*Cover sheet containing author details

This is the postprint version Accepted for publication to The Journal of Emergency Medicine on January 27, 2017. The published version of this article is available at J. R. Brubacher, H. Chan, E. Purssell, B. J. Tuyp, D. K. Ting, V. Mehrnoush. Minor Injury Crashes: Prevalence of Driver-Related Risk Factors and Outcome. The Journal of Emergency Medicine, Volume 52, Issue 5,2017,Pages 632-638. https://doi.org/10.1016/j.jemermed.2017.01.044

Title: Minor injury crashes: Prevalence of driver-related risk factors and outcome.

Authors

Jeffrey R Brubacher, MD, MSc,

Department of Emergency Medicine, University of British Columbia

Jbrubacher@shaw.ca

(Corresponding author)

Herbert Chan, PhD,

Department of Emergency Medicine, University of British Columbia

Herbert.chan@ubc.ca

Elizabeth Purssell, MSc,

University of British Columbia

elizabeth.purssell@gmail.com

Benjamin J. Tuyp, MD,

Department of Emergency Medicine, University of British Columbia

bjtuyp@gmail.com

Daniel K. Ting, MD,

Department of Emergency Medicine, University of British Columbia

k.daniel.ting@gmail.com

Vahid Mehrnoush, MD,

University of British Columbia

mv1361@yahoo.com

No authors have any financial or other conflicts of interest pertaining to this submission.

ABSTRACT

Objectives: The majority of crashes cause "minor" injuries (i.e. treated and released from emergency department -ED). Minor injury crashes are poorly studied. This study aims to determine the prevalence of driver-related risk factors and subsequent outcome in drivers involved in minor crashes.

Methods: We interviewed a convenience sample of injured drivers, aged over 17 years, who were treated and released from ED. Follow-up interviews were conducted 6 months after the crash.

Results: We approached 123 injured drivers; baseline interviews were completed in 69, and followup interviews in 45. Prior to the index crash, 1.4% of drivers drank alcohol, 1.4% used illicit drugs and 7.2% used sedating prescription medications. Nine drivers (13%) were distracted. In this sample, 5.8% met criteria for being aggressive drivers, 7.2% were risky drivers, and 11.6% drove while experiencing negative emotions. At 6 month follow-up, many drivers were still having health problems, 53.3% were not fully recovered, 46.7% had not returned to usual activities, and 28.9% were off work. Of the 42 participants who resumed driving, 16.7% had a near miss and 4.8% had another crash. Nine (21.4%) reported drinking and driving, and 9.5% reported driving after cannabis use. Cell phone use (16.7%) and use of other electronics while driving (23.8%) were also common.

Conclusions: Driver-related risk factors are common in drivers involved in minor injury crashes and drivers persist in taking risks after being involved in a crash. Despite their name, minor injury crashes are often associated with slow recovery and prolonged absenteeism from work.

KEYWORDS:

Motor vehicle crashes, risk factors, alcohol, drug impaired driving, distraction, aggressive driving

INTRODUCTION

Globally road trauma is responsible for over 1.3 million fatalities and 54 million injuries per year.<1, 2> Although road trauma surveillance is based on serious injury crashes,<3> the majority of crashes that result in an ED visit cause *minor injuries* - defined as those that do not require hospital admission. Despite their name, minor injury crashes can result in adverse sequelae such as "whiplash", concussion, and chronic pain.<4-7> Minor injury crashes are also a burden on society. They use police and healthcare resources, interfere with traffic, and cause property damage.

The majority of crashes are attributed to driver-related factors such as distraction, aggressive driving, and impairment from alcohol or drugs.<8, 9> The prevalence of distracted driving is believed to be increasing as more drivers use cell phones and other electronic devices.<10> Research into driver-related factors has largely focused on serious injury crashes and it is not known if minor injury crashes have the same risk factor profile.

Long term disability as a result of orthopedic, spinal, or brain injuries or from chronic pain or psychological sequelae is common after major MVCs.<11-14> However, sequelae of minor injury crashes are seldom studied,<3> and their subsequent outcome is poorly understood.<15> Much of the available evidence comes from studies performed decades ago when vehicle safety features such as airbags and crumple zones were less common,<15> or from research conducted in Europe,<7, 16> or Australia.<17, 18> These findings may not be generalizable to North America because recovery following an MVC is related to patient expectations,<19> or compensation seeking,<18> which may be different in North America.

