Incidence and outcomes of major trauma in New Zealand: findings from a feasibility study of New Zealand's first national trauma registry

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Incidence and outcomes of major trauma in New Zealand: findings from a feasibility study of New Zealand's first national trauma registry

Karol J Czuba, Paula Kersten, David Anstiss, Nicola M Kayes, Belinda J Gabbe, Ian Civil, Bridget Kool, Gareth Terry, Greta A Smith, Mahesweran Rohan, Alain C Vandal, Richard J Siegert

ABSTRACT

AIMS: The aim of the study was to pilot the feasibility of long-term outcomes data collection from adult major trauma survivors in New Zealand. This initial paper aims to characterise the New Zealand major trauma population in terms of long-term disability and functional outcomes after major trauma.

METHODS: A prospective cohort study of adults who had survived major trauma was conducted between June 2015 and December 2016 at two major trauma centres in Auckland.

RESULTS: Of 256 trauma referrals, 112 (44%) were confirmed eligible and consented. One hundred completed the survey at six months and 83 at 12 months. A majority of the study sample were male (72%), under 65 years (84%), with a disproportionally higher number of Māori in the sample (23%). At six months post-injury, the majority of participants were categorised as experiencing either moderate disability (37%) or good recovery (42%). Half of the participants experienced moderate pain at both 6 and 12 months post-injury (50% and 52% respectively), and problems with their usual activities at six months post-injury (51%).

CONCLUSIONS: Most study participants made a good recovery, but there was still a large group of people experiencing disability, pain and not in paid employment at 12 months post-injury.

Improvements in acute care have increased survival rates after major trauma, with more people now living with long-term and often complex consequences of their injuries.[1–5] Data on outcomes for these populations are needed for health and disability service planning, and to identify opportunities for sustainable provision of rehabilitation, health and social care to people living with the long-term impacts of injury. The lack of such data in New Zealand greatly limits the evaluation of the cost-effectiveness of trauma care as well as limiting evaluation of rehabilitation services. Data describing injury survivors' long-term recovery could inform service providers and funders about ways to improve care and support for trauma survivors, their family and whānau.

Existing surveillance systems in New Zealand, including hospital admission datasets and hospital registries, do not include data on long-term outcomes of trauma survivors. Although barriers to the collection of such data (eg, cost, mode of administration, privacy legislation) exist, these can be overcome. The Victorian State Trauma Registry (VSTR) in Australia has

Table 1: Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
a. ISS 12 b. admitted to one of the two trauma centres following their injury c. sustained their injury between 15 June 2015 and 14 December 2015 d. living permanently in New Zealand e. aged 18	f. acquired major trauma due to drowning, poisoning, hanging (where only asphyxia occurs without other physical injury), or burns (ie, where burns were a major component requiring admission to a burns unit); as per NZMTN definition.[8] g. unable to complete the assessment tasks in English h. people with significant cognitive deficits (pre-existing or as a result of the injury)

implemented routine collection of these outcomes through establishment of opt-out consent, access to both patient and their next-of-kin contact details, use of a brief interview covering a number of areas important in trauma recovery, centralised data collection system and use of interviewers with clinical experience.[6]

The overall aim of the study reported here was to pilot the feasibility of long-term outcomes data collection from adult major trauma survivors in New Zealand. As the first of a series of papers from a broader project exploring feasibility of long-term follow-up of major trauma survivors, this paper aims to characterise the New Zealand major trauma population, focusing on ratings of long-term disability and functional outcomes after major trauma.

Methods

Study design

The Outcomes after Trauma Study (OATS) Study was conducted in Auckland, New Zealand's largest urban area (>1.5 million) which accounts for approximately one third of the country's population. Auckland is serviced by two major trauma centres (out of a total of six centres across New Zealand), which were selected as the study's data collection sites.

A prospective cohort study of adults who had survived major trauma was conducted between June 2015 and December 2016. The study used consecutive sampling and a mixed-methods approach, incorporating a quantitative component (using self-report measures and interviewer-administered questionnaires) and a qualitative component (using semi-structured face-to-face interviews). The current paper focuses on the quantitative component of the study, aimed at characterising the New Zealand major trauma population.

Participants

Included participants were those who were admitted to one of the two recruitment sites, and who had sustained significant physical trauma—defined as an Injury Severity Score (ISS) of 12 or more (Table 1). The ISS score is a widely used anatomical score to assess the severity of trauma.[7] Patients who died as a result of their injuries, were in a vegetative state or who were unable to give informed consent due to significant cognitive impairment were excluded.

