put simply, this shows the trend in outcomes since the model was introduced. There was little evidence of improvement in patient-reported outcomes after implementation of the Recovery model with only the probability of reporting problems on the EQ-5D anxiety/depression item tracking downwards. However, there was evidence of an increase in claim costs (Table 7).

Table 7: Impact of the introduction of the Recovery model on 6-month outcomes – results from the multivariable* segmented regression

Outcome	***Baseline trend Log-odds (95% CI)***	***p-value***	***Level change after Recovery Log-odds (95% CI)***	***p-value***	***Trend change after Recovery Log-odds (95% CI)***	***p-value***
Good recovery	-0.01 (-0.03, 0.01)	0.21	-0.002 (-0.26, 0.26)	0.99	0.01 (-0.02, 0.04)	0.57
Return to work**	0.003 (-0.02, 0.02)	0.79	-0.16 (-0.46, 0.14)	0.29	-0.01 (-0.04, 0.03)	0.64
Complete recovery	-0.001 (-0.02, 0.02)	0.95	-0.07 (-0.38, -0.24)	0.66	-0.02 (-0.05, 0.02)	0.40
Moderate/severe persistent pain	-0.01 (-0.03, 0.01)	0.56	-0.05 (-0.35, 0.26)	0.76	0.02 (-0.02, 0.05)	0.30
EQ-5D mobility limitations	-0.01 (-0.07, 0.05)	0.79	0.24 (-0.08, 0.56)	0.15	-0.01 (-0.08, 0.05)	0.70
EQ-5D self-care limitations	0.04 (-0.04, 0.11)	0.32	0.40 (0.03, 0.76)	0.03	-0.05 (-0.13, 0.03)	0.23
EQ-5D usual activity limitations	0.03 (-0.03, 0.09)	0.36	0.23 (-0.08, 0.54)	0.15	-0.03 (-0.09, 0.04)	0.42
EQ-5D pain/discomfort	-0.03 (-0.09, 0.03)	0.35	0.30 (-0.01, 0.62)	0.06	-0.004 (-0.07, 0.06)	0.91
EQ-5D anxiety/depression	0.05 (-0.01, 0.10)	0.11	0.02 (-0.28, 0.31)	0.91	-0.05 (-0.11, 0.01)	0.14
	Baseline trend (95% CI)		***Level change after Recovery (95% CI)***		***Trend change after Recovery (95% CI)***	
PCS-12	-0.01 (-0.10, 0.08)	0.80	-0.65 (-2.12, 0.82)	0.39	-0.04 (-0.21, 0.13)	0.65
MCS-12	0.01 (-0.09, 0.11)	0.91	1.11 (-0.41, 2.62)	0.15	-0.13 (-0.30, 0.05)	0.16
EQ-5D summary score	0.0002 (-0.01, 0.01)	0.95	-0.02 (-0.06, 0.02)	0.37	0.002 (-0.01, 0.01)	0.61
	Baseline trend %[a] (95% CI)		***Level change after Recovery %[b] (95% CI)***		***Trend change after Recovery %[c] (95% CI)***	
Cost ($)	-0.04 (-0.62, 0.54)	0.89	-7.7 (-16.10, 1.40)	0.10	1.13 (0.01, 2.26)	0.05

n.b. Patients with a date of injury 6 months prior to the introduction of the Recovery model were excluded from the analysis because their care would be a mixture of the old model and the Recovery model; *All analyses were adjusted for age, gender, road user group, injury group, comorbid status, pre-injury work status and level of education; [a] Percentage change in 6 month costs per 2 month interval; [b] Percentage change in 6 month costs immediately after Recovery was introduced; [c] Percentage change in trend after Recovery compared to percentage change before Recovery was introduced.

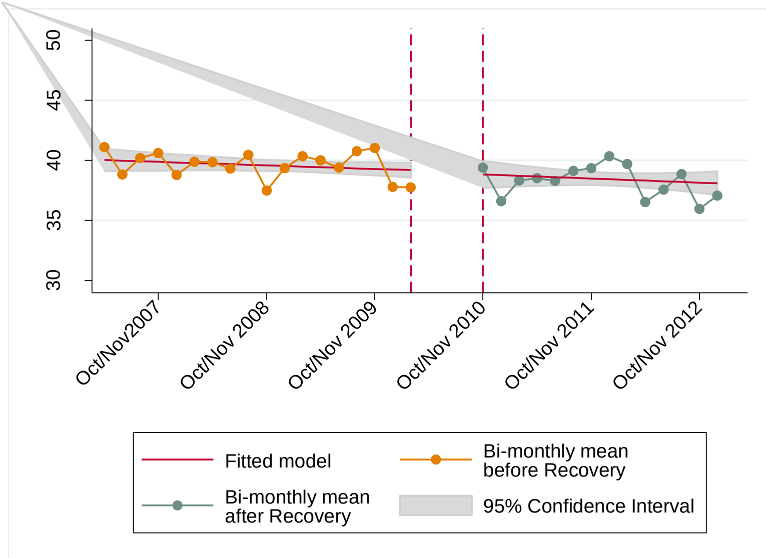


n.b. graph refers to time post-injury rather than post claim lodgement

Figure 21: Impact of the Recovery model on 6-month post-injury claim costs for VOTOR and VSTR clients

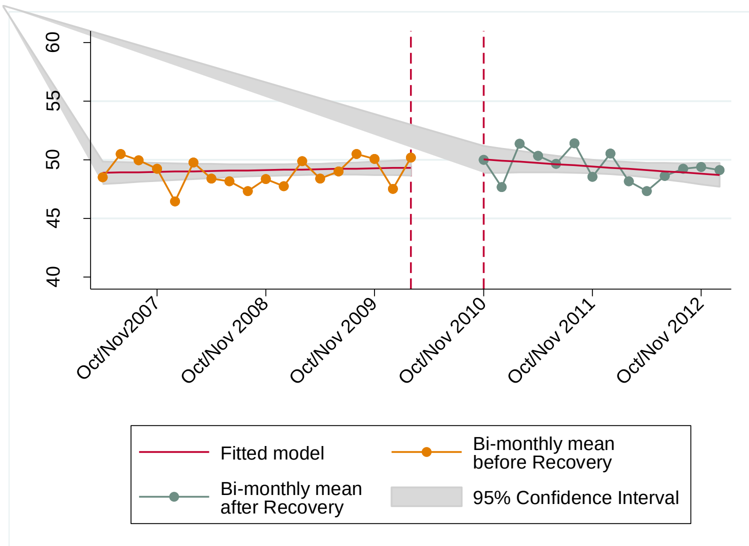
The results of the segmented regression modelling 6-month claim costs is shown in Figure 21 Before implementation of the Recovery model, claim costs appeared to be stable. At the point of implementation of the Recovery model, there was evidence of a substantial drop in claim costs (Table 7). Since introduction of the Recovery model, claim costs appeared relatively stable for a period before increasing sharply over time (Figure 21).

The figures for the PCS-12 and MCS-12 scores at 6-months post-injury are provided as Figure 22 and Figure 23. Both figures show a similar trend of stable health-related quality of life prior to introduction of the Recovery model, little change at the point of implementation and little change following introduction of the Recovery model (Figure 22 and Figure 23).



n.b. graph refers to time post-injury rather than post claim lodgement

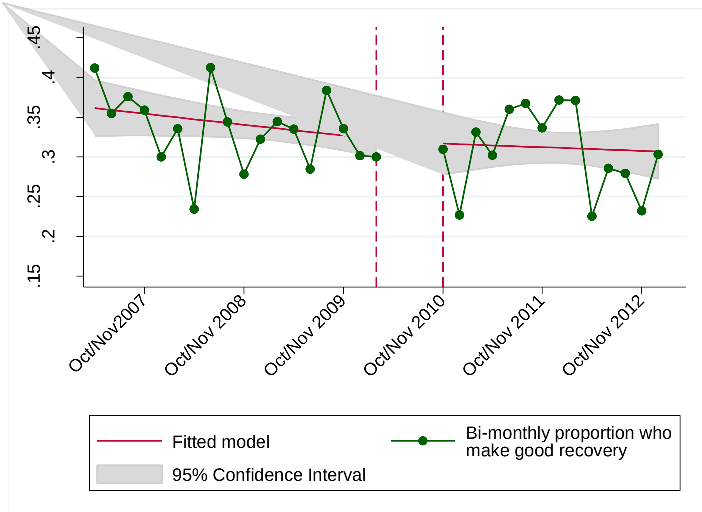
Figure 22: Impact of the Recovery model on physical health at 6-months post-injury of VOTOR and VSTR clients



n.b. graph refers to time post-injury rather than post claim lodgement

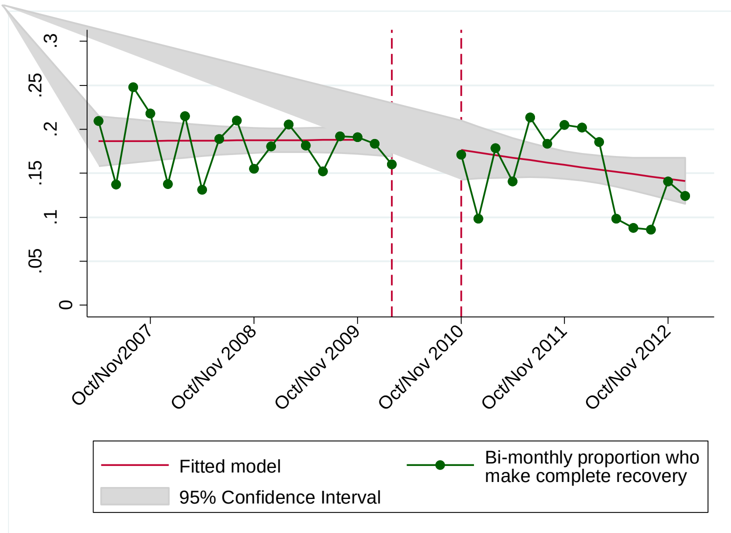
Figure 23: Impact of the Recovery model on mental health at 6-months post-injury of VOTOR and VSTR clients

Figure 24 and Figure 25 represent the GOS-E good recovery and complete recovery outcomes for VOTOR and VSTR clients, respectively. There was a trend for declining probability of a good functional recovery prior to implementation of the Recovery model, little change at the point of implementation, improvement following implementation of the Recovery model in the early period and then a decline, resulting in stable rate of good recovery since implementation fo the new claims model (Figure 24). Figure 25 shows stability in the probability of a complete functional recovery prior to the introduction of the Recovery model, a small decline at the point of implementation, and a small downward trend since introduction of the Recovery model (Figure 25). For both GOS-E outcomes, there was evidence of improvement in the probability of a better functional outcome in the early period post-implementation of the Recovery model, but a decline over the most recent year of claims which has resulted in an overall downward or neutral trend (Figure 24 and 25).