The current pilot study aims to provide preliminary estimates of i) the prevalence of driver-related risk factors (distraction, aggressive driving, substance use) in drivers treated and released from ED following a crash, and ii) of the six month health outcome and subsequent driving behaviour of drivers after minor crashes.

METHODS

This study was approved by the University of XXX institutional research ethics board. The study was conducted at an urban, level one trauma centre with an annual census of approximately 85,000 adult visits at time of the study. Volunteer medical student research assistants (RAs) were trained and supervised by the PI and by a research associate. RAs

interviewed a convenience sample of injured drivers who were treated in the emergency department of XXX Hospital using a structured questionnaire. RAs practiced the interview prior to commencing the study and reviewed interview questions and possible responses with the PI and Research Associate to ensure that they understood the meaning of each question. During times when a research assistant was available, injured drivers who were being treated in the ED were identified by manually scanning the electronic ED visit log to identify all patients with trauma related chief complaints and then reviewing trauma flags (added by ED registration clerks at time of admission) to identify which patients were drivers in a car crash. We have previously confirmed the high accuracy of these trauma flags.<20> We included all injured drivers aged over 17 years. We excluded drivers who were: i) non-residents of BC, ii) unable to communicate in English, iii) amnestic for the event, iv) unable to complete the interview due to pain or injuries, or v) admitted to hospital.

Baseline Interviews

Drivers were approached for consent while still in the ED. RAs screened potential participants to confirm that they were alert and oriented prior to explaining the study and asking for verbal consent to participate. Baseline interviews were conducted in person while drivers were still in the ED during times when they were not being actively treated by clinical staff. Participants received a $25 honorarium. RAs read each interview question verbatim and provided additional explanation as required. Interviews lasted 30 minutes and included: i) a description of the crash event, ii) drug or alcohol use in the 6 hours preceding the crash, iii) dangerous driving behaviour (Dula Dangerous Driving Index),<21, 22> and iv) general driving history including perceived driving ability, previous crashes and citations, and use of seatbelts and child seats. Participants were asked to describe how the crash occurred, where the crash occurred, and exactly what they (i.e. the driver) were doing at time of crash (RAs mentioned the following examples - talking to a passenger, using a cell phone, sipping a beverage, looking at a map - but the term “distraction” was not mentioned). Driver’s responses were recorded. RAs used feedback and follow-up questions to clarify ambiguous responses. In this study we define distraction as occurring when drivers were actively engaged in any non-driving related activity at time of crash.

The Dula dangerous driving index (DDDI) asks about aggressive driving and other dangerous driving indicators.<22> The (DDDI) questionnaire captures 3 domains relevant to aggressive

driving: i) risky driving which is dangerous driving without intent to cause harm, such as running a red light or weaving in traffic. ii) negative emotions felt while driving (including frustration, anger, rage but also other negative emotions such sadness or jealousy) and iii) intentional acts of aggression towards others such as trying to run another driver off the road.<21, 23> The DDDI has been validated in known dangerous drivers from the US and from Belgium.<22>

Follow-up Interviews

Drivers who consented to follow-up were contacted 6 months following the index crash. They were contacted by telephone (up to 5 attempts) and asked questions about i) personal health, financial, social, and legal sequelae resulting from the index crash, and ii) subsequent driving records including other collisions, and risky driving behaviour (impaired, speeding, distracted driving).

Analysis

We used simple descriptive statistics to report proportions, means, medians and interquartile ranges.

RESULTS

We approached 123 injured drivers, 77 agreed to be interviewed and interviews were completed in 69 (58.5%) drivers after excluding 5 ineligible drivers and 3 who were unable to complete the interviews (Figure 1). Reasons for refusal in the other 46 drivers included: "too tired", "too much pain", "not in the mood", on sedating pain medication in ED, or uncomfortable sharing personal information. Twelve of these 46 drivers were subsequently admitted and became non eligible.