Eligible patients were invited to take part in the study in person (during their hospital stay) or by mail (following discharge), as soon as was deemed appropriate by the study team and no longer than six months post-injury. Written informed consent was obtained from those who agreed to take part. No proxy consents were obtained.

Data collection

Data were collected from eligible participants at baseline (on discharge following their injury), and at 6 and 12 months post-injury ('follow-up data'). At baseline, demographic and injury data were collected from the participants and their hospital records, including: age, preferred ethnicity, pre-existing long-term conditions, pre-injury employment status, residential status, ISS score, diagnosis, cause of injury and length of hospital stay.

Participants were given the option of completing follow-up surveys via telephone interview, online, face-to-face, postal or e-mail. Up to five attempts were made to collect the data from participants, with the

counter being reset every time we spoke to a participant. After five failed attempts in a row, participants were deemed uncontactable. The follow-up surveys were identical at both data collection points and included the Glasgow Outcomes Scale-Extended (GOS-E)[9] as the primary outcome measure, and five secondary outcomes: the Short Form 12 (SF-12),[10] the Euroqol 5d-3L (EQ-5D-3L),[11] Numeric Rating Scale (NRS),[12] World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0)[13] and a set of questions regarding productivity status (asking whether participants were in paid employment, homemaking, retired, studying or volunteering, and whether in full- or part-time capacity). These measures were chosen based on their use in previous injury outcome studies,[6] brevity and psychometric properties.

Statistical analysis

Data were analysed using R 3.0.3.,[14] a statistical software developed by R Core Team in Vienna, Austria. Descriptive data were summarised using frequencies and percentages for categorical variables, and means and standard deviations for continuous variables; skewed data were reported as median and interquartile range (IQR). Two response rates were calculated: (1) response rate for eligible trauma cases ((total number of referrals—non-respondents—people deceased at screening)/(total number of referrals—people deceased at screening) *100%) and (2) consenting rate (consenting participants/(total number of referrals—confirmed ineligible referrals—non-respondents—people deceased at screening) *100%). Reasons for non-participation, when provided, were recorded and summarised. For each participant, total scores for questionnaires were only computed when there were no missing data.

Changes in continuous outcomes were estimated using the mean change from complete case data and tested for a location shift using the Wilcoxon (aka, Mann-Whitney) paired sample test. In case of failure of the Wilcoxon test to produce reliable p-values (due to the presence of too many ties and of zeros), the p-value was approximated from the estimated difference between periods and the bootstrapped variance under the alternative, using a normal approximation. Confidence intervals (CI) for the mean difference at the 95% level were constructed using the bootstrap.

Changes in categorical outcomes were expressed as absolute numbers in transition tables, and as proportions in conditional probabilities tables (Appendix). These latter proportions are probability estimates, and the 95% confidence intervals for these probabilities were constructed using the Clopper-Pearson method. The overall significance of the transitions were tested using the McNemar-Bowker test.

The EQ-5D-3L was converted to a utility score using the New Zealand Tariff 2 coefficients,[15] as recommended by the tool's developers.[11]

Ethics

Ethical approval for the study was received from the Health and Disability Ethics Committee of New Zealand (15/STH/98/AM02).

