Client Information Brief

Research and Information Service

For Dr Alex Douglas, MP

Attention Beverley Malseed

Request Fatigue and motor vehicle crashes - Queensland

Date 26 April 2013

Thank you for your request for information on the incidence of fatigue (sleep deprivation) causing motor vehicle crashes in Queensland, particularly details of a study done by Professor Doug McEvoy at the Adelaide Institute for Sleep Health.

Summary

In Queensland, driver fatigue (sleepiness) is considered one of the top five causes of motor vehicle crashes (the others being: speeding, alcohol, not wearing a seatbelt and distracted driving) and is included in many road safety campaigns.

There are several high risk groups which studies have shown are more likely to be involved in a motor vehicle accident where sleep deprivation is considered a high risk factor, including: shift-workers travelling to-and-from work (including drive-in-drive-out workers in the mining sector); younger drivers and/or more inexperienced drivers; drivers on rural and remote roads; drivers in the heavy vehicle road transport industry (truck-drivers) and motor cycle riders. Studies show that persons who have been diagnosed with specific sleep disorders (such as sleep apnoea) may also be at a higher risk of car accidents involving fatigue as a contributing factor.

However, any driver can be at risk of driving while sleep deprived, and many road safety campaigns seek to educate drivers to be aware of the signs of tiredness and to avoid particular circumstances that predicate the increased risk of driving while sleepy, including particular times of the night/day (circadian or biometric rhythms) and following long work shifts.

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Professor Doug McEvoy

Professor Doug McEvoy, B Med Sc, MBBS, FRACP, MD, is a specialist in research related to sleep apnoea, and is the Senior Director at the Adelaide Institute for Sleep Health, at the Repatriation General Hospital in Daw Park, South Australia.

Sleep apnoea (also spelt as sleep apnea) is defined as a condition in which breathing stops for more than ten seconds during sleep. Sleep apnea is a major, though often unrecognized, cause of daytime sleepiness. It can have serious negative effects on a person’s quality of life, and is thought to be considerably underdiagnosed in the United States.1

Professor Doug McEvoy is the Senior Director of the Adelaide Institute for Sleep Health and Staff Consultant in Sleep and Respiratory Medicine at the Repatriation General Hospital and Flinders Medical Centre. He has had a distinguished career in sleep medicine over the past 25 years. He has led a number of important multi-centre clinical trials in sleep medicine and is presently the Principal Investigator of the international Sleep Apnoea Cardiovascular Endpoints study (SAVE). He is a past president of the Australasian Sleep Association and is a board member of the Sleep Health Foundation. Prof McEvoy is a Practitioner Fellow of the National Health and Medical Research Council.2

The following journal articles relate to the impact of sleep apnoea on driving and include Professor McEvoy as one of the authors.


Abstract: To assess the effectiveness of CPAP treatment in improving 90-minute driving simulator performance in severe OSA patients compared to age/gender matched controls. While driving simulator performance improved after ~3 months of CPAP treatment with high adherence in patients with severe OSA, performance remained impaired compared to control subjects. These results add to the growing body of evidence that some neurobehavioral deficits in patients with severe OSA are not fully reversed by treatment. Further studies are needed to assess causes of residual driving simulator impairment and to determine whether this is associated with persistent elevated real-life accident risk.


1 The Free Medical Dictionary, online, accessed 26 April 2013.
2 Adelaide Institute for Sleep Health, at the Repatriation General Hospital, Staff profiles, Prof Doug McEvoy, website, accessed 26 April 2013.

Abstract: Partial sleep deprivation and alcohol consumption are a common combination, particularly among young drivers. We hypothesized that while low blood alcohol concentration (<0.05 g/dL) may not significantly increase crash risk, the combination of partial sleep deprivation and low blood alcohol concentration would cause significant performance impairment.


Abstract: It has been suggested that the Maintenance of Wakefulness Test (MWT) may be clinically useful to assess fitness to drive, yet little is known about the actual relationship between sleep latency and driving performance. This study examined the ability of 2 MWT trials to predict driving-simulator performance in healthy individuals. The results indicate that sleep latency on the MWT is a reasonable predictor of driving simulator performance in sleepy, alcohol-impaired, normal subjects. Further research is needed to examine the relationship between daytime MWT results and driving simulator performance in sleepy patients (e.g., those with obstructive sleep apnea) and in experimentally sleep-deprived normal subjects.

• 2004 - Siobhan Banks, PhD; Peter Catcheside, PhD; Leon Lack, PhD; Ron R. Grunstein MD, PhD; R. Doug McEvoy MD. Low Levels of Alcohol Impair Driving Simulator Performance and Reduce Perception of Crash Risk in Partially Sleep Deprived Subjects, Sleep, 27 (6), 1063-1067.

Abstract: Partial sleep deprivation and alcohol consumption are a common combination, particularly among young drivers. We hypothesized that while low blood alcohol concentration (<0.05 g/dL) may not significantly increase crash risk, the combination of partial sleep deprivation and low blood alcohol concentration would cause significant performance impairment. Alcohol at legal blood alcohol concentrations appears to increase sleepiness and impair performance and the detection of crash risk following partial sleep deprivation. When partially sleep deprived, women appear to be either more perceptive of increased crash risk or more willing to admit to their driving limitations than are men. Alcohol eliminated this behavioral difference.