Of the 69 completed baseline interviews, 34 (49.3%) of the drivers were male. The median driver age was 41 years (IQR = 29 years – 53 years). The majority of crashes (62/69 = 89.9%) occurred during daytime (06:00 hrs – 18:00 hrs), and most (65/69 = 94.2%) were multi-vehicle crashes. All study participants had minor injuries that did not require hospital admission. Non-participants and participants were similar in terms of basic demographic information. Non-participants had a median age of 37 (IQR = 29 - 58) and 51 % were male.

Immediately prior to the index crash, 1/69 drivers (1.4%) reported drinking alcohol and 1 (1.4%) reported illicit drug use. Five drivers (7.2%) had used sedating medications in the 6 hours prior to the crash: 3 (4.3%) used opiates and 2 (2.9%) used antidepressants. In the 34 drivers for whom blood alcohol levels (BALs) were measured as part of clinical care, there was perfect agreement between BAL and self-reported alcohol use prior to the crash. Nine drivers (13.0%) were engaged in a distracting activity at time of crash: 1 (1.4%) using a cell phone, 1 (1.4%) adjusting the radio, 5 (7.2%) talking to passengers and 2 (2.9%) distracted by something else. We did not specifically ask about fatigue but 2 drivers (2.9%) reported falling asleep at time of crash.

In our sample, 4/69 (5.8%) were aggressive drivers according to the DDDI (aggressive driving subscale score > 15), 5/69 (7.2%) were risky drivers (risky driving subscale score > 21), and 8 (11.6%) drove while experiencing anger or other negative emotions (negative emotion subscale score > 24).

Drivers were asked to self-rate their driving skills. One driver (1.4%) reported having below average driving skills, 5 (7.2%) reported average driving skills and the rest (91.3%) reported good or excellent driving skills. Several drivers reported having at least a little difficulty driving in the rain (21.7%), driving at night (17.4%), driving during rush hour (17.4%), or making left hand turns (4.3%). Two drivers (2.9%) had stopped driving on the highway, and 4 (5.8%) no longer drove in rush hour. No driver had been told by a health professional that their eyesight was too poor for them to drive but 25 (36.2%) had a little to moderate difficulty due to glare from sunlight or oncoming headlights and 7 (10.1%) had been diagnosed with cataracts (repaired in 3/7). In this sample, 95.7% of drivers reported always using a seatbelt and all 9 who drove with young children always used car seats. No driver regularly used hand-held cell phones but 14 (20.3%) reported “sometimes” or “rarely” using them, 26 drivers (37.7%) “often” or “sometimes” used hand-free phones, 8 (11.6%) “often” or “sometimes” texted while driving, and 7 (10.1%) “rarely” texted while driving. Twenty three drivers (33.3%) reported “often” or “sometimes” driving while tired, 14 (20.3%) drove “a little” or “much” faster than other drivers, and 14 (20.3%) reported driving more aggressively than other drivers. Twelve drivers (17.4%) reported one or more crashes in the previous year, and 17 (24.6%) had been pulled over by police in the past year. Table 1 summarizes the prevalence of driver-based risk factors.

Follow-up Interviews.

Sixty one drivers agreed to follow-up and we completed follow-up interviews with 45/61 (73.8%) (See Figure 1). Many drivers were still experiencing health issues and other problems due to the crash: 24/45 (53.3%) were not fully recovered, 21 (46.7%) had not returned to their usual daily activities, 22 (48.9%) had discontinued their previous recreational pursuits, and 13 (28.9%) were not back to work. In addition 27 patients (60%) reported ongoing pain (reported as severe in 5 cases and moderate in 8), 16 (35.6%) reported anxiety or depression related to the crash (reported as severe in 2 cases and moderate in 8), 26 (57.8%) had financial difficulties and 12 (26.6%) had legal problems related to the crash. Table 2 summarizes the adverse sequelae at 6 months.

Of the 42 participants who were back to driving, 7/42 (16.7%) reported a near miss and 2/42 (4.8%) reported another crash. Nine (21.4%) reported driving after drinking and 4 (9.5%) reported driving after cannabis use. Cell phone use (7/42 = 16.7%) and use of other electronics while driving (10/42 = 23.8%) were also common.