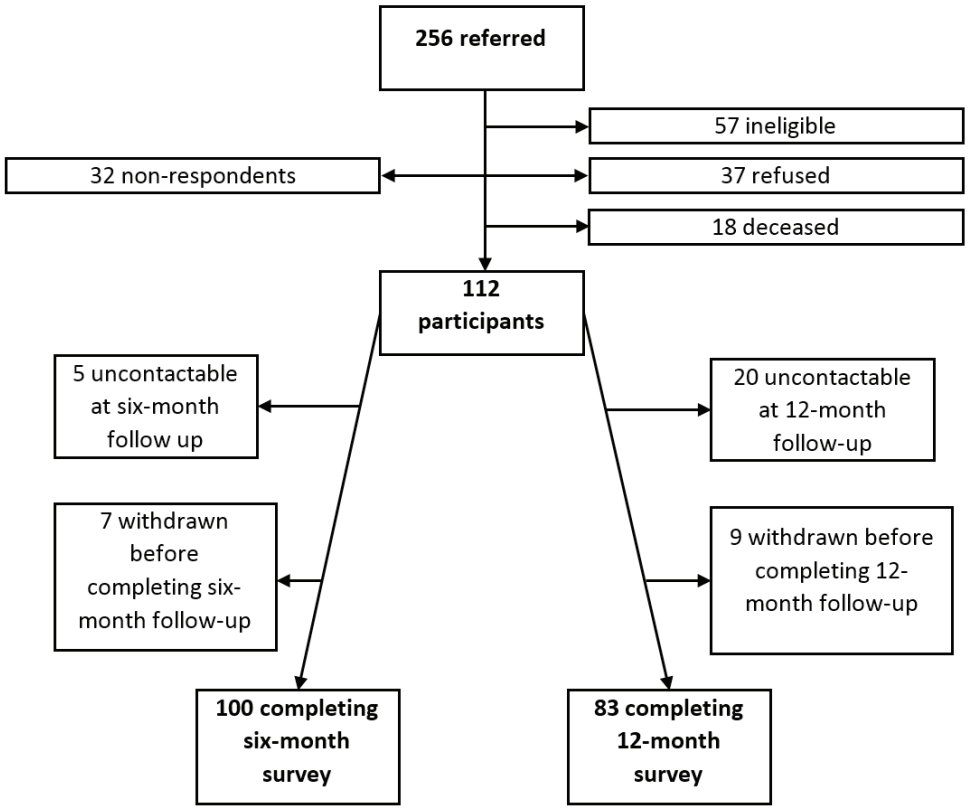
Results

Recruitment process

In total, we were notified of 256 trauma referrals, of whom 112 (44%) were confirmed eligible and consented to take part in the study (Figure 1). A further 112 individuals were either confirmed to be ineligible or declined participation in the follow-up study. Individuals (n=32) with confirmed or with unknown eligibility, who did not respond to the study invitation are referred to as 'non-respondents'.

The follow-up study's response rate was 86.5% and the overall consenting rate was 75.2%. The main reason given for refusal was lack of interest in taking part in the study (n=28), followed by being "too busy" (n=8). The main reason for ineligibility was death during the hospital stay (n=18) followed by an inability to speak English to a sufficient degree to complete the questionnaires (n=16).

Figure 1: Recruitment and data collection flow diagram.



Study sample characteristics

A large majority of the study sample were male (72%) and under 65 years of age (84%) (Table 2). Median age was 45.5 years (IQR 27–58). There were disproportionally higher numbers of Māori in the sample (23%) than their representation in Auckland's population (10.7%; Statistics New Zealand, 2013). The majority of participants were in paid employment prior to their injury (69%). The majority of participants had completed a secondary-level qualification (73%), with 62% also completing a post-secondary qualification.

The most common cause of injury was motor vehicle crash (30.4%), followed by injuries received as a result of a fall (27.6%) and vulnerable road-users (25.9%; includes motorcyclists, pedal cyclists and pedestrians; Table 3). The cause of injury was not known for two participants. The majority of the study sample sustained neurotrauma (n=66; 59%), with 88% of these classified as having a traumatic brain injury (TBI; defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force). The most common specific pre-existing medical conditions reported were asthma (n=14), arthritis (n=13) and heart disease (n=7). Sixty-five participants (58%) reported no pre-existing medical condition.

Table 2: Demographic characteristics of study population at baseline.

		Participants N=112	
		n	%
Sex	Female	31	27.7
	Male	81	72.3
Age (in years)	<40	47	42.0
	40–64	47	42.0
	65+	18	16.0
Ethnicity*	NZ European	67	59.8
	Māori	26	23.2
	Pacifica	12	10.7
	Asian	5	4.4
	Other	28	25.0
Productivity status*	Paid employment	77	68.7
	Retired	16	14.2
	Home making	14	12.5
	Study	11	9.8
	Volunteering	7	6.2
Educational attainment	Secondary qualification	73	65.1
	Post-secondary qualification	62	55.3
	Information not provided	14	12.5

*Multiple selection was allowed.

Table 3: Cause of injury.

Cause of injury	Participants	
	n	%
Motor vehicle crash	34	30.4
Vulnerable road users*	29	25.9
High falls (1 meter or higher)	15	13.3
Low falls (standing or <1m)	16	14.3
Struck or collision**	13	11.6
Other***	3	2.7
Unknown	2	1.8

*Includes: motorcyclists, pedal cyclists, pedestrians.
**Includes: rugby injuries, physical assaults, stabbings.
***Includes injuries with a combination of causes, eg, car crash with electrocution, or hit by a wave and fall in the surf.