Fatigue

Fatigue is one of the leading factors contributing to road crashes. However, may studies indicate that it is difficult to define fatigue, or sleepiness and to prove it is the cause of a motor vehicle accident.


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The Queensland Department of Transport and Main Roads (TMR) provides the following definition of fatigue-related as it applies to the calculation of factors contributing to car crashes in Queensland:

A contributing factor, determined by the reporting police officer, where any controller involved, including pedestrians and bicycle riders, is attributed with a reduction in driving or riding ability as a result of prolonged driving or being tired while driving. It should be noted that other factors, such as the elapsed time since the person last slept, the time of the day or night, as well as the human circadian rhythm may be involved. A single vehicle crash occurring in a speed zone of 100 km/hr or greater during the typical fatigue times of 2pm to 4pm or 10pm to 6am is deemed as 'Fatigue related by definition'.

A fatigued driver or rider is defined as “a driver/rider whose driving/riding ability has become impaired due to fatigue.”

Fatigue is defined as physical and/or mental exhaustion that can be triggered by stress, medication, overwork, or mental and physical illness or disease.

Without in-depth investigation, fatigue is a particularly difficult variable to assign as a crash factor. Some Australian mass crash databases (but not Victoria’s) include fatigue as a variable, however it usually reflects the conclusion of the attending police officer, based on information such as witness statements. A method of deriving a fatigue-involved crash from a number of other crash factors was proffered by the Australian Transport Safety Bureau. That method was applied to Victoria’s Mass crash database. Depending how the definition is used, 6-16% of all crashes and 17-27% of fatality crashes in Victoria were the result of fatigue.

The Centre for Accident Research & Road Safety – Queensland (CARRS-Q) has further information on fatigued driving at the CARRS-Q website.

Statistics - driver fatigue in Queensland

In 2010, there were 30 fatalities as a result of fatigue related crashes within Queensland, representing 12% of the Queensland road toll.

In 2009, there were 45 fatal car crashes where fatigue was considered a contributing factor/characteristic, representing 13.6% of all road crash fatalities.

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5 The Free Medical Dictionary, online, accessed 26 April 2013.

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From 2006 to 2010 there were 221 fatigue-related fatalities in Queensland. The key characteristics of these fatalities were that:

- 183 (or 82.8%) were light passenger vehicle drivers, 27 (or 12.2%) were truck drivers and 11 (or 5.0%) were motorcycle riders.
- 50 (or 22.7%) were aged 17 to 24 years, 47 (or 21.4%) were aged 30 to 39 years, 39 (or 17.7%) were aged 40 to 49 years and 36 (or 16.4%) were aged 50 to 59 years, where age was known.
- 180 (or 81.8%) were male and 40 (or 18.2%) were female, where gender was known.
- 124 (or 60.8%) held an open licence, 44 (or 21.6%) held a provisional licence, 25 (or 12.3%) were unlicensed, five (or 2.5%) held a learner licence, four (or 2.0%) were not licensed within Australia and two (or 1.0%) held a restricted licence, where licence type was known.
- 81 (or 36.7%) were also alcohol/drug related, 75 (or 33.9%) were also drink driving, 38 (or 17.2%) were also speeding and 21 (or 9.5%) were also performing illegal manoeuvres.9

Queensland Transport (2008, p17) has stated that fatigue was a factor in 65 fatalities on Queensland Roads in 2007. Based on this figure, fatigue contributed to 18.1% (Data Analysis Unit 2009) or almost one in five road crash fatalities in Queensland that year.

In Queensland during 2008 there were 44 fatalities as a result crashes involving fatigue related drivers or riders, which represented 13.4% of the Queensland road toll (Data Analysis Unit 2009).10

From 2008-2009, there were 433 hospitalised casualties as a result of fatigue related crashes in Queensland, which represents 6.4% of all hospitalised casualties in Queensland over that time.11

**Major contributing factors to fatigue**

Medically diagnosed conditions such as narcolepsy and sleep apnea are also considered to be associated with an increased risk of motor vehicle accidents in the United States.

*Sleep disorders are thought to be responsible for many motor vehicle crashes. However, it is difficult to establish reliable estimates of the contribution of sleepiness to motor vehicle crashes. The difficulty in identifying the role of sleepiness in crashes is due to the multifactorial nature of many crashes, and the lack of objective and reliable measures for assessing driver sleepiness (Pack, Pack, Rodgman, Cucchiara, Dinges, and Schwab, 1995). According to recent estimates, one to three percent of all highway crashes are caused by driver sleepiness (Knipling and Wang, 1994; 1995; Wang, Knipling, and Goodman, 1996; Webb, 1995). Narcolepsy and obstructive sleep apnea are two of the most common medical disorders that cause excessive daytime sleepiness, with obstructive sleep apnea the most common of the two disorders*.8

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9 RACQ, Fact Sheet 13 – Safer Road Users – Fatigue, website, accessed 26 April 2013.