DISCUSSION

In this series of minor injury crashes, we found a high prevalence of driver-related risk factors including distraction (13.0%), driving while experiencing negative emotions (11.6%), risky (7.2%) or aggressive (5.8%) driving, and use of sedating medications (7.2%). In addition, two drivers (2.9%) volunteered that they had fallen asleep immediately prior to the crash. Since we did not specifically ask about fatigue, the prevalence may have been higher. Many drivers reported difficulty driving in adverse driving conditions or gave a history of engaging in risky driving behavior such as cell phone use, speeding, or driving while fatigued (Table 1). Unfortunately, following the index crash many drivers engaged in risky driving including drinking and driving, driving after using cannabis, and driving while using cell phones or other electronic devices. The high rate of cell phone use is concerning since, at the time of this study, BC drivers who use cell phones or other handheld electronic devices were subject to fines of up to $167 and 3 demerit points (those penalties have since been increased). Self-reported near misses were common (16.7%), and 4.8% reported a subsequent crash within 6 months of the index crash. We found that the health outcome in this sample of drivers, who were discharged from the ED, was worse than expected. Of the drivers we were able to follow, a third had not

returned to work at 6 months and half had not returned to their usual activities or were still experiencing health issues or other problems as a result of the crash.

Our findings add to the understanding of the role of driver related risk factors in minor injury crashes. We found no prospective studies reporting the prevalence of aggressive driving, risky driving or driving with negative emotions in crash involved drivers. The prevalence of distraction has been studied in serious injury crashes but not in minor crashes. According to Canadian police reports, distraction contributes to 30% of injury crashes.<24> McEvoy (Australia, 2007) found that 31.7% of drivers involved in serious crashes reported distraction at time of crash.<25> Bakiri (France, 2013) studied hospitalized drivers and found a prevalence of distraction ranging from 0.8% for cell phone use to 2.7% for "distraction related to driver activity" to 27.3% for "listening to radio/music".<26> Both studies had a higher prevalence of distraction than found in our series. Part of this difference likely depends on how distraction was defined. For example, unlike Bakiri, we did not categorize "listening to the radio" as a distracting activity. Evidence of alcohol or drug use is commonly found in injured drivers around the world.<27, 28> In Canada, alcohol is found in approximately a third of drivers involved in serious injury or fatal crashes and the prevalence of drugs is similar.<29-31> In our series of minor injury crashes, the prevalence of sedating medications (7.2%), alcohol (1.4%), or illicit drugs (1.4%) was much lower. Other evidence also suggests that alcohol and drugs play less of a role in minor crashes than in severe ones. For example, in a study of injured drivers who required bloodwork after a crash, we found a significantly higher prevalence of alcohol and of medications in those who were admitted to hospital as compared to those who were discharged from the ED.<32>

Our study also adds to the understanding of outcome following a minor injury crash. Other researchers have reported concussion, chronic pain,<4-7> and especially chronic neck pain from whiplash associated disorder (WAD)<33-38> following minor injury crashes. In a 2004 systematic review, Ameratunga found 6 studies reporting outcomes in injured drivers recruited from the ED or outpatient settings. The prevalence of disability in this group ranged from 5% to 39%.<15> Since that review, only a few researchers have studied the outcome following MVC and most focused on severe crashes. A French group studied outcome after crashes of all severity in 1168 adult MVC victims.<39> Outcomes were worse following severe injuries, but even in the mild injury group, only 45% reported full recovery at one year,<7> 36% were dissatisfied

with their health status,<16> 29% had delayed return to work,<11> and 12% developed post-traumatic stress disorder.<40> Ottosson (2010) studied 200 drivers involved in minor crashes and found that 89 (45%) had not recovered at one year.<41> Littleton (2011) studied 95 Australian drivers after a minor crash and found that those claiming compensation had worse health outcome.<18>

Limitations

This study is based on self-report and therefore is subject to socially desirable responding (reporting bias). Recall bias may also be a problem. We minimized these biases by conducting interviews soon after the crash, by asking objective questions, by reassuring participants that their answers are confidential, and by training interviewers to be non-judgmental and establish good rapport with participants. There is evidence that self-reported drug and alcohol use corresponds well with laboratory testing.<42-44>