Injuries classified with an ISS of 16–20 were most common (n=40; 36%), followed by those with an ISS of 12–15 (n=27; 24%). Average length of hospital stay was greater in those with higher ISS scores (Table 4). The median hospital stay was nine days (IQR 6–19.5).

Table 4: Median hospital length of stay (in days) by ISS scores.

ISS ranges	Length of stay (days)
12–15	7
16–20	7
21–25	10
26–30	22
>30	25

Prior to injury, the majority of participants (77%) were in paid employment, this declined to 55% at 12 months follow-up. The number of people reporting home-making as one of their occupational activities increased over time—from 12.5% prior to injury to 58% at 12 months post-injury.

At 6 and 12-month follow-up, most participants reported living at home independently (61% and 76% respectively). Almost a third of all participants (29%) were residing in their own home but still required support six months post-injury. This number decreased over time, to 16% 12 months post-injury. A small number (n=8) of participants were not residing in their own home at six months post-injury. At 12 months post-injury, all but nine participants were residing in their own home.

Major trauma outcomes at 6 and 12 months post-injury

Primary outcome—GOS-E

At six months post-injury, the majority of participants were categorised as experiencing either moderate disability (37%) or good recovery (42%) (Table 5). At 12 months post-injury, the number of people in the severe (15%) and moderate disability groups (32%) declined. There were no deaths among respondents during the follow-up period. McNemar-Bowker's test did not detect any statistically significant difference in transitions between GOS-E outcome categories at 6 and at 12 months (p =0.15; see Appendix Tables 1 and 2).

Secondary outcomes

NRS

The mean difference between 'current pain' at 12 and 6 months was -0.062 (95% CI [-0.55, 0.44]) and was not statistically significant (p=0.81). The mean difference between 'worst pain in the last 24 hours' at 12 and 6 months was -0.85 (95% CI [-1.49, -0.20]) and was statistically significant (p=0.0079). The mean difference between 'best pain in the last 24 hours' at 12 and 6 months was -0.2 (95% CI [-0.6, 0.2]) and was not statistically significant (p=0.34). McNemar-Bowker's test detected statistically significant difference in transitions between pain level categories for 'worst pain in the last 24 hours' at 6 and at 12 months (p=0.04), and no statistically significant differences in transitions

Table 5: GOS-E scores at 6 and 12 months (n=83).

Outcome	Severe disability*		Moderate disability*		Good recovery*	
Follow-up period	6	12	6	12	6	12
Overall n (%)	23 (23%)	12 (15%)	37 (37%)	27 (32%)	40 (40%)	44 (53%)

*Due to small numbers for some of the outcomes, the outcome levels (eg, upper severe disability and lower severe disability) were bundled into broader levels of function (eg, severe disability).

Table 6: EQ5D scores.

EQ5D subscale		6 months N=100		12 months N=83	
		n	%	n	%
Mobility*	No problem	59	59	55	66
	Moderate problem	35	35	25	30
	Extreme problem	4	4	2	4
Self-care	No problem	77	77	71	86
	Moderate problem	18	18	10	12
	Extreme problem	5	5	2	2
Usual activities	No problem	44	44	49	59
	Moderate problem	44	44	32	39
	Extreme problem	12	12	1	2
Pain	No problem	47	47	39	47
	Moderate problem	50	50	43	52
	Extreme problem	3	3	1	1
Anxiety	No problem	63	63	53	64
	Moderate problem	33	33	26	32
	Extreme problem	4	4	3	4

*n=2 participants did not provide any response at six-month follow-up.

between pain level categories for 'current pain' and 'best pain in the last 24 hours' (see Appendix Tables 3–8).

EQ-5D-3L

The majority of participants reported experiencing no problems with mobility (six months—59%; 12 months—66%), self-care (six months—77%; 12 months—86%) or anxiety (six months—63%; 12 months—64%) post-injury (Table 6). Half of the participants experienced moderate pain at both 6 and 12 months post-injury (50% and 52% respectively), and problems with their usual activities at six months post-injury (51%). With the exception of 'usual activities' at six months post-injury (12%), few participants experienced extreme problems in any of the categories (between 1% and 5%).

The mean difference in EQ-5D tariff scores between 12 and 6 months was 0.01 (95% CI [-0.04, 0.05]. The p-value of the test for the difference in location to be different from 0 was 0.63, meaning no statistically significant change in the participants' health status score derived from their ratings of EQ5D subscales.The mean difference in EQ-5D VAS scores between 12 and 6 months was 4.09 (95% CI [-0.15, 8.52), and it was statistically significant (p=0.03), meaning there was a statistically significant improvement in the participants' health score on VAS.