n.b. graph refers to time post-injury rather than post claim lodgement

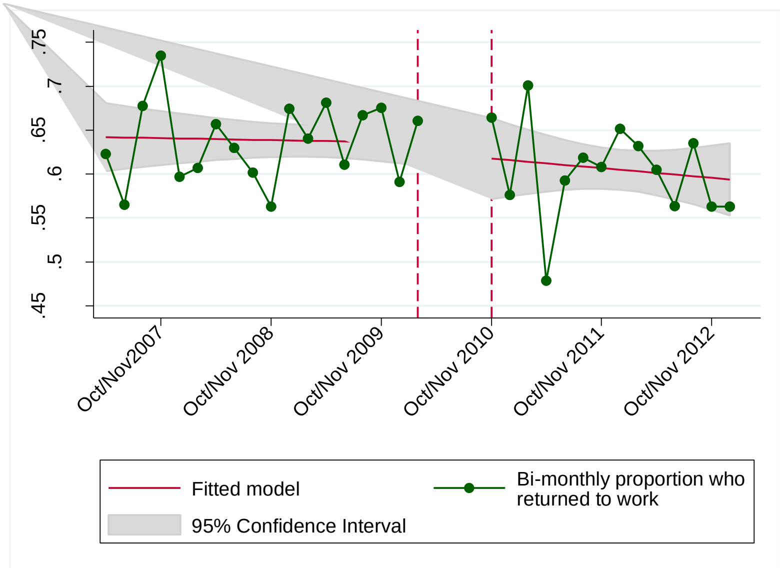
Figure 24: Impact of the Recovery model on functional outcomes (GOS-E good recovery) at 6-months post-injury of VOTOR and VSTR clients



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 25: Impact of the Recovery model on functional outcomes (GOS-E complete recovery) at 6-months post-injury of VOTOR and VSTR clients

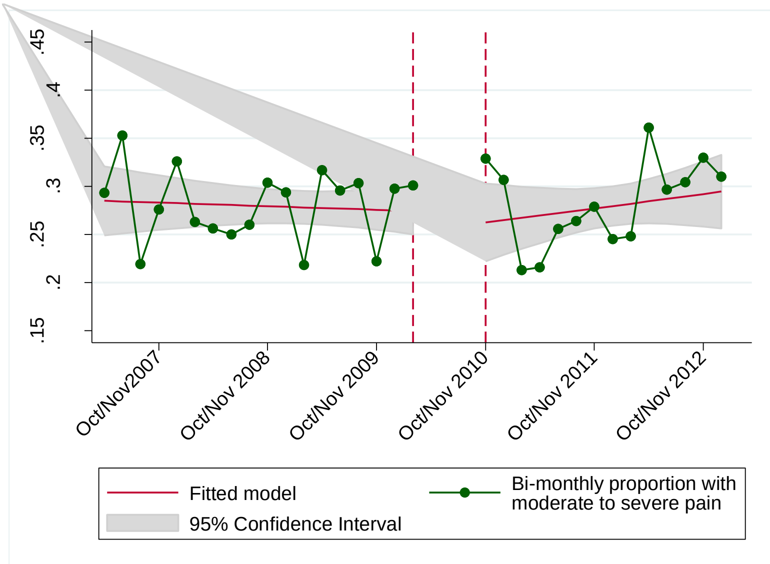
There appears to be little evidence of an impact on 6-month return to work rates for VOTOR and VSTR clients following implementation of the Recovery model (Table 7 and Figure 26). Consistent with the physical health and functional outcomes, there was a relatievely flat slope of the probability of return to work pre-Recovery, a small decrease at the time of implementation, and relatively little change since implementation of the Recovery model (Figure 26).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 26: Impact of the Recovery model on return to work at 6-months post-injury of VOTOR and VSTR clients

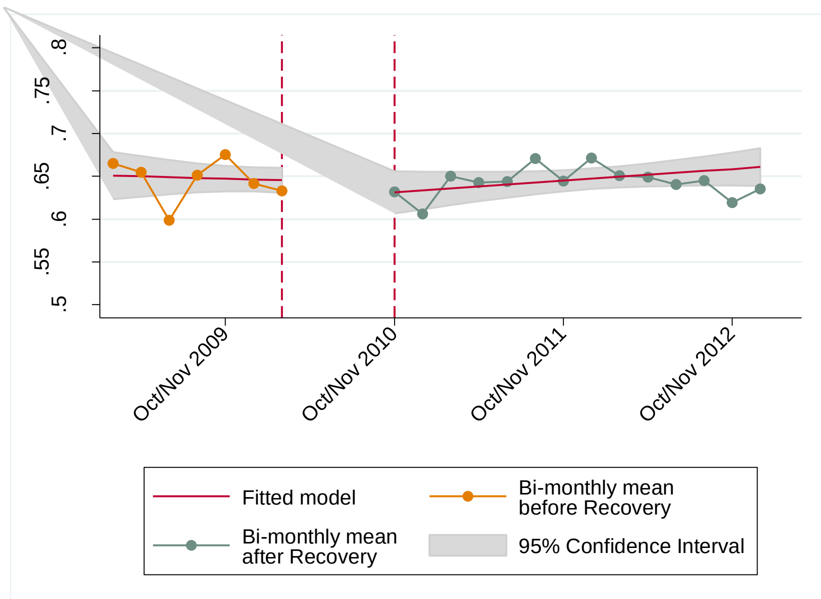
The probability of VSTR and VOTOR clients reporting moderate to severe persistent pain at 6-months was stable prior to the implementation of the Recovery model, followed by a small (not significant) decline in the probability of persistent pain at the point of implementation, and a small upward trend since the implamentation of the Recovery model (Figure 27). Again, there was evidence of improvement in the early stages followng implementation of the Recovery model with declining outcomes in the more recent timeframe.



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 27: Impact of the Recovery model on reporting moderate to severe persistent pain at 6-months post-injury of VOTOR and VSTR clients

The figure for the EQ-5D summary score at 6-months post-injury is provided as Figure 28. Figure 28 shows a stable trend in health status prior to introduction of the Recovery model, a very small decline at the point of implementation, and a slight upward trend in health status since the introduction of the Recovery model (Figure 28).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 28: Impact of the Recovery model on the EQ-5D summary score at 6-months post-injury of VOTOR and VSTR clients

Consistent with Table 7, the probability of reporting problems on the EQ-5D mobility item at 6-months was stable prior to Recovery model implementation, increased at the point of implementation and has been trending downwards since (Figure 29).

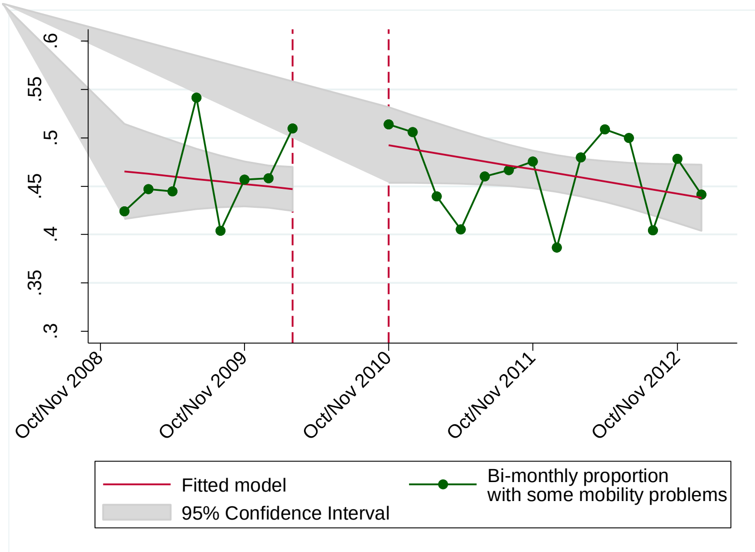


Figure 29: Impact of the Recovery model on reporting problems with mobility on the EQ-5D at 6-months post-injury of VOTOR and VSTR clients

The probability of reporting problems on the EQ-5D mobility item at 6-months was increasing marginally prior to Recovery model implementation, increased substantially at the point of implementation and has been showing a stable/slightly downward trend since (Figure 30).

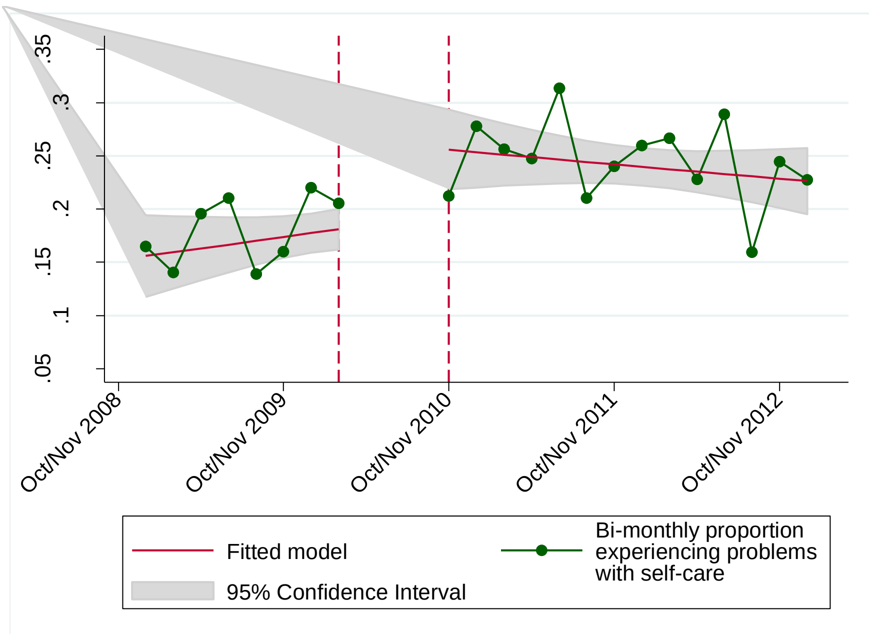


Figure 30: Impact of the Recovery model on reporting problems with self-care on the EQ-5D at 6-months post-injury of VOTOR and VSTR clients

The probability of reporting problems on the EQ-5D usual activities item at 6-months was increasing marginally prior to Recovery model implementation, increased at the point of implementation and has been showing a stable trend since (Figure 31).

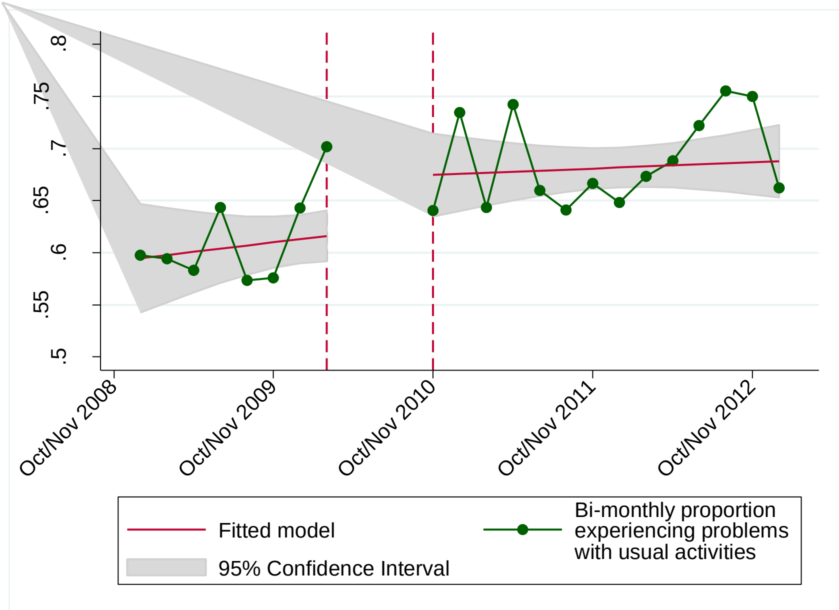


Figure 31: Impact of the Recovery model on reporting problems with usual activities on the EQ-5D at 6-months post-injury of VOTOR and VSTR clients

The probability of reporting problems on the EQ-5D pain or discomfort item at 6-months was stable prior to Recovery model implementation, increased at the point of implementation and has been showing a strong downward trend since (Figure 32).