Another limitation is that, because we studied a convenience sample of drivers, we oversampled daytime crashes. Compared to night-time drivers, daytime drivers are less likely to be impaired,<32> and we suspect that the prevalence of other crash related risk factors is also lower in daytime than in night-time drivers. Our conclusions are also limited by a high rate of drivers who declined participation or were lost to follow-up. Non-participating drivers may have been more likely to have caused the crash (i.e. higher rate of risk factors). In addition, 26.2% of drivers were lost to follow-up. This lost to followup rate is consistent with other injury outcome studies,<45> but may have biased our outcome estimates. Finally, we did not ask about some important driver related risk factors including fatigue, medical conditions, and psychiatric conditions.

CONCLUSIONS

We found that driver-related risk factors are common in drivers treated in the ED for minor injury crashes and that these drivers are at high risk of subsequent crashes. Therefore this group may benefit from screening for driver-related risk factors together with appropriate education or other interventions to prevent future crashes. We also found that many drivers discharged from the ED following a crash have slow recovery, prolonged absenteeism from work, and ongoing problems with pain, anxiety and/or depression. These drivers may benefit from post ED programs designed to improve recovery and return to work.

Acknowledgement: Dr Brubacher's research is supported by a Scholar Award from the Michael Smith Foundation for Health Research.

REFERENCES

1. Collaborators, G.B.o.D.S., *Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013.* Lancet, 2015. **386**(9995): p. 743-800.
2. Toroyan, T., et al., *Global status report on road safety, 2015*. 2015, World Health Organization: Geneva, Switzerland.
3. Amoros, E., et al., *Reporting on Serious Road Traffic Casualties*. 2011, International Traffic Forum Paris, France.
4. Mamelak, M., *The motor vehicle collision injury syndrome.* Neuropsychiatry, Neuropsychology, & Behavioral Neurology, 2000. **13**(2): p. 125-35.
5. Bennun, I.S. and P. Bell, *Psychological consequences of road traffic accidents.* Medicine, Science & the Law, 1999. **39**(2): p. 167-72.
6. Chan, A.O.M., et al., *Posttraumatic stress disorder and its impact on the economic and health costs of motor vehicle accidents in South Australia.* Journal of Clinical Psychiatry, 2003. **64**(2): p. 175-81.
7. Hours, M., et al., *Outcomes one year after a road accident: Results from the ESPARR cohort.* Accident Analysis & Prevention, 2013. **50**: p. 92-102.
8. Petridou, E. and M. Moustaki, *Human factors in the causation of road traffic crashes.* European Journal of Epidemiology, 2000. **16**(9): p. 819-26.
9. Schlundt, D., R. Warren, and S. Miller, *Reducing unintentional injuries on the nation's highways: a literature review.* Journal of Health Care for the Poor & Underserved, 2004. **15**(1): p. 76-98.
10. Wilson, F.A. and J.P. Stimpson, *Trends in fatalities from distracted driving in the United States, 1999 to 2008.* American journal of public health, 2010. **100**(11): p. 2213-9.
11. Fort, E., et al., *Return to work following road accidents: factors associated with late work resumption.* Journal of Rehabilitation Medicine, 2011. **43**(4): p. 283-91.
12. Duckworth, M.P. and T. Iezzi, *Chronic pain and posttraumatic stress symptoms in litigating motor vehicle accident victims.* Clinical Journal of Pain, 2005. **21**(3): p. 251-61.
13. Cassidy, J.D., E. Boyle, and L.J. Carroll, *Population-based, inception cohort study of the incidence, course, and prognosis of mild traumatic brain injury after motor vehicle collisions.* Archives of Physical Medicine & Rehabilitation, 2014. **95**(3 Suppl): p. S278-85.
14. Ameratunga, S.N., et al., *A Population-Based Cohort Study of Longer-Term Changes in Health of Car Drivers Involved in Serious Crashes.* Annals of Emergency Medicine, 2006. **48**(6): p. 729-736.
15. Ameratunga, S.N., et al., *Risk of disability due to car crashes: a review of the literature and methodological issues.* Injury, 2004. **35**(11): p. 1116-1127.
16. Khati, I., et al., *Quality of life one year after a road accident: results from the adult ESPARR cohort.* The Journal of Trauma and Acute Care Surgery, 2013. **74**(1): p. 301-11.
17. Littleton, S.M., et al., *The influence of fault on health in the immediate post-crash period following road traffic crashes.* Injury, 2012. **43**(9): p. 1586-92.
18. Littleton, S.M., et al., *The association of compensation on longer term health status for people with musculoskeletal injuries following road traffic crashes: emergency department inception cohort study.* Injury, 2011. **42**(9): p. 927-33.
19. Carroll, L.J., et al., *Recovery in whiplash-associated disorders: do you get what you expect?* Journal of Rheumatology, 2009. **36**(5): p. 1063-70.