SF-12

The Physical Component Score (PCS-12) increased between 6 and 12 months with the mean difference of 3.45 (CI [1.57, 5.31], p=0.001), indicating a slight improvement in participants' physical health.The mean

Table 7: Productivity status.

	Baseline		6 months N=100		12 months N=83	
	n	%	n	%	n	%
Paid employment*	77	69	51	51	46	55
Home making*	16	14	14	14	18	22
Retired*	14	12	42	42	48	58
Volunteering*	11	10	11	11	11	13
Study*	7	6	13	13	12	14

*Multiple selection was allowed, so percentage values do not add up to 100.

difference in the Mental Component Scores (MCS-12) between 6 and 12 months was 0.46 (CI [-2.1, 2.96]) and it was not statistically significant (p=0.95), indicating no change in the participants' mental health.

WHODAS 2.0

The mean difference between 12 and 6 months WHODAS scores was -3.23 (CI [-5.03,-1.58], p=0.001).

Over one-third (38%) of participants reported high scores (and thus ongoing problems) at six months post-injury, compared to 22% at 12 months post-injury. Just over half of the participants (51%) reported low WHODAS scores at 12 months post-injury, suggesting fewer ongoing problems.

McNemar-Bowker's test did not detect any statistically significant differences in transitions between WHODAS score categories at 6 and 12 months (p=0.06; see Appendix Tables 9 and 10).

Productivity status following injury

Prior to injury, most participants (69%) were in paid employment (Table 2). At six months 51% of people were in paid employment; this increased to 55% by 12 months (Table 7). The proportion of people reporting home-making as one of their occupational activities increased over time—from 12% prior to injury (Table 2) to 58% 12 months post-injury (Table 7).

McNemar-Bowker's test did not detect any statistically significant differences in transitions between productivity status categories at 6 and 12 months (see Appendix Tables 11–20).

Discussion

Trauma registries provide a valuable opportunity to monitor long-term outcomes for major trauma survivors.[16] Such knowledge could be used to improve service planning, prognostication and quantification of the burden of major trauma. However, collecting long-term outcomes data for this group is not routine in New Zealand, nor in most countries. This is the first study, to our knowledge, that has explored the feasibility of capturing and describing long-term outcomes of a New Zealand major trauma population.

Our findings suggest that at 12 months post-injury the majority of participants in this study had made a good recovery in terms of disability, living situation and health. It is important to note, however, that patients in vegetative state and those who did not have the cognitive capacity to give informed consent were not included in the study sample. Nevertheless, as compared with the six-month findings, fewer participants were experiencing a severe or moderate disability. In addition, a greater number of survivors were living in their own home independently, and indicated experiencing no problems with mobility, self-care or usual activities. Fewer survivors required home-based support. Participants also indicated higher self-rated health, self-rated quality of life, and better functional outcomes at 12 months compared to six months post-injury. However, a sizeable group of survivors were still experiencing pain and problems with their usual activities 12 months post-injury, which suggests

that not all major trauma survivors will follow the same trajectory of recovery. Furthermore, almost half of the participants were not in paid employment at 12 months post-injury.

Differences in the inclusion criteria, rates of follow-up and the case-mix of patients make comparisons with other outcome studies of major trauma patients challenging. Nevertheless, the prevalence of reporting problems on each of the EQ-5D items was lower in our study than observed in previous studies of Australian[2] and Dutch[3,4] major trauma populations, potentially reflecting differences in inclusion criteria and follow-up rates. In our study, we did not use proxy interviews of patients, and excluded patients who were unable to consent at baseline, which likely resulted in a lower prevalence of patients with significant TBI, when compared to the previous studies. Notably, our return to work rates were 51% at six months, and 55% at 12 months post-injury. The observed rates were lower than reported in an Australian population-based study of major trauma survivors where the return to work rates were 58% at six months, and 66% at 12 months, post-injury.[17] Holtslag et al[3] reported a return to work rate of 73% at 12–18 months post-injury in their study of more than 300 major trauma patients in the Netherlands.

In the current study, 70% of the participants were male, 50% having sustained a brain injury, with Māori participants (New Zealand's indigenous population) over-represented in the study population, particularly in terms of poorer outcomes. This is consistent with findings from other research.[2,16,18] We found that approximately two-thirds of all injuries were traffic-related, while falls accounted for approximately a quarter of the injuries. Our findings suggest future research could focus on exploring these characteristics as potential risk factors for major trauma in New Zealand.