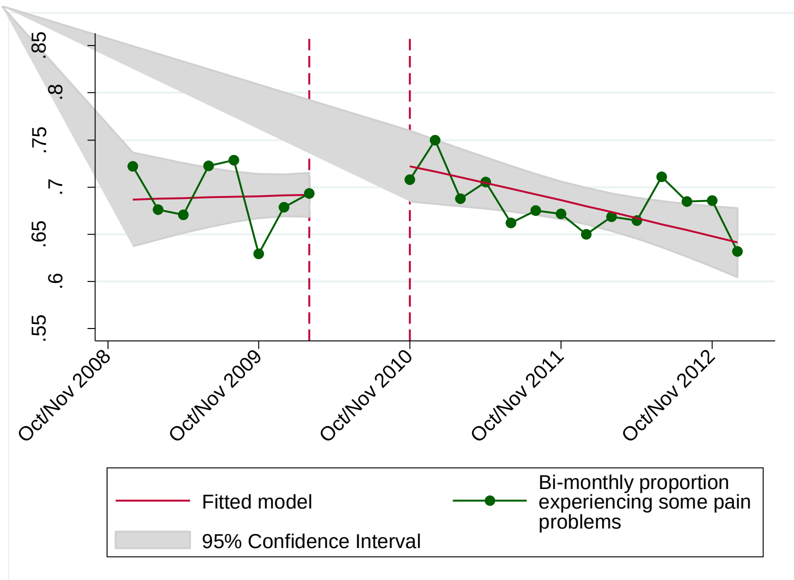


Figure 32: Impact of the Recovery model on reporting problems with pain or discomfort on the EQ-5D at 6-months post-injury of VOTOR and VSTR clients

The probability of reporting problems on the EQ-5D anxiety or depression item at 6-months was increasing prior to Recovery model implementation, relatively stable at the point of implementation and has been showing a stable trend since (Figure 33).

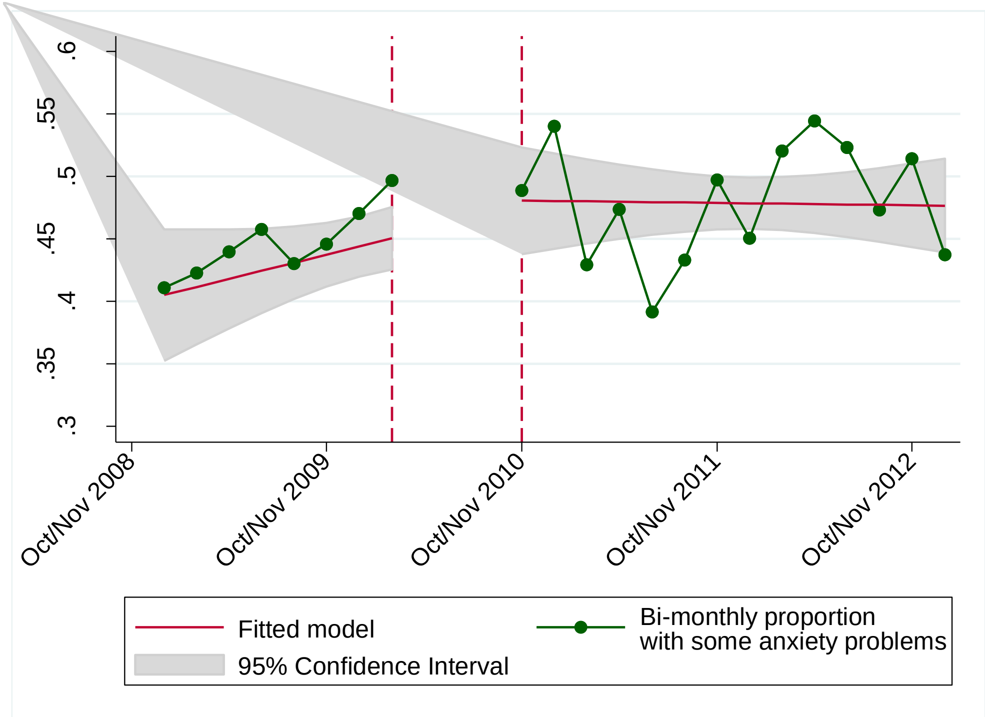


Figure 33: Impact of the Recovery model on reporting problems with anxiety or depression on the EQ-5D at 6-months post-injury of VOTOR and VSTR clients

4.3.2 12-month post-injury outcomes

Table 8 shows the outcomes at 12-months post-injury the Pre-Recovery and Post-Recovery groups. Again, there was consistency in patient-reported and 12-month claim cost outcomes when simply comparing the cases before the Recovery model was implemented with the cases since the Recovery model was implemented (Table 8).

The results of the multivariable segmented regression modelling to quantify the impact of the introduction of the Recovery model on 12-month outcomes of VSTR and VOTOR clients are summarised in Table 9. EQ-5D summary scores were excluded from the modelling due to low numbers of patients in the Pre-Recovery timeframe related to the late inclusion of the EQ-5D in the standardised follow-up for the VSTR and VOTOR.

Table 8: Comparison of outcomes pre and post Recovery model at 12-months- VSTR and VOTOR clients

	N	*Pre-Recovery Outcome** *N (%)*	*N*	*Post-Recovery Outcome* *N (%)*
Good recovery	2346	911 (38.8)	2075	758 (36.5)
Return to work**	1744	1220 (70.0)	1483	1029 (69.4)
Complete recovery	2346	508 (21.7)	2075	425 (20.5)
Moderate/severe persistent pain	1773	456 (25.7)	1637	468 (28.6)
		Mean (SD)		*Mean (SD)*
PCS-12	1744	41.5 (12.1)	1544	40.1 (12.3)
MCS-12	1559	48.7 (11.8)	1544	49.4 (11.7)
EQ-5D summary score	1147	0.66 (0.31)	1924	0.67 (0.30)
Cost ($)	2701	70,296 (68,341)	2231	72,094 (68,964)

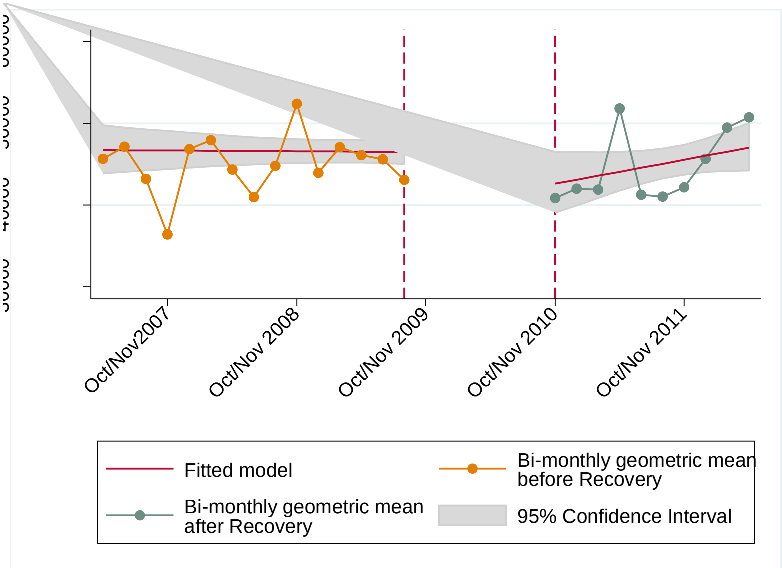
* Similarly patients with a date of injury in the 12 months prior to the introduction of the Recovery model are excluded from the 12 month summary; ** If working prior to injury.

Once again, the baseline period refers to before the introduction of Recovery model. The log odds of the baseline trend showed declining probability of a good functional outcome and increasing probability of reporting moderate to severe persistent pain prior to introduction of the Recovery model (Table 9). There was a no change in the log odds of each of the patient-reported outcomes at the implementation phase of the Recovery model (Table 9). In contrast, there was an immediate 11.1 per cent reduction in costs immediately after introduction of the Recovery model (Table 9). Consistent with the 6-month outcomes in the previous section of the report, there is no evidence of sustained improvement in 12-month outcomes following introduction of the Recovery model (Table 9).

Table 9: Impact of the introduction of the Recovery model on 12-month outcomes – results from the multivariable* segmented regression

Outcome	***Baseline trend Log-odds (95% CI)***	***p-value***	***Level change after Recovery Log-odds (95% CI)***	***p-value***	***Trend change after Recovery Log-odds (95% CI)***	***p-value***
Good recovery	-0.02 (-0.04, -0.003)	0.09	0.09 (-0.18, 0.37)	0.51	0.004 (-0.03, 0.04)	0.82
Return to work**	0.003 (-0.02, 0.03)	0.82	0.09 (-0.25, 0.43)	0.61	-0.03 (-0.07, 0.02)	0.29
Complete recovery	-0.01 (-0.03, 0.02)	0.48	0.16 (-0.16, 0.48)	0.34	-0.01 (-0.06, 0.0032)	0.53
Moderate/severe persistent pain	0.03 (0.004, 0.06)	0.02	-0.13 (-0.46, 0.20)	0.44	-0.02 (-0.06, 0.03)	0.41
	Baseline trend (95% CI)		***Level change after Recovery (95% CI)***		***Trend change after Recovery (95% CI)***	
PCS-12	-0.10 (-0.23, 0.03)	0.13	-0.48 (-2.13, 1.17)	0.57	0.09 (-0.14, 0.32)	0.43
MCS-12	-0.02 (-0.11, 0.14)	0.81	1.27 (-0.36, 2.90)	0.13	-0.14 (-0.37, 0.08)	0.22
	Baseline trend[a] (95% CI)		***Level change after Recovery[b] (95% CI)***		***Trend change after Recovery[c] (95% CI)***	
Cost ($)	0.14 (-0.64, 0.93)	0.73	-11.1 (-20.6, -0.04)	0.04	1.17 (-0.43, 2.80)	0.15

n.b. Patients with a date of injury 12 months prior to the introduction of the Recovery model were excluded from the analysis because their care would be a mixture of the old model and the Recovery model; *All analyses were adjusted for age, gender, road user group, injury group, comorbid status, pre-injury work status and level of education; [a] Percentage change in 12 month costs per 2 month interval; [b] Percentage change in 12 month costs immediately after Recovery was introduced; [c] Percentage change in trend after Recovery compared to percentage change before Recovery was introduced.