20. Purssell, R.A., et al., *Proportion of injured drivers presenting to a tertiary care emergency department who engage in future impaired driving activities.* Traffic Injury Prevention, 2010. **11**: p. 34-42.
21. Dula, C.S. and M.E. Ballard, *Development and evaluation of a measure of dangerous, aggressive, negative emotional and risky driving.* Journal of Applied Social Psychology, 2003. **33**: p. 263-282.
22. Willemsen, J., et al., *The Dula Dangerous Driving Index: an investigation of reliability and validity across cultures.* Accident Analysis & Prevention, 2008. **40**(2): p. 798-806.
23. Dula, C.S. and E.S. Geller, *Risky, aggressive, or emotional driving: Addressing the need for consistent communication in research.* Journal of Safety Research, 2003. **34**(5): p. 559-566.
24. ICBC, *Quick statistics for the media.* 2011: Vancouver
25. McEvoy, S.P., M.R. Stevenson, and M. Woodward, *The prevalence of, and factors associated with, serious crashes involving a distracting activity.* Accident Analysis & Prevention, 2007. **39**(3): p. 475-82.
26. Bakiri, S., et al., *Distraction and driving: Results from a case–control responsibility study of traffic crash injured drivers interviewed at the emergency room.* Accident Analysis & Prevention, 2013. **59**(0): p. 588-592.
27. Sweedler, B.M., et al., *Worldwide trends in alcohol and drug impaired driving.* Traffic injury prevention, 2004. **5**(3): p. 175-84.
28. Gonzalez-Wilhelm, L., *Prevalence of alcohol and illicit drugs in blood specimens from drivers involved in traffic law offenses. Systematic review of cross-sectional studies.* Traffic Injury Prevention, 2007. **8**(2): p. 189-98.
29. Stoduto, G., et al., *Alcohol and drug use among motor vehicle collision victims admitted to a regional trauma unit: demographic, injury, and crash characteristics.* Accident Analysis & Prevention, 1993. **25**(4): p. 411-420.
30. Beasley, E. and D. Beirness, *Drug use by fatally injured drivers in Canada. (2000 - 2008). Ottawa, ON: Canadian Centre on Substance Abuse.* 2011.
31. Beasley, E., D. Beirness, and A.J. Porath-Waller, *A Comparison of Drug- and Alcohol-involved Motor Vehicle Driver Fatalities* 2011, Canadian Centre on Substance Abuse: Ottawa, Ontario.
32. Brubacher, J.R., et al., *Prevalence of alcohol and drug use in injured British Columbia drivers.* BMJ Open, 2016. **6**(3).
33. Ameratunga, S., et al., *Chronic neck pain following car crashes: a population-based study from Auckland, New Zealand.* Internal Medicine Journal, 2010. **40**(10): p. 704-9.
34. Atherton, K., et al., *Predictors of persistent neck pain after whiplash injury.* Emergency Medicine Journal, 2006. **23**(3): p. 195-201.
35. Buitenhuis, J., et al., *Work disability after whiplash: a prospective cohort study.* Spine, 2009. **34**(3): p. 262-7.
36. Pape, E., et al., *Prognostic factors for chronic neck pain in persons with minor or moderate injuries in traffic accidents.* Accident Analysis & Prevention, 2007. **39**(1): p. 135-46.
37. Richter, M., et al., *Whiplash-type neck distortion in restrained car drivers: frequency, causes and long-term results.* European Spine Journal, 2000. **9**(2): p. 109-17.
38. Walton, D.M., et al., *Risk factors for persistent problems following whiplash injury: results of a systematic review and meta-analysis.* Journal of Orthopaedic & Sports Physical Therapy, 2009. **39**(5): p. 334-50.
39. Hours, M., et al., *Functional outcome after road-crash injury: description of the ESPARR victims cohort and 6-month follow-up results.* Accident Analysis & Prevention, 2010. **42**(2): p. 412-21.