The focus of many trauma care systems is still on mortality, with the ISS being the most commonly used method to assess trauma care performance.[2,16,18] With recent care improvements, many trauma survivors go on to live past their hospital admission.[1,2] However, our knowledge on what happens to this group and what their long-term outcomes are is limited. Our study has shown that a large proportion of trauma survivors experience ongoing disability at 12 months post-injury and are not in paid employment, potentially causing heavy burden on public health resources. This experience highlights the need to monitor outcomes other than just mortality in trauma, and was further explored in a nested qualitative study conducted as part of this project (in preparation for publication).

This study has provided new and important information on the New Zealand major trauma population. However, we would like to acknowledge some limitations. First, we were only able to gain informed consent from 54% of eligible trauma survivors. This is consistent with many other research studies, but lower than reported by Gabbe et al.[16] One reason for this is that we used an opt-in, rather than an opt-out consent process (as in Gabbe et al study). Using an opt-out consent (where trauma patients are automatically included in the registry) increases the follow-up rates and has obvious benefits for trauma outcomes monitoring. However, as the current study was conducted by an organisation external to the hospital registries, it was not in a position to use an opt-out consent protocol.

Another reason for the lower consenting rate might be the exclusion of people who were unable to complete the study questionnaires in English (n=16). In the future, we recommend using validated translations of long-term outcome measures, and using interpreters where appropriate. Also, in the current study 19 people who were referred to us, were later found to not be diagnosed as major trauma (ie, their ISS was lower than 12). As our aim was to contact the potential participants as soon as possible, some referrals might have been made before the full extent of injuries was known to the medical teams. We recommend delaying patient screening until their inclusion on hospital trauma registries, at which time their diagnoses are final.

In this study, only those major trauma survivors who were personally able to consent to taking part were included. This meant exclusion of people who had ongoing or incurred substantial cognitive deficits. Hence, caution needs to be taken when applying these findings to a wider context, as

they do not necessarily represent the experience of all major trauma survivors. Future studies should attempt to use proxy consent for major trauma survivors who are in vegetative states, or who are unable to consent from a cognitive perspective. It is important to include as much data as possible from the patients' next-of-kins to gain a better understanding of major trauma outcomes.

Another limitation is our lack of knowledge regarding the 66 people who either refused to take part, withdrew their consent, or were lost to follow-up. While we know most people who refused to take part were "not interested", we have no indication of whether the long-term outcomes of these people reflect the experience of our study's participants. Again, an opt-out consenting approach may facilitate improvements in response rates, which could help understand biases in the population available for follow-up.[16] Notably, a recently published paper[18] reports on a number of developments made by the New Zealand Major Trauma Network (NZMTN), which will allow for automatic opt-out consent, and a routine and centralised data collection system. This initiative has great potential for improving trauma care and addressing challenges identified in the current study.

Future studies might also want to gather more detailed information on survivors' return to work status. In the present study we focused on capturing details on all productive activity that participants engaged in before and after the trauma. Involvement in paid work decreased in frequency and the role of homemaker increased. It could be useful in future to collect more detailed information on the length of time taken to return to normal or modified work or normal ADLs for participants who achieved this.

In conclusion, this paper reports the long-term outcomes of a subset of major trauma survivors in New Zealand. The findings show that most study participants made a good recovery, but there was still a large group of people experiencing disability and not in paid employment at 12 months post-injury. The findings suggest that trauma registries are ideally placed to monitor long-term outcomes of trauma survivors, and can play an important role in reducing the impact of burden associated with major trauma.

Appendix

Definitions of acronyms:
GOS-E—Glasgow Outcome Scale – Extended
NRS—Numeric Rating Scale
WHODAS—World Health Organization's Disability Assessment Schedule
NaN—not a number; indicates an incomputable number
NA—not applicable/not available

Appendix Table 1: Transition table for GOS-E.

	GOS-E at 12 months			
GOS-E at 6 months	**Severe disability**	**Moderate disability**	**Good recovery**	**Not available**
Severe disability	9	5	4	5
Moderate disability	1	17	9	10
Good recovery	2	4	30	4
Not available	0	1	1	10

Appendix Table 2: Conditional probabilities for GOS-E at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=5.26, p=0.154).