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(Arbus, Tiberge, Serres, and Rouge, 1991; National Commission on Sleep Disorders Research Report, 1993). Both are believed to be associated with an increased risk of motor vehicle crashes.12

Other issues - microsleeps

In 2001, New South Wales Road Transport Authority (RTA) launched its ‘Microsleep’ campaign to educate the general public regarding microsleeps and the impact on driving and car accidents. Scientist and media personality Dr Karl Kruszelnicki was the public face of the RTA microsleep campaign.

- Microsleeps occur when a driver falls asleep or ‘nods off’. They are unintended periods of light sleep that last a few seconds or several minutes. A driver may just lose attention and stare blankly or even close their eyes, and the driver’s head might snap up.
- Microsleeps are dangerous when driving. During a 4 second microsleep, a car travelling at 100km/h will travel 111m while completely out of the driver’s control.
- Microsleeps usually occur at times of day when the driver would normally be asleep or when the driver is tired and trying to stay awake.13

Other issues – monotony

CARRS –Q also reports on the issue of monotony and hypovigilence as issues of concern that are linked to fatigue in drivers.

It is difficult to separate monotony from fatigue in the causes of road crashes. Research suggests that monotony induces physiological reactions similar to those experienced when fatigued (such as increased drowsiness and decreased arousal).

Their effects on driving performance are similar and result in similar types of crashes.14

Literature review – Queensland

The Centre for Accident Research and Road Safety – Queensland (CARRS-Q) State of the Road: fatigue Fact Sheet states that fatigue contributes to 20-30% of all deaths on the road, and may reach 40-50% in particular crash types, such as single-vehicle semi-trailer crashes. In addition:

The relative risk of dying as a result of a fatigue-related crash in rural areas of Queensland is 13.5 times higher than the risk in urban areas.

The National Truck Accident Research Centre (NTARC) report ‘2013 major accident investigation report’ found that in Queensland in 2011, there was an increase in the number of truck accidents attributed to driver fatigue, from less than 20% in 2009 to about 33% in 2011.15


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In 2012, a Queensland Police Union Journal article discussed the role of police officers in fatigue management. 16

The Queensland Government Mining Journal reported in 2008 regarding fatigue and road travel for mine workers following the death of two mine workers. The article discusses work patterns of mining workers and the potential for fatigue travelling to and from workplaces. 17

The 2008 report, Non-fatal motorcycle crashes on public roads in North Queensland stated that fatigue was only a minor contributing factor (1%) for non-fatal motor cycle accidents in Queensland in 2007, with the major contributing factors the road condition and a driving violation.


In June 2004, the Queensland Parliamentary Travelsafe Committee released Issues Paper No. 8 Inquiry into crashes involving driver and rider fatigue in Queensland. The paper stated in summary that:

- Around one in every twenty reported crashes in Queensland are likely to involve fatigue.
- Fatigue-related crashes were more likely to occur on a Friday, Saturday or Sunday in 2002.
- Obstructive Sleep Apnea is the most common sleep disorder to cause fatigue. This disease affects approximately 25 per cent of middle-aged men.
- The Queensland Road Safety Strategy 2004-2011 is a Queensland Government plan that encourages community participation to help reduce road trauma on Queensland roads. The Queensland Government is aiming to have less than 5.6 deaths per 100,000 people by 2011
- Fatigue is a key issue highlighted in the strategy.
- The strategy also mentions that fatigue can occur at any time, not just when driving long distances. 18

In 2002, there was study undertaken by Queensland Industrial Relations and Queensland Transport which found that Brisbane taxi drivers worked long shifts potentially placing them and their passengers at risk from sleep deprivation related accidents.

BRISBANE taxi drivers are risking the safety of their passengers by working shifts of up to 24 hours in order to earn a decent living.

A Queensland Industrial Relations and Queensland Transport review into the industry's health and safety practices has revealed taxi drivers have been working shifts of an average of 12 hours though shifts of up to 24 hours do occur. 19

15 National Truck Accident Research Centre (NTARC), 2013 major accident investigation report, accessed 26 April 2013.

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Literature Review – Australia


Smith, Simon S. & Trinder, John (2001) *Sleep and driving in young adults*. Australian Transport Safety Bureau (ATSB), Canberra

Sleepiness is a significant contributor to car crashes and sleepiness related crashes have higher mortality and morbidity than other crashes. Young adult drivers are at particular risk for sleepiness related car crashes. It has been suggested that this is because young adults are typically sleepier than older adults because of chronic sleep loss, and more often drive at times of increased risk of acute sleepiness.

Symons, M. and Haworth, N. *The contributions of speed and fatigue to work-related road crashes*. Monash University Accident Research Centre.

Please contact the Research and Information Service for any additional research.

Karen Stokes
Research Librarian

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Client: Dr Alex Douglas, MP
Client Information Brief title: Fatigue and sleep deprivation causing motor vehicle crashes in Qld.
Date: 26 April 2013
Officer: Karen Stokes

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