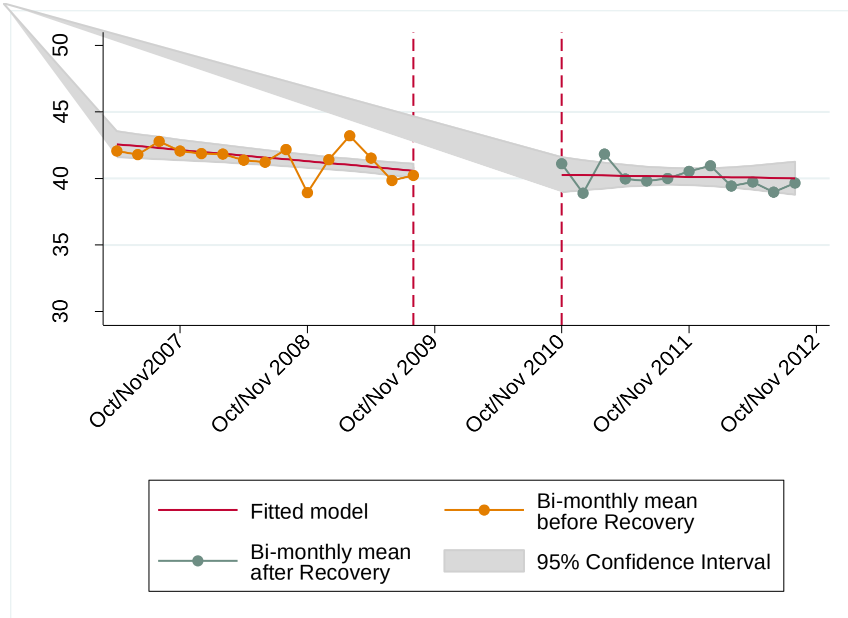


n.b. graph refers to time post-injury rather than post claim lodgement

Figure 34: Impact of the Recovery model on 12-month post-injury claim costs for VOTOR and VSTR clients

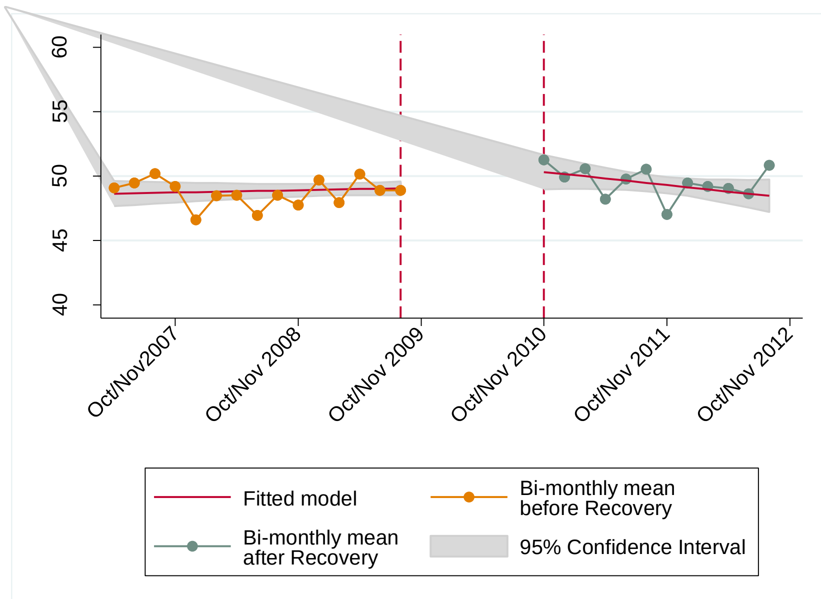
The results of the segmented regression modelling 12-month claim costs as the outcome is shown in Figure 34. Before implementation of the Recovery model, 12-month claim costs were stable. At the point of implementation of the Recovery model, there was evidence of significant drop in claim costs (Table 9). Since introduction of the Recovery model, claim costs appeared relatively stable for a period before increasing sharply in the most recent time periods (Figure 34).

The figures for the PCS-12 and MCS-12 scores at 12-months post-injury are provided as Figure 35 and Figure 36. Both figures show a similar trend of stable or slightly declining health-related quality of life prior to introduction of the Recovery model, little change at the point of implementation and little change following introduction of the Recovery model (Figure 35 and Figure 36).



n.b. graph refers to time post-injury rather than post claim lodgement

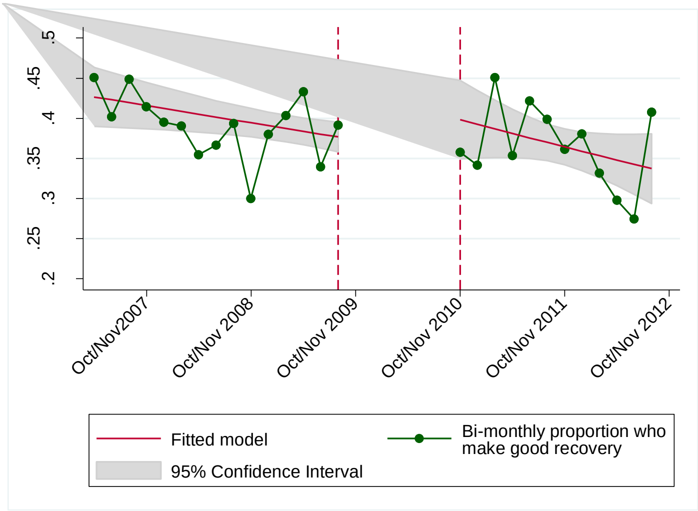
Figure 35: Impact of the Recovery model on physical health at 12-months post-injury of VOTOR and VSTR clients



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 36: Impact of the Recovery model on mental health at 12-months post-injury of VOTOR and VSTR clients

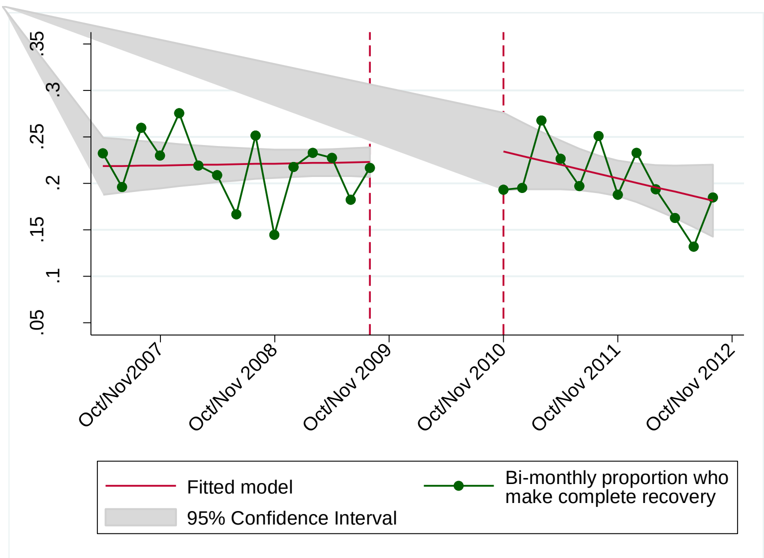
Figure 37 and Figure 38 represent the GOS-E good recovery and complete recovery outcomes at 12-months, respectively. There was a trend for declining probability of a good functional recovery prior to implementation of the Recovery model, slight improvment at the point of implementation and persistent decline since the Recovery model introduction (Figure 37).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 37: Impact of the Recovery model on functional outcomes (GOS-E good recovery) at 12-months post-injury of VOTOR and VOTOR clients

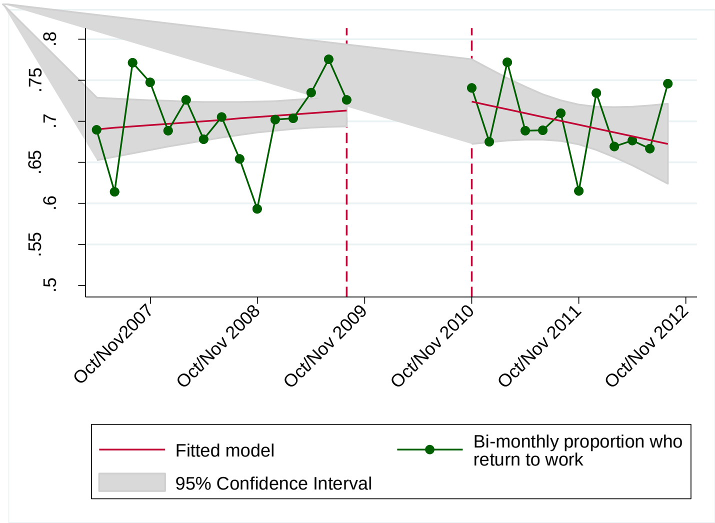
Figure 38 shows stability in the probability of a complete functional recovery at 12-months prior to the introduction of the Recovery model, a small improvement at the point of implementation, and a generalised downward trend since introduction of the Recovery model (Figure 38).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 38: Impact of the Recovery model on functional outcomes (GOS-E complete recovery) at 12-months post-injury of VOTOR and VSTR clients

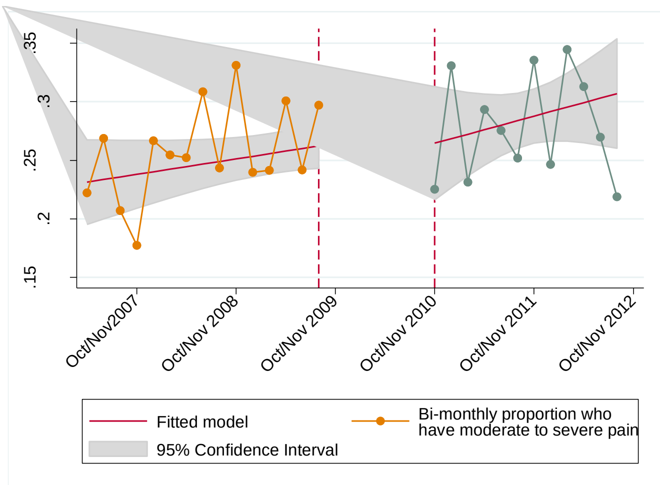
There appears to be little evidence of an impact on 12-month return to work rates for VOTOR clients following implementation of the Recovery model (Table 9 and Figure 39). The rate of return to work appeared to be increasing slightly prior to Recovery model implementation, no change at the point of implementation and then a slight downward trajectory since implementation of the Recovery model (Figure 39).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 39: Impact of the Recovery model on return to work at 12-months post-injury of VOTOR and VSTR clients

The probability of reporting moderate to severe persistent pain at 12-months was increasing slightly prior to the implementation of the Recovery model, changed little at the point of implementation, and there has been an overall, small upward trend since the implamentation of the Recovery model (Figure 40).



n.b. graph refers to time post-injury rather than post claim lodgement

Figure 40: Impact of the Recovery model on reporting moderate to severe persistent pain at 12-months post-injury of VOTOR and VSTR clients

4.4 Relationship between fault status and Recovery client outcomes

4.4.1 Overview of fault status of VOTOR Recovery clients

There were 2,554 VOTOR Recovery cases between September 2010 and January 2013, of which 2,408 had a fault classification from either the police or self-reported indicator, or both. If the police-reported fault was available but the self-reported was unknown then the police-reported classification was used. Similarly, the self-reported classification was used if the police indicator was unknown.

Table 10: Comparison of police-reported and self-reported fault

		Police-reported fault		
		Yes	***Unknown***	***No***
Self-reported	***Yes***	927	37	137
fault	***Unknown***	158	146	156
	No	79	25	889

There were 927 (36.3%) cases where the fault was apportioned to the claimant through self-report and police-report, 889 (34.8%) cases where the claimant was not at fault according to both self- and police-report, and 216 (8.5%) where sources of fault status differed (Table 10). There were 25 cases with a self-reported fault status but no police report, and 37 where the reporting was vice versa. Only 146 cases (5.7%) had no reported fault status from either the TAC client or the police (Table 10).

Of the 216 cases where the sources of fault status differed, 137 (63.4%) of the clients believed they were not at fault when the police reported that they were. Omitting the unknown cases and those where data were only available from one source, the Kappa coefficient was 0.79, indicating substantial agreement between the sources of fault status.

4.4.2 Association between fault status and 6-month outcomes

For analysis, Recovery claims were divided into four categories for analysis:

i. Client at fault

ii. Client admits fault but police reports not at fault

iii. Client denies fault but police reports client is at fault

iv. Client not at fault.