	GOS-E at 12 months		
GOS-E at 6 months	**Severe disability**	**Moderate disability**	**Good recovery**
Severe disability	0.500 (0.260–0.740)	0.278 (0.097–0.535)	0.222 (0.064–0.476)
Moderate disability	0.037 (0.001–0.190)	0.630 (0.424–0.806)	0.333 (0.165–0.540)
Good recovery	0.056 (0.007–0.187)	0.111 (0.031–0.261)	0.833 (0.672–0.936)

Appendix Table 3: Transition table for NRS 'Current pain'.

	NRS at 12 months				
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**	**Not available**
No pain	27	5	1	2	5
Mild pain	11	11	8	0	8
Moderate pain	1	9	3	0	5
Severe pain	1	0	1	1	1
Not available	1	0	1	0	10

Appendix Table 4: Conditional probabilities for NRS 'Current pain' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=NaN, p=NA).

	NRS at 12 months			
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**
No pain	0.771 (0.599–0.896)	0.143 (0.048–0.303)	0.029 (0.001–0.149)	0.057 (0.007–0.192)
Mild pain	0.367 (0.199–0.561)	0.367 (0.199–0.561)	0.267 (0.123–0.459)	0.000 (0.000–0.116)
Moderate pain	0.077 (0.002–0.360)	0.692 (0.368–0.909)	0.231 (0.050–0.538)	0.000 (0.000–0.247)
Severe pain	0.333 (0.008–0.906)	0.000 (0.000–0.708)	0.333 (0.008–0.906)	0.333 (0.008–0.906)

Appendix Table 5: Transition table for NRS 'Worst pain'.

	NRS at 12 months				
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**	**Not available**
No pain	19	2	0	1	4
Mild pain	10	7	6	2	5
Moderate pain	4	4	8	1	7
Severe pain	4	2	4	7	3
Not available	1	0	0	1	10

Appendix Table 6: Conditional probabilities for NRS 'Worst pain' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=13.33, p=0.038).

	NRS at 12 months			
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**
No pain	0.864 (0.651–0.971)	0.091 (0.011–0.292)	0.000 (0.000–0.154)	0.045 (0.001–0.228)
Mild pain	0.400 (0.211–0.613)	0.280 (0.121–0.494)	0.240 (0.094–0.451)	0.080 (0.010–0.260)
Moderate pain	0.235 (0.068–0.499)	0.235 (0.068–0.499)	0.471 (0.230–0.722)	0.059 (0.001–0.287)
Severe pain	0.235 (0.068–0.499)	0.118 (0.015–0.364)	0.235 (0.068–0.499)	0.412 (0.184–0.671)

Appendix Table 7: Transition table for NRS 'Best pain'.

	NRS at 12 months				
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**	**Not available**
No pain	43	4	2	1	8
Mild pain	7	12	2	0	7
Moderate pain	1	8	1	0	4
Severe pain	0	0	0	0	0
Not available	1	0	1	0	10

Appendix Table 8: Conditional probabilities for NRS 'Best pain' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=4.7515, p=0.191).

	NRS at 12 months			
NRS at 6 months	**No pain**	**Mild pain**	**Moderate pain**	**Severe pain**
No pain	0.860 (0.733–0.942)	0.080 (0.022–0.192)	0.040 (0.005–0.137)	0.020 (0.000–0.106)
Mild pain	0.333 (0.146–0.570)	0.571 (0.340–0.782)	0.095 (0.012–0.304)	0.000 (0.000–0.161)
Moderate pain	0.100 (0.002–0.445)	0.800 (0.444–0.975)	0.100 (0.002–0.445)	0.000 (0.000–0.308)
Severe pain	NA	NA	NA	NA

Appendix Table 9: Transition table for WHODAS.

	WHODAS at 12 months			
WHODAS at 6 months	**Low score**	**Average score**	**High score**	**Not available**
Low score	27	1	0	7
Average score	5	11	4	7
High score	4	7	12	15
Not available	1	0	0	11

Appendix Table 10: Conditional probabilities for WHODAS at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=7.4848, p=0.058).

	WHODAS at 12 months		
WHODAS at 6 months	**Low score**	**Average score**	**High score**
Low score	0.964 (0.817–0.999)	0.036 (0.001–0.183)	0.000 (0.000–0.123)
Average score	0.250 (0.087–0.491)	0.550 (0.315–0.769)	0.200 (0.057–0.437)
High score	0.174 (0.050–0.388)	0.304 (0.132–0.529)	0.522 (0.306–0.732)

Appendix Table 11: Transition table for Productivity status 'Working'.