40. Chossegros, L., et al., *Predictive factors of chronic post-traumatic stress disorder 6 months after a road traffic accident.* Accident Analysis & Prevention, 2011. **43**(1): p. 471-7.
41. Ottosson, C., et al., *Personality disorders are not associated with nonrecovery in patients with traffic-related minor musculoskeletal injuries.* Journal of Trauma-Injury Infection & Critical Care, 2010. **68**(1): p. 198-203.
42. Cherpitel, C.J., et al., *Validity of self-reported drinking before injury compared with a physiological measure: cross-national analysis of emergency-department data from 16 countries.* Journal of studies on alcohol, 2007. **68**(2): p. 296-302.
43. Hjorthoj, C.R., A.R. Hjorthoj, and M. Nordentoft, *Validity of Timeline Follow-Back for self-reported use of cannabis and other illicit substances--systematic review and meta-analysis.* Addictive Behaviors, 2012. **37**(3): p. 225-33.
44. Large, M.M., et al., *Meta-analysis of self-reported substance use compared with laboratory substance assay in general adult mental health settings.* International journal of methods in psychiatric research, 2012. **21**(2): p. 134-48.
45. Kendrick, D., et al., *Recovery from injury: the UK burden of injury multicentre longitudinal study.* Injury Prevention, 2013. **19**(6): p. 370-81.

Table 1: Driver based risk factors.

Substance use before index crash	
Any substance	7/69 (10.1%)
Alcohol	1/69 (1.4%)
Illicit drugs	1/69 (1.4%)
Sedating medications	5/69 (7.2%)
Opiates	3/69 (4.3%)
Antidepressants	2/69 (2.9%)
Distraction during index crash	
Any distraction	9/69 (13.0%)
Cell phone	1/69 (1.4%)
Adjusting radio	1/69 (1.4%)
Talking to passengers	5/69 (7.2%)
Other	2/69 (2.9%)
Typical driving behaviour (Dula Dangerous Driving Index)	
Aggressive drivers	4/69 (5.8%)
Risky drivers	5/69 (7.2%)
Negative emotions	8/69 (11.6%)
Self-reported driving skills	
Below average	1/69 (1.4%)
Average	5/69 (7.2%)
Good or excellent	63/69 (91.3%)

Difficulty driving in the following conditions	
Rain	15/69 (21.7%)
Night-time	12/69 (17.4%)
Rush hour	12/69 (17.4%)
Left turns	3/69 (4.3%)
Glare conditions	25/69 (36.2%)
Typical driving habits (self-reported)	
Always use seatbelts	68/69 (95.7%)
Ever use hand held cell phones	14/69 (20.3%)
Handsfree cell phones	26/69 (37.7%)
Ever text while driving	15/69 (21.7%)
Drive when feeling tired	23/69 (33.3%)
Drive faster than others	14/69 (20.3%)
Drive more aggressively than others	14/69 (20.3%)

Table 2: Self reported adverse sequelae at 6 months.

Adverse Outcome	Number Reporting Outcome (Prevalence)
Incomplete recovery	24 (53.3%)
Not returned to usual daily activities	21 (46.7%)
Discontinued previous recreational activities	22 (48.9%)
Not back to work	13 (28.9%)
Ongoing Pain	27 (60%)
Severe	5
Moderate	8
Mild	14
Anxiety or Depression	16 (35.6%)
Severe	2
Moderate	8
Mild	6
Financial Problems	26 (57.8%)
Legal Problems	12 (26.6%)

Figure
Click here to download Figure: Figure 1 - Flow Sheet.docx

Figure 1.