Table 11: Association between VOTOR client outcomes at 6 months and fault (self-reported or police-reported)

Outcome at 6-months	*Fault category*	*N*	*n (%) with outcome*	**AOR (95% CI)*	*p-value*
Good recovery	At fault (reference)	944	306 (32.4)	1.00	
	Client admits fault	68	14 (20.6)	0.49 (0.25, 0.97)	0.04
	Client denies fault	290	79 (27.2)	0.60 (0.43, 0.84)	0.003
	Not at fault	818	232 (28.4)	0.67 (0.52, 0.85)	0.001
Complete recovery	At fault (reference)	944	169 (17.9)	1.00	
	Client admits fault	68	9 (13.2)	0.70 (0.31, 1.62)	0.41
	Client denies fault	290	29 (10.0)	0.49 (0.31, 0.77)	0.002
	Not at fault	818	100 (12.2)	0.62 (0.45, 0.84)	0.002
Return to work	At fault (reference)	702	427 (60.8)	1.00	
	Client admits fault	49	27 (55.1)	0.78 (0.41, 1.49)	0.45
	Client denies fault	172	92 (53.5)	0.62 (0.42, 0.90)	0.01
	Not at fault	608	368 (60.5)	0.80 (0.62, 1.05)	0.10
Moderate/severe persistent pain	At fault (reference)	767	184 (24.0)	1.00	
	Client admits fault	56	21 (37.5)	1.63 (0.88, 3.02)	0.12
	Client denies fault	232	79 (34.1)	1.68 (1.18, 2.38)	0.004
	Not at fault	661	184 (27.8)	1.27 (0.97, 1.66)	0.08
	Mean (sd)		***Mean (sd)***	****Adjusted change from no fault group (95% CI)***	***p-value***
PCS-12	At fault (reference)	720	39.5 (12.1)	0	
	Client admits fault	52	35.8 (10.8)	-2.9 (-6.1, 0.26)	0.07
	Client denies fault	201	37.3 (11.5)	-2.6 (-4.4, -0.8)	0.01
	Not at fault	624	36.7 (11.6)	-2.9 (-4.2, -1.6)	<0.001
MCS-12	At fault (reference)	720	50.5 (11.6)	0	
	Client admits fault	52	47.3 (12.6)	-1.9 (-5.3, 1.4)	0.26
	Client denies fault	201	48.4 (12.2)	-2.4 (-4.3, -0.5)	0.01
	Not at fault	624	49.0 (12.1)	-2.1 (-3.5, -0.8)	0.002
EQ-5D Summary score	At fault (reference)	930	0.67 (0.28)	0	
	Client admits fault	66	0.60 (0.34)	-0.06 (-0.13, 0.01)	0.09
	Client denies fault	285	0.59 (0.30)	-0.07 (-0.11, -0.03)	0.001
	Not at fault	805	0.62 (0.29)	-0.06 (-0.08, -0.03)	<0.001
			Mean (sd)	****Adjusted % change from no fault group (95% CI)***	
Cost	At fault (reference)	976	63,274 (58,979)	0	
	Client admits fault	79	66,193 (56,273)	2.9 (-15.6, 25.6)	0.78
	Client denies fault	300	59,682 (50,680)	3.9 (-7.3, 16.6)	0.51
	Not at fault	825	64,024 (57,630)	5.0 (-3.5, 14.3)	0.26

*Adjusted for age, sex, comorbidities, education level, prior work history, injury group and cause of injury

The proportion of clients who had attained a good or complete recovery at 6 months was lower in the no-fault and disputed groups when compared to the at-fault group (Table 11). After adjusting for key potential confounders of the relationship between fault status and outcomes, the clients who were not at fault, or who believed they were not at fault despite the police reporting that they were, demonstrated significantly lower adjusted odds of a good (or complete) functional outcome at 6-months, when compared to TAC Recovery clients who were at fault (Table 11).

TAC Recovery clients who reported being at fault despite the police reporting that they were not, demonstrated similar risk-adjusted odds of return to work and reporting moderate to severe pain when compared to TAC clients who were at fault (Table 11). For these outcomes, the risk-adjusted odds of a poorer outcome were not different for TAC clients who were not at fault, when compared to those at fault. However, where the client reported that they were not at fault and the police report said they were, the adjusted odds of reporting moderate to severe pain were significantly higher, and the adjusted odds of returning to work were significantly lower, when compared to “at fault” Recovery clients (Table 11).

TAC Recovery clients who were not at fault, or reported they were not at fault in contrast to the police report, demonstrated significantly poorer risk-adjusted health-related quality of life outcomes at 6-months (measured using the PCS-12, MCS-12 and EQ-5D summary score), when compared to “at fault” Recovery clients (Table 11). There was no association between fault status and claim costs at 6-months (Table 11).

4.4.3 Association between fault status and 12-month outcomes

Table 12 shows the results of the analyses of the association between fault status and 12-month outcomes. The findings were largely consistent with the 6-month outcomes. There was no association between fault status and return to work rates, or prevalence of moderate to severe persistent pain at 12-months (Table 12). The group where the client reported that they were at fault when the police report suggested they were not at fault for the crash behaved similarly to the “at fault” group for all outcomes (Table 12). Not at fault TAC Recovery clients demonstrated poorer risk-adjusted functional, physical health (PCS-12) and EQ-5D health status at 12-months post-injury compared to “at fault” clients. Twelve month claim costs were also 8.9 per cent higher when compared to “at fault” clients, but this failed to reach significance (Table 12).

TAC Recovery clients who reported that they were not at fault when the police report indicated that they were demonstrated significantly poorer risk-adjusted functional and health-related quality of life outcomes when compared to “at fault” clients. Adjusted odds of a good recovery and a complete functional recovery were 37 and 62 per cent lower than “at fault” clients, respectively (Table 12). Adjusted mean difference PCS-12 and MCS-12 scores more than 3 points lower than "at fault" clients. Adjusted mean EQ-5D summary scores were 0.08 points lower than "at fault" clients (Table 12).

Table 12: Relationship between outcomes at 12 months and fault (self-reported or police-reported)

Outcome at 6-months	***Fault category***	***N***	***n (%) with outcome***	****AOR (95% CI)***	***p-value***
Good recovery	At fault (reference)	768	293 (38.2)	1.00	
	Client admits fault	67	23 (34.3)	0.80 (0.44, 1.46)	0.48
	Client denies fault	249	75 (30.1)	0.63 (0.44, 0.89)	0.01
	Not at fault	642	211 (32.9)	0.69 (0.53, 0.89)	0.01
Complete recovery	At fault (reference)	768	185 (24.1)	1.00	
	Client admits fault	67	14 (20.9)	0.73 (0.36, 1.50)	0.39
	Client denies fault	249	29 (11.7)	0.38 (0.24, 0.61)	<0.001
	Not at fault	642	110 (17.1)	0.56 (0.41, 0.77)	<0.001
Return to work	At fault (reference)	567	392 (69.1)	1.00	
	Client admits fault	47	32 (68.1)	0.89 (0.44, 1.82)	0.75
	Client denies fault	145	98 (67.6)	0.83 (0.53, 1.30)	0.43
	Not at fault	485	333 (68.7)	0.82 (0.60, 1.12)	0.21
Moderate/severe persistent pain	At fault (reference)	605	165 (27.3)	1.00	
	Client admits fault	55	16 (29.1)	1.18 (0.61, 2.26)	0.63
	Client denies fault	188	61 (32.5)	1.38 (0.93, 1.04)	0.11
	Not at fault	514	143 (27.8)	1.16 (0.86, 1.56)	0.35
	Mean (sd)		***Mean (sd)***	****Adjusted change from no fault group (95% CI)***	***p-value***
PCS-12	At fault (reference)	576	41.4 (12.7)	0	
	Client admits fault	50	38.9 (11.4)	-2.7 (-6.1, 0.7)	0.12
	Client denies fault	171	38.1 (12.0)	-3.3 (-5.4, -1.3)	0.001
	Not at fault	484	38.5 (11.6)	-3.7 (-5.1, -2.2)	<0.001
MCS-12	At fault (reference)	576	50.2 (11.9)	0	
	Client admits fault	50	47.4 (12.4)	-2.97 (-6.1, 0.8)	0.13
	Client denies fault	171	47.2 (11.9)	-3.6 (-5.6, -1.5)	0.001
	Not at fault	484	49.6 (11.4)	-1.4 (-2.9, 0.1)	0.07
EQ-5D Summary score	At fault (reference)	756	0.70 (0.28)	0	
	Client admits fault	66	0.66 (0.31)	-0.03 (-0.11, 0.04)	0.35
	Client denies fault	241	0.61 (0.31)	-0.08 (-0.13, -0.04)	<0.001
	Not at fault	626	0.65 (0.29)	-0.06 (-0.09, -0.03)	<0.001
			Mean (sd)	****Adjusted % change from no fault group (95% CI)***	
Cost	At fault (reference)	808	71,533 (70,668)	0	
	Client admits fault	74	74,509 (66,742)	0.9 (-19.4, 26.4)	0.94
	Client denies fault	266	68,916 (61,146)	7.2 (-6.1, 22.5)	0.30
	Not at fault	691	75,905 (70,130)	8.9 (-1.5, 20.4)	0.10

*Adjusted for age, sex, comorbidities, education level, prior work history, injury group and cause of injury

4.4.4 Association between fault status and change over time in outcomes

To assess whether the rate of change in outcomes differed according to fault status, multilevel mixed effects regression models were fitted with an interaction term between fault status and time post-injury (6 and 12-months). The results are shown in Table 13.

The rate of recovery did not differ by fault status for any of the patient-reported outcomes, but there was a significant interaction between fault status group and costs (Table 13). The rate of increase in costs from 6 to 12-months post-injury was highest for cases "not at fault" and those where the claimant denied fault when the police report stated that they were at fault (Table 13).

Table 13: Association between fault status and rate of recovery

	At fault *AOR (95% CI)*	*Client admits fault* *AOR (95% CI)*	*Client denies fault* *AOR (95% CI)*	*Not at fault* *AOR (95% CI)*	*Interaction p-value*
Good recovery	1.56 (1.14, 2.15)	4.81 (1.32, 17.6)	1.62 (0.90, 2.90)	1.77 (1.24, 2.54)	0.99
Complete recovery	1.88 (1.34, 2.65)	2.58 (0.64, 10.4)	1.38 (0.66, 2.87)	2.13 (1.40, 3.26)	0.99
Return to work	2.94 (1.86, 4.66)	4.55 (1.02, 20.2)	7.63 (2.93, 19.9)	3.38 (2.04, 5.62)	0.99
Moderate/severe persistent pain	1.19 (0.87, 1.64)	0.69 (0.24, 1.95)	0.89 (0.48, 1.54)	1.10 (0.78, 1.55)	0.71
	Adjusted mean change (95% CI) From 6 to 12-months	***Adjusted mean change (95% CI) From 6 to 12-months***	***Adjusted mean change (95% CI) From 6 to 12-months***	***Adjusted mean change (95% CI) From 6 to 12-months***	***Interaction p-value***
PCS-12	2.2 (1.4, 2.9)	2.1 (-0.6, 4.8)	1.9 (0.5, 3.3)	1.7 (0.8, 2.5)	0.86
MCS-12	-0.1 (-1.0, 0.8)	-0.6 (-3.8, 2.6)	-0.9 (-2.6, 0.7)	0.2 (-0.8, 1.2)	0.70
EQ-5D summary score	0.03 (0.01, 0.05)	0.05 (-0.01, 0.12)	0.01 (-0.02, 0.05)	0.02 (0.002, 0.04)	0.78
	Adjusted % change (95% CI) From 6 to 12-months	***Adjusted % change (95% CI) From 6 to 12-months***	***Adjusted % change (95% CI) From 6 to 12-months***	***Adjusted % change (95% CI) From 6 to 12-months***	***Interaction p-value***
Cost ($)	11.1 (9.8, 12.4)	10.0 (5.7, 14.5)	14.1 (11.7, 16.5)	16.0 (14.5, 17.5)	<0.001