	'Working' at 12 months		
'Working' at 6 months	**Yes**	**No**	**Not available**
Yes	37	5	9
No	8	31	10
Not available	1	1	10

Appendix Table 12: Conditional probabilities for Productivity status 'Working' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=0.3077, p=0.58).

	'Working' at 12 months	
'Working' at 6 months	**Yes**	**No**
Yes	0.881 (0.744–0.960)	0.119 (0.040–0.256)
No	0.205 (0.093–0.365)	0.795 (0.635–0.907)

Appendix Table 13: Transition table for Productivity status 'Homemaking'.

	'Homemaking' at 12 months		
'Homemaking' at 6 months	**Yes**	**No**	**Not available**
Yes	28	8	6
No	19	26	13
Not available	1	1	10

Appendix Table 14: Conditional probabilities for Productivity status 'Homemaking' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=3.7037, p=0.054).

	'Homemaking' at 12 months	
'Homemaking' at 6 months	**Yes**	**No**
Yes	0.778 (0.608–0.899)	0.222 (0.101–0.392)
No	0.422 (0.277–0.578)	0.578 (0.422–0.723)

Appendix Table 15: Transition table for Productivity status 'Volunteering'.

	'Volunteering' at 12 months		
'Volunteering' at 6 months	Yes	No	Not available
Yes	4	7	2
No	8	62	17
Not available	0	2	10

Appendix Table 16: Conditional probabilities for Productivity status 'Volunteering' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=0, p=1).

	'Volunteering' at 12 months	
'Volunteering' at 6 months	Yes	No
Yes	0.364 (0.109–0.692)	0.636 (0.308–0.891)
No	0.114 (0.051–0.213)	0.886 (0.787–0.949)

Appendix Table 17: Transition table for Productivity status 'Studying'.

	'Studying' at 12 months		
'Studying' at 6 months	Yes	No	Not available
Yes	5	4	2
No	5	67	17
Not available	1	1	10

Appendix Table 18: Conditional probabilities for Productivity status 'Studying' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=0, p=1).

	'Studying' at 12 months	
'Studying' at 6 months	Yes	No
Yes	0.556 (0.212–0.863)	0.444 (0.137–0.788)
No	0.069 (0.023–0.155)	0.931 (0.845–0.977)

Appendix Table 19: Transition table for Productivity status 'Retirement'.

	'Retirement' at 12 months		
'Retirement' at 6 months	Yes	No	Not available
Yes	14	0	0
No	2	46	10
Not available	2	5	13

Appendix Table 20: Conditional probabilities for Productivity status 'Retirement' at 12 months with 95% confidence intervals (n=83; Mc Nemar-Bowker's X^2=0.5, p=0.48).

	'Retirement' at 12 months	
'Retirement' at 6 months	Yes	No
Yes	1.000 (0.768–1.000)	0.000 (0.000–0.232)
No	0.042 (0.005–0.143)	0.958 (0.857–0.995)

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Author information:
Karol J Czuba, Research Fellow, Centre for Person Centred Research, AUT, Auckland; Paula Kersten, Head of the School, School of Health Sciences, University of Brighton, Brighton; David Anstiss, Research Officer, Centre for Person Centred Research, AUT, Auckland; Nicola M Kayes, Director, Centre for Person Centred Research, AUT, Auckland; Belinda J Gabbe, Head of the Emergency and Trauma Research Unit, Department of Epidemiology and Preventive Medicine, Monash University, Melbourne; Ian Civil, Director, Trauma Services, Auckland City Hospital, Auckland; Bridget Kool, Associate Dean, Faculty of Medical and Health Sciences, University of Auckland, Auckland; Gareth Terry, Senior Research Fellow, Centre for Person Centred Research, AUT, Auckland; Greta A Smith, Research Officer, Centre for Person Centred Research, AUT, Auckland; Mahesweran Rohan, Data Scientist, New South Wales Department of Primary Industries, Orange, Australia; Alain C Vandal, Head of Department, Biostatistics and Epidemiology, AUT, Auckland; Richard J Siegert, Professor of Psychology and Rehabilitation, Faculty of Health and Environmental Sciences, AUT, Auckland.
Corresponding author:
Karol J Czuba, Centre for Person Centred Research, AUT; 90 Akoranga Drive, Northcote, Auckland.
kczuba@aut.ac.nz
URL:
http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2019/vol-132-no-1494-3-may-2019/7867

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