*Adjusted for age, sex, comorbidities, education level, prior work history, injury group and cause of injury

4.5 Costs of severe pelvic ring fractures

There were 535 severe pelvic ring fractures recorded by the VSTR between January 2003 and January 2013 (inclusive), and definitively managed at The Alfred or RMH. Of these, 372 (69.5%) were classified as TAC cases and 301 (80.9%) survived to hospital discharge. Of the 301 survivors to hospital discharge, 280 (93.0%) were successfully linked with TAC claims data; 162 at The Alfred and 128 at RMH (Figure 41)

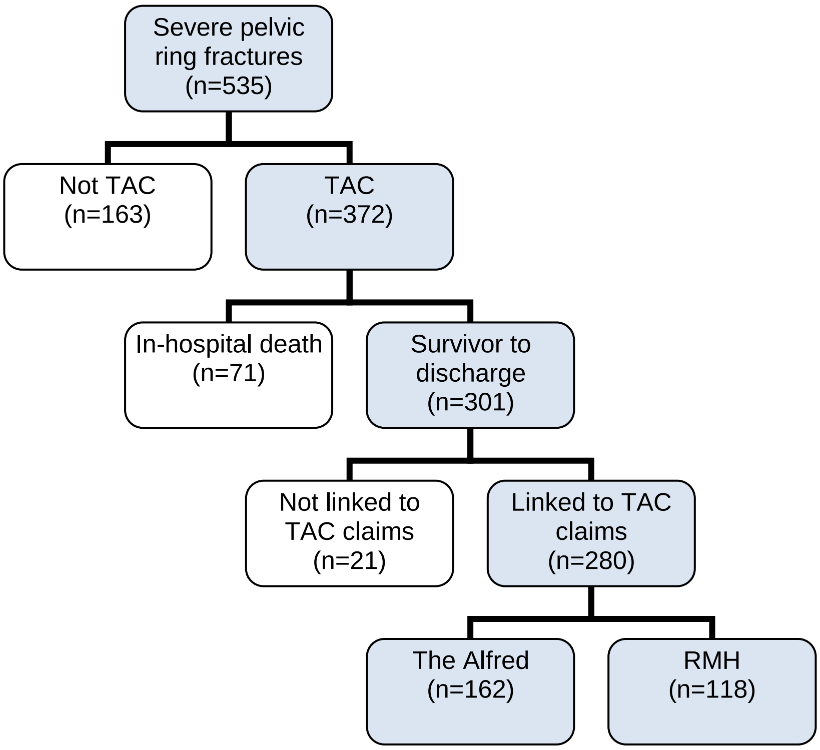


Figure 41: Flowchart of linkage of severe pelvic ring fractures with TAC claim costs data

4.5.1 Costs by definitive hospital of care

The profile of severe pelvic ring fractures by definitive hospital of care is shown in Table 14. The age and gender profile of severe pelvic ring fracture cases was consistent between the hospitals of definitive care. The proportion with a recorded comorbidity was higher at The Alfred (Table 14). A higher proportion of severe pelvic ring fractures definitively managed at RMH resulted from motorcycle crashes and pedestrian incidents (Table 14). The overall ISS was higher for cases managed at The Alfred, although the proportion of cases with severe head, abdominal or thoracic injuries was consistent between the hospitals of definitive care (Table 14).

Cases managed at RMH included a higher proportion of patients with complete posterior pelvic arch disruption and a higher proportion with a “critical” (AIS severity score 5) classification. The proportion of cases managed non-operatively was higher at RMH, while the proportion managed with internal fixation was lower at RMH when compared to The Alfred (58% vs. 70%). External fixation was more commonly used at The Alfred (72%) than at RMH (34%). Most cases at both hospitals were managed by the Recovery (previously Benefit Delivery) division of TAC claims (Table 14).

Table 14: Characteristics of severe pelvic ring fractures by hospital (n=280)

Population descriptor		The Alfred (n=162)	RMH (n=118)
Age group	N (%)		
	15-34 years	80 (49.4)	51 (43.2)
	35-64 years	62 (38.3)	49 (41.5)
	≥ 65 years	20 (12.4)	18 (15.3)
Gender	N (%)		
	Male	106 (65.4)	79 (67.0)
	Female	56 (34.6)	39 (33.0)
Charlson Comorbidity Index weight	N (%)		
	None	104 (64.2)	88 (74.6)
	≥ 1	46 (28.4)	24 (20.3)
		12 (7.4)	6 (5.1)
Road user group	N (%)		
	Motor vehicle	87 (53.7)	45 (38.1)
	Motorcycle	39 (24.1)	38 (32.2)
	Pedestrian	31 (19.1)	27 (22.9)
	Other	5 (3.1)	8 (6.8)
Posterior arch injury	N (%)		
	Incomplete	37 (22.8)	24 (20.3)
	Complete	125 (77.2)	94 (79.7)
Pelvic fracture severity score	N (%)		
	AIS 4	142 (87.7)	91 (77.1)
	AIS 5	20 (12.3)	27 (22.9)
Definitive fracture management	N (%)		
	Non-operative	20 (12.4)	34 (28.8)
	External fixation only	29 (17.9)	16 (13.6)
	External fixation and ORIF	88 (54.3)	24 (20.3)
	ORIF only	25 (15.4)	44 (37.3)
Injury Severity Score	Median (IQR)	33 (24-41)	29 (24-41)
Severe head injury	N (%) Yes	23 (14.2)	16 (13.6)
Severe chest injury	N (%) Yes	25 (15.4)	14 (11.9)
Severe abdominal injury	N (%) Yes	22 (13.6)	17 (14.4)
TAC claim division	N (%)		
	Recovery	119 (73.5)	90 (76.3)
	Independence	43 (26.5)	28 (23.7)
Hospital length of stay	Median (IQR) days	17.7 (11.1-27.7)	19.2 (11.1-32.1)

The median costs incurred in-hospital increased by less than $10,000 for The Alfred cases in the 24-months after injury, but increased by more than $19,000 at RMH from the 6-month figure. At each time point, the median costs incurred by TAC for severe pelvic ring fractures was lower for RMH managed cases compared to cases managed at The Alfred (Table 15). The estimated lifetime costs for severe pelvic ring fractures managed at The Alfred was almost $50,000 higher (Table 15).

Table 15: TAC claim costs for severe pelvic ring fractures by hospital

Type of cost		**The Alfred (n=162)**	**RMH (n=118)**
In-hospital	Median (IQR) $		
	6-months	165,464 (96,387-220,944)	143,020 (73,539-227,878)
	12-months	167,060 (99,249-231,254)	152,153 (73,467-229,782)
	24-months	173,716 (101,198-235,041)	162,225 (92,674-249,530)
Out of hospital	Median (IQR) $		
	6-months	4,840 (2,331-7,085)	3,484 (1,953-5,808)
	12-months	10,192 (6,056-18,177)	7,824 (3,006-15,254)
	24-months	17,071 (8,295-30,327)	15,254 (5,134-31,678)
Loss of earnings	Median (IQR) $		
	6-months	17,541 (11,589-28,274)	16,881 (9,958-25,713)
	12-months	31,338 (16,594-49,471)	28,973 (11,645-49,194)
	24-months	45,867 (19,920-76,604)	46,918 (15,808-89,906)
Other costs	Median (IQR) $		
	6-months	10,273 (5,487-15,320)	7,642 (3,255-13,419)
	12-months	12,796 (8,422-19,999)	10,349 (3,655-17,158)
	24-months	31,994 (13,691-64,003)	20,638 (9,361-51,990)
Estimated total lifetime	Median (IQR) $	312,455 (199,551-440,484)	262,476 (136,982-471,106)

The differences in costs reported here differ to the results of Project number GE-M-11-026 “Classification, management and outcomes of severe pelvic ring fractures” where the costs were substantially higher at RMH when compared to The Alfred. The previous study focused on a 3-year (July 2007 to June 2010) group of severe pelvic ring fractures and the number of linked TAC cases for analysis was low (n=50 at The Alfred and n=26) at RMH. As Figure 42 shows, using 6-month in-hospital costs as an example, the median costs incurred by TAC differ substantially by hospital over time, reflecting the relatively small number of cases that occur in each year. The timeframe of cases used in Project number GE-M-11-026 coincided with high cost years for RMH (Figure 42).

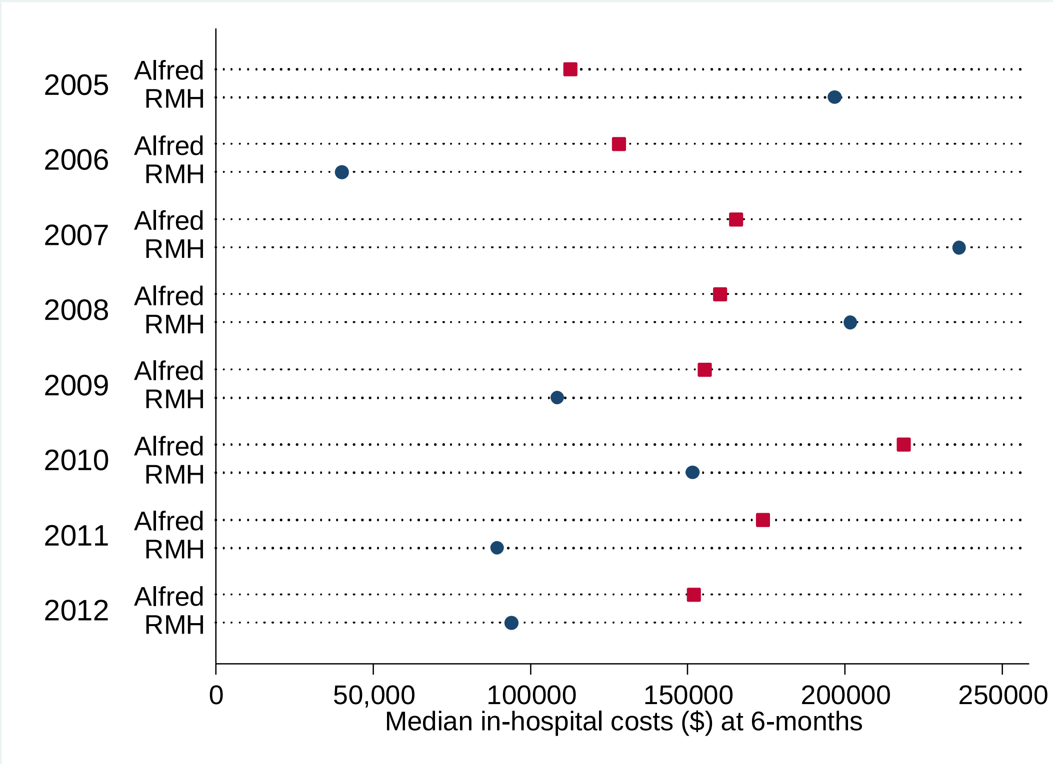


Figure 42: Median in-hospital costs at 6-months for severe pelvic ring fractures by year and hospital of definitive care (red=Alfred, blue=RMH)

Univariate and multivariate negative binomial models were fitted using a GLM to obtain the unadjusted, and adjusted ratio of arithmetic mean costs between the hospitals. The multivariate models were fitted with road user group, ISS, comorbid status, and the AIS severity score of the pelvic fracture as these factors were shown to differ between the hospitals (Table 14). The type of management was not fitted as this reflects the differences in clinical practice at each hospital and is addressed in the next section of this report.

At 6, 12 and 24-months post-injury, the in-hospital costs for severe pelvic ring fracture cases surviving to hospital discharge were comparable for cases managed at RMH when compared to The Alfred (Table 3). The risk-adjusted out-of-hospital costs were 22 per cent, and 20 per cent, lower at RMH at 6-months and 12-months post-injury, respectively (Table 16). By 24-months post-injury, there was no association between hospital and out-of-hospital costs (Table 16). There was no association between loss of earnings payments, other costs, or estimated lifetime claim costs, and hospital of definitive care for severe pelvic ring fractures (Table 16).

Table 16: Association between hospital of definitive care and TAC claim costs for severe pelvic ring fractures

		IRR (95% CI)	Adjusted* IRR (95% CI)
In-hospital costs			
6-months	The Alfred (reference)	1.00	1.00
	RMH	0.91 (0.78, 1.07)	0.91 (0.81, 1.03)
12-months	The Alfred (reference)	1.00	1.00
	RMH	0.96 (0.81, 1.13)	0.95 (0.83, 1.08)
24-months	The Alfred (reference)	1.00	1.00
	RMH	1.07 (0.89, 1.28)	1.06 (0.91, 1.23)
Out of hospital costs			
6-months	The Alfred (reference)	1.00	1.00
	RMH	0.75 (0.61, 0.93)	0.78 (0.62, 0.96)
12-months	The Alfred (reference)	1.00	1.00
	RMH	0.83 (0.67, 1.03)	0.80 (0.64, 1.00)
24-months	The Alfred (reference)	1.00	1.00
	RMH	0.94 (0.73, 1.22)	0.86 (0.66, 1.14)
Loss of earnings payments			
6-months	The Alfred (reference)	1.00	1.00
	RMH	0.92 (0.74, 1.13)	0.85 (0.69, 1.06)
12-months	The Alfred (reference)	1.00	1.00
	RMH	0.94 (0.74, 1.18)	0.84 (0.66, 1.06)
24-months	The Alfred (reference)	1.00	1.00
	RMH	1.04 (0.79, 1.38)	0.95 (0.70, 1.28)
Other TAC claim costs			
6-months	The Alfred (reference)	1.00	1.00
	RMH	0.93 (0.76, 1.13)	0.87 (0.72, 1.07)
12-months	The Alfred (reference)	1.00	1.00
	RMH	1.06 (0.84, 1.35)	0.86 (0.69, 1.09)
24-months	The Alfred (reference)	1.00	1.00
	RMH	1.08 (0.81, 1.43)	0.95 (0.72, 1.26)
Estimated lifetime costs			
	The Alfred (reference)	1.00	1.00
	RMH	1.11 (0.88, 1.40)	0.96 (0.79, 1.25)

* Adjusted for comorbid status, pelvic fracture severity, ISS, and road user group

4.5.1 Costs by management approach

The profile of severe pelvic ring fractures by management approach is shown in Table 17. Severe pelvic ring fracture patients managed non-operatively or with external fixation only included a higher proportion of older and female patients, a higher proportion with severe chest and/or head injuries, and a higher proportion managed by the Independence (previously Community Support) division of the TAC (Table 17). The profile of cases managed with internal fixation only was similar to those managed using internal and external fixation, except for a greater degree of severity in the combined treatment group (Table 17).

Table 17: Characteristics of severe pelvic ring fractures by management approach (n=280)

Population descriptor		Non-operative (n=54)	External fixation only (n=45)	Internal & External fixation (n=112)	Internal fixation only (n=69)
Age group	N (%)				
	15-34 years	19 (35.2)	22 (48.9)	55 (49.1)	35 (50.7)
	35-64 years	20 (37.0)	14 (31.1)	49 (43.8)	28 (40.6)
	≥ 65 years	15 (27.8)	9 (20.0)	8 (7.1)	6 (8.7)
Gender	N (%)				
	Male	26 (48.2)	26 (57.8)	80 (71.4)	53 (76.8)
	Female	28 (51.8)	19 (42.2)	32 (28.6)	16 (23.2)
Charlson Comorbidity Index weight	N (%)				
	None	43 (79.6)	31 (68.9)	68 (60.7)	50 (72.5)
	≥ 1	11 (20.4)	14 (31.1)	44 (39.3)	19 (27.5)
Road user group	N (%)				
	Motor vehicle	27 (50.0)	23 (51.1)	52 (46.4)	30 (43.5)
	Motorcycle	10 (18.5)	8 (17.8)	32 (28.6)	27 (39.1)
	Pedestrian	14 (25.9)	11 (24.4)	24 (21.4)	9 (13.0)
	Other	3 (5.6)	3 (6.7)	4 (3.6)	3 (4.4)
Posterior arch injury	N (%)				
	Incomplete	13 (24.1)	11 (24.4)	22 (19.6)	15 (21.7)
	Complete	41 (75.9)	34 (75.6)	90 (80.4)	54 (78.3)
Pelvic fracture severity score	N (%)				
	AIS 4	46 (85.2)	38 (84.4)	88 (78.6)	61 (88.4)
	AIS 5	8 (14.8)	7 (15.6)	24 (21.4)	8 (11.6)
Injury Severity Score	Median (IQR)	34 (25-44)	34 (24-43)	32 (25-41)	29 (23-35)
Severe head injury	N (%) Yes	10 (18.5)	9 (20.0)	10 (8.9)	10 (14.5)
Severe chest injury	N (%) Yes	10 (18.5)	10 (22.2)	12 (10.7)	7 (10.1)
Severe abdominal injury	N (%) Yes	1 6 (11.1)	8 (17.7)	19 (17.0)	6 (8.7)
TAC claim division	N (%)				
	Independence	18 (33.3)	15 (33.3)	23 (20.5)	15 (21.7)
	Recovery	36 (66.7)	30 (66.7)	89 (79.5)	54 (78.3)
Hospital length of stay	Median (IQR) days	19.9 (9.9-32.9)	23.7 (12.1-35.7)	19.4 (13.9-29.8)	13.1 (8.8-19.6)

Table 18 shows the median (IQR) in-hospital, out-of-hospital, loss of earnings and other TAC claim costs at 6-months, 12-months and 24-months post-injury. Estimated lifetime claim costs are also shown (Table 18). In-hospital costs were lowest at every time point after injury for the group managed using open reduction and internal fixation (ORIF) only. The in-hospital costs increased marginally over time for each management group, indicating that the bulk of the in-hospital costs are borne from the index admission (Table 18).

Out-of-hospital costs differed little between the management groups at 6-months and 12-months, but were substantially higher for the non-operative group, and those managed with a combination of internal and external fixation, at 24-months post-injury (Table 18). Loss of earnings payments were highest for the groups that were managed with internal fixation, which is likely to reflect the much higher proportion of working age adults in these groups (Table 17).

Other claims costs were comparable between the management groups at 6-months and 12-months post-injury , but increased from 12-months to 24-months for patients who were managed with external fixation (alone) or with external fixation and internal fixation (Table 18). Estimated lifetime claim costs were substantially lower for the group managed with internal fixation alone (Table 18).

Table 18: TAC claim costs for severe pelvic ring fractures by management approach

Type of cost		**Non-operative (n=54)**	**External fixation only (n=45)**	**Internal & External fixation (n=112)**	**Internal fixation only (n=69)**
In-hospital	Median (IQR) $				
	6-months	158,060 (54,805-234,571)	198,855 (95,786-282,725)	174,512 (116,828-229,395)	101,511 (67,038-152,662)
	12-months	158,656 (57,940-231,571)	198,874 (87,125-295,567)	176,611 (116,828-241,328)	104,856 (67,038-154,244)
	24-months	165,464 (77,664-249,530)	209,211 (92,674-300,606)	179,405 (123,234-247,725)	116,083 (67,038-175,749)
Out of hospital	Median (IQR) $				
	6-months	4,535 (2,761-6,877)	4,235 (1,711-6,431)	4,667 (2,171-6,824)	3,562 (2,123-7,044)
	12-months	10,479 (4,796-17,706)	8,357 (4,959-16,226)	11,196 (6,100-18,619)	7,288 (2,971-12,320)
	24-months	16,292 (5,382-30,485)	12,710 (6,687-26,875)	20,479 (8,976-33,016)	12,159 (4,882-19,578)
Loss of earnings	Median (IQR) $				
	6-months	17,085 (10,051-25,901)	15,027 (10,042-20,519)	19,398 (11,852-29,770)	16,476 (11,500-24,571)
	12-months	28,042 (15,203-47,889)	21,057 (10,672-39,512)	37,756 (16,660-52,828)	25,028 (16,516-43,471)
	24-months	43,265 (20,451-90,981)	46,424 (14,828-65,991)	59,447 (31,233-89,101)	59,972 (14,060-50,130)
Other costs	Median (IQR) $				
	6-months	8,277 (3,477-13,454)	11,372 (4,393-15,096)	9,562 (5,327-15,350)	8,617 (3,258-12,495)
	12-months	11,130 (5,262-16,165)	14,817 (7,118-25,946)	12,744 (7,441-22,349)	9,408 (4,294-14,466)
	24-months	16,427 (8,775-47,056)	42,371 (14,981-65,494)	33,920 (15,393-64,003)	15,630 (8,875-42,993)
Estimated total lifetime	Median (IQR) $	305,879 (76,123-616,021)	289,220 (203,885-471,106)	340,490 (219,696-479,213)	197,717 (134,033-333,795)

Univariate and multivariate negative binomial models were fitted using a GLM to obtain the unadjusted, and adjusted ratio of arithmetic mean costs between the management groups. The multivariate models were fitted with age group, gender, road user group, ISS, comorbid status, and the AIS severity score of the pelvic fracture, severe head and chest injury indicators, and TAC claim division as these factors differed between the management approaches (Table 17).

Table 19: Association between management approach and TAC in-hospital and out-of hospital costs for severe pelvic ring fractures

		IRR (95% CI)	Adjusted* IRR (95% CI)
In-hospital costs			
6-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.84 (0.68, 1.03)	0.72 (0.61, 0.85)
	External fixation only	1.04 (0.84, 1.29)	0.91 (0.77, 1.07)
	Internal fixation only	0.64 (0.53, 0.77)	0.71 (0.62, 0.82)
12-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.86 (0.69, 1.07)	0.73 (0.61, 0.87)
	External fixation only	1.00 (0.80, 1.26)	0.89 (0.74, 1.06)
	Internal fixation only	0.64 (0.52, 0.78)	0.70 (0.60, 0.82)
24-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.92 (0.73, 1.16)	0.78 (0.64, 0.96)
	External fixation only	1.04 (0.81, 1.35)	0.90 (0.74, 1.10)
	Internal fixation only	0.66 (0.53, 0.84)	0.75 (0.62, 0.90)
Out of hospital costs			
6-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	1.04 (0.77, 1.40)	1.22 (0.90, 1.66)
	External fixation only	1.07 (0.75, 1.47)	1.13 (0.82, 1.56)
	Internal fixation only	1.00 (0.77, 1.29)	1.02 (0.79, 1.32)
12-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.89 (0.66, 1.20)	0.91 (0.66, 1.25)
	External fixation only	0.91 (0.67, 1.25)	0.89 (0.65, 1.22)
	Internal fixation only	0.74 (0.57, 0.98)	0.78 (0.59, 1.02)
24-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.82 (0.59, 1.16)	0.80 (0.56, 1.15)
	External fixation only	0.97 (0.67, 1.42)	0.83 (0.57, 1.22)
	Internal fixation only	0.82 (0.59, 1.15)	0.88 (0.63, 1.22)

* Adjusted for age, gender, comorbid status, pelvic fracture severity, ISS, TAC claim division, severe head injury, severe chest injury, and road user group

There was no association between management approach and out-of-hospital costs after adjusting for differences in case-mix between the groups (Table 19). In contrast, the in-hospital costs were significantly lower for patients managed non-operatively, and with internal fixation only, when compared to patients managed with both internal and external fixation (Table 19).

Compared to patients managed with internal and external fixation, the adjusted mean loss of earnings payments and other costs was significantly lower for patients managed using internal fixation only at 24-months post-injury (Table 20). At each time point, non-operatively managed cases demonstrated significantly lower adjusted mean "other" costs when compared to patients managed with internal and external fixation (Table 20). After adjusting for key differences in patient case-mix, the adjusted mean projected lifetime claim costs were 29 per cent lower for externally fixed severe pelvic ring fracture cases, and 32 per cent lower for those managed with internal fixation only, compared to cases managed using internal and external fixation (Table 20).

Table 20: Association between management approach and TAC loss of earning, other and projected lifetime costs for severe pelvic ring fractures

		IRR (95% CI)	Adjusted* IRR (95% CI)
Loss of earnings payments			
6-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.88 (0.64, 1.22)	0.97 (0.69, 1.35)
	External fixation only	0.76 (0.56, 1.04)	0.75 (0.55, 1.03)
	Internal fixation only	0.90 (0.70, 1.16)	0.88 (0.68, 1.13)
12-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.86 (0.61, 1.23)	0.96 (0.66, 1.38)
	External fixation only	0.72 (0.52, 1.01)	0.68 (0.48, 0.96)
	Internal fixation only	0.84 (0.63, 1.11)	0.77 (0.59, 1.02)
24-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.93 (0.62, 1.40)	0.97 (0.63, 1.49)
	External fixation only	0.78 (0.53, 1.16)	0.71 (0.48, 1.07)
	Internal fixation only	0.70 (0.49, 0.98)	0.58 (0.40, 0.82)
Other TAC claim costs			
6-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	1.01 (0.76, 1.34)	0.69 (0.52, 0.92)
	External fixation only	0.97 (0.72, 1.30)	0.85 (0.65, 1.12)
	Internal fixation only	0.94 (0.73, 1.22)	0.83 (0.65, 1.03)
12-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.88 (0.63, 1.22)	0.57 (0.42, 0.76)
	External fixation only	1.01 (0.71, 1.42)	0.83 (0.62, 1.10)
	Internal fixation only	0.81 (0.60, 1.10)	0.78 (0.61, 1.01)
24-months	Internal & external fixation (reference)	1.00	1.00
	Non-operative	0.98 (0.67, 1.41)	0.68 (0.48, 0.96)
	External fixation only	1.04 (0.70, 1.57)	0.92 (0.64, 1.32)
	Internal fixation only	0.73 (0.51, 1.06)	0.66 (0.47, 0.91)
Estimated lifetime costs			
	Internal & external fixation (reference)	1.00	1.00
	Non-operative	1.06 (0.76, 1.48)	0.77 (0.59, 1.00)
	External fixation only	0.96 (0.68, 1.35)	0.71 (0.54, 0.92)
	Internal fixation only	0.75 (0.59, 1.03)	0.68 (0.54, 0.84)

* Adjusted for age, gender, comorbid status, pelvic fracture severity, ISS, TAC claim division, severe head injury, severe chest injury, and road user group

4.6 Costs of tibial plafond fractures

There were 106 tibial plafond fractures sustained by 103 patients in the VOTOR sub-project investigating the outcomes of tibial plafond fractures. The cases studied in this project involved injuries sustained between 2003 and 2009. Of the 103 patients, 57 were coded as TAC funded cases. Fifteen were registered by VOTOR in 2003 and 2004, the years corresponding to low linkage rates with the TAC claims data due to incomplete claim numbers from The Alfred. Of the 42 cases remaining, 41 could be successfully linked with the TAC claims data in the current linkage exercise. There were insufficient cases to model the claim costs by hospital of management or by management approach and therefore the results are not presented here.

5. Summary of findings

The results presented in this report represent the third linkage of VOTOR and TAC claims data. There were four separate *a priori* research questions. Each question was addressed in this report, and the results are briefly discussed here.

5.1 What has been the impact of the TAC2015 Recovery model on patient-reported and TAC scheme outcomes for VOTOR clients?

The analyses presented in this report provide an updated, and extended, analysis of the impact of the Recovery model presented in Research Report # 0213-007-R4C. The updated linkage allowed additional cases, and the EQ-5D outcome measure, to be included. However, there were insufficient cases in the period before Recovery to support the EQ-5D outcome for the 12-month models.

Of the 5,698 VOTOR Recovery clients successfully linked, almost half also met major trauma criteria, and there were few additional VSTR cases which were classified as Recovery but did not meet VOTOR criteria, and hence the findings with the latter cases included were consistent with the analyses including cases meeting VOTOR criteria. Separating the VOTOR major trauma cases from the VOTOR cases would have halved the cases available for each model, and leading to low precision of the model estimates. Therefore, the analyses were presented as all VOTOR cases, and then with VOTOR and VSTR (not meeting VOTOR criteria) included.

In the previous report, (# 0213-007-R4C), there was early evidence of a beneficial impact of the Recovery model on VOTOR patient outcomes and claim costs. The analyses presented in this report suggest that this has not been sustained. For a number of outcomes (e.g. functional outcomes and costs), there was evidence of improvement in the early periods post-Recovery model implementation but then a change in the direction of the trend. The end result has been an estimate of no change or a trend towards poorer outcomes. The findings overall were largely consistent at both 6 and 12-months post-injury, and with or without the additional VSTR (not VOTOR) cases included.

With respect to the 6-month post-injury time point, most outcomes were relatively stable except for an increase in the probability of reporting anxiety/depression problems on the EQ-5D instrument. At the point of implementation, there was a clear increase in the proportion of cases reporting problems on the EQ-5D self-care and pain/discomfort items, and a concurrent significant drop in claim costs. Since the implementation of the Recovery model, the most substantial evidence of impact are shown for the pain/discomfort item of the EQ-5D which trended towards better outcome, though on the backdrop of a significant rise at the point of implementation. There was also a strong shift towards increased claim costs after implementation of the model, however, again on the backdrop of a significant decline at the point of implementation. The 12-month models shared many of the trends of the 6-month models. However, the EQ-5D items could not be analysed and this will not be able to be remedied for future evaluations.

5.2 What is the association between fault (self-reported or police-reported) and client outcomes?

The analyses presented represent an extension of the analyses conducted for the previous report with a focus on further investigating the group where the police and self-reported fault status differed. The previous report used data from 2,408 VOTOR Recovery clients with a reported fault status (either police or self-reported). The self-reported and police-reported fault status differed for 216 Recovery clients with 137 reporting clients reporting that they were not at fault in the presence of a police report stating that they were, and 79 where the disagreement was in the other direction.

Overall, the group of VOTOR Recovery clients who reported that they were at fault, even though the police report stated otherwise, behave very similarly to the group where both the client and police report stated that they were at fault. A “not at fault” status, whether self-reported in the presence of a contradictory police report, or where police and patient-report agreed, was associated with poorer risk-adjusted functional, pain, EQ-5D, mental health and physical health outcomes at both 6 and 12-months post-injury. There was no association between claim costs and faults status at either time point post-injury.

The findings indicate that the fault status captured by TAC claims data is an important predictor of patient outcomes. Client who were not at fault, or believed that they were not at fault, demonstrated much poorer patient-reported outcomes than VOTOR Recovery clients who were at fault. These findings support the notion that blame, while not measured specifically here, plays an important role in the recovery following serious injury.

5.3 What are the TAC claim costs for patients who have sustained severe pelvic ring fractures? Does this differ by hospital of treatment or treatment approach?

A previous attempt to explore this research question involved 76 severe pelvic ring fracture patients from a 3-year timeframe (July 2007 to June 2010) with the preliminary findings suggesting increased risk-adjusted claim costs for severe pelvic ring fractures managed at RMH when compared to The Alfred. The analyses presented in this report pertain to 280 cases, representing 93 per cent of TAC severe pelvic ring fractures managed at The Alfred and RMH during the period April 2003 to January 2013 timeframe.

Consistent with the previous report, there was clear evidence of difference in clinical practice between the hospitals for the management of severe pelvic ring fractures. A much higher proportion of RMH cases were managed non-operatively while external fixation of severe pelvic ring fractures – either in isolation or combined with open reduction and internal fixation (ORIF) – was more prevalent at The Alfred. In contrast to the previous report and study, TAC claim costs were generally higher for severe pelvic ring fractures managed at The Alfred and there was no association between hospital of definitive management and claim costs when differences in case-mix were accounted for.

In the previous report, there were insufficient numbers of cases to explore claim costs by management approach. With the current 280 cases, analysis by management approach was possible and revealed significant differences in in-hospital, loss of earning, other and projected lifetime claim costs between management approaches. Compared to the most common approach of combined internal and external fixation, internal fixation alone demonstrated significantly lower adjusted mean in-hospital, loss of earnings and estimated lifetime claim costs. Non-operatively managed patients were also less expensive than patients managed with a combination of internal and external fixation. However, this group were also shown to have the poorest outcomes in the completed project (Project number GE-M-11-026) "Classification, management and outcomes of severe pelvic ring fractures". Project GE-M-11-026 highlighted the poor overall outcomes following severe pelvic ring fractures and analysis undertaken for this report also highlight the expense of these patient to TAC with a median (IQR) project lifetime claim cost of $298,163 ($179,612-$442,079). Efforts to improve outcomes are warranted.

5.4 What are the TAC claim costs for patients who have sustained tibial plafond fractures? Does this differ by treatment approach?

Only 41 tibial plafond cases could be successfully linked with the TAC claims data in the current linkage exercise. While this represented 98 per cent of cases for the relevant timeframe, there were insufficient cases to generate robust cost estimates or to model the claim costs by management approach.

Given the limb-threatening nature of these injuries, detailed analysis of the costs and outcomes is needed. The ICD-10-AM classification system does not specifically identify plafond fractures and therefore identifying the cases in the VOTOR dataset is challenging without individual imaging review (as was done for the tibial plafond sub-project). In contrast, the current version of the AIS (2008 update) used by the VSTR does identify "pilon" or plafond fractures. However, an isolated plafond fracture will not meet VSTR major trauma criteria. The issue has been discussed with Sue McLellan, the VSTR Data Manager, to see what the options would be. It is likely that most plafond fractures will meet the wider VSTR criteria for inclusion on the registry but will be flagged as VSTR "minor" cases. These cases receive more limited data from the treating hospital, but the AIS diagnoses and VSTR procedures. These cases, if managed at The Alfred and RMH will always meet VOTOR criteria and could therefore be linked with TAC claims data. It is unclear how representative these cases will be of the wider tibial plafond population but we will be able to check this by using the plafond sub-project data as a comparison source. To avoid delaying the release of this report, we have opted to exclude the plafond analyses but are currently going through the necessary checks to ensure we can identify them in the VSTR, the representative of the cases, and the rate of linkage. These analyses will be presented in the early stages of 2014.