Why Don't Australian Drivers with Type 1 Diabetes Check their Blood Glucose before Driving?

Steven Trawley [a,b], Elizabeth Holmes-Truscott [a,b], Jane Speight [a,b].

[a] School of Psychology, Deakin University, Geelong, Victoria, Australia.[b] The Australian Centre for Behavioural Research in Diabetes, Diabetes Victoria, Melbourne, Victoria, Australia.

Abstract

Australian guidelines for people who manage their diabetes with insulin indicate that they should check their blood glucose before driving (Austroads, 2016). An Australian survey of 539 drivers with type 1 diabetes (T1D) has shown that three-quarters did not perform a pre-drive blood glucose check (Trawley, Holmes-Truscott, & Speight, 2016). Analysis of how often drivers did not follow these guidelines and the reasons why was beyond the scope of that report. In the present paper, these data are re-visited to further explore the self-reported reasons and whether these drivers were at increased risk for motor vehicle crashes.

Background

Australian drivers who manage their diabetes with insulin are automatically issued with a conditional licence, which is reviewed regularly to ensure they meet specific fitness-to-drive criteria. These criteria stem from research that indicates an increase in motor vehicle crash risk for "at-risk" drivers (Cox et al., 2010; Signorovitch et al., 2013; Songer & Dorsey, 2006). "At-risk" is defined typically as those who have a history of severe hypoglycaemia (very low blood glucose, requiring the assistance of another person for recovery (Seaquist et al., 2013)) or the syndrome of impaired awareness of hypoglycaemia (IAH, i.e. reduced autonomic symptoms or recognition of such symptoms (Little et al., 2014)).

In addition to attending a periodic medical licence review, these drivers are also required to perform self-monitoring of blood glucose (SMBG) before driving (Austroads, 2016). The rationale for these requirements is the neuroglycopenic effect of hypoglycaemia (i.e. cognitive disruption caused by brain glucose deprivation), which impairs driving performance (Cox, Gonder-Frederick, Kovatchev, Julian, & Clarke, 2000).

Recently, Trawley et al. (2016) surveyed over 500 Australian drivers with type 1 diabetes (T1D) and found that three-quarters did not perform SMBG consistently before driving. However, their self-reported reasons and "at-risk" status was not examined in detail. This paper aims to further explore these important issues.

Method

The data were derived from the YourSAY: Glucose Monitoring study, which was a national, cross-sectional online survey designed to explore SMBG attitudes and self-reported behaviours amongst Australian adults with T1D. From a total of 539 drivers, 406 (64% (n=260) women; mean±SD age 44±14 years, T1D duration 23±14 years) indicated that they did not (never/rarely/sometimes) perform SMBG consistently before driving and provided reasons for this via fixed-choice responses and free text. A subgroup (n=341; demographics consistent with larger sample) also provided information regarding their recent history (past 6 months) of severe hypoglycaemic events and IAH.

Results/Discussion

The most commonly reported reasons for not performing SMBG before driving was that it was inconvenient, closely followed by food consumption (see Table 1). Food consumption as an alternative to checking is potentially problematic for three reasons. First, even fast-acting carbohydrate (e.g. fruit juice) takes 10–15 minutes to produce an effect, during which time driving performance may be impaired if blood glucose is already low. Second, ingesting carbohydrate when blood glucose is not low will result in higher glucose levels, which can also disrupt cognition (Cox et al., 2005) and adversely affect driving performance (Cox, Ford, Ritterband, Singh, & Gonder-Frederick, 2011). Finally, this behaviour may increase the time spent in hyperglycaemia, with important ramifications for overall glycaemic control and risk of long-term complications.

Table 1 Why drivers with T1D do not check their blood glucose consistently before driving, and their risk profile as a function of not doing so

	Do you check your blood glucose level immediately before you drive a motor vehicle?			
What are the reasons you may not check your blood glucose regularly when driving?	**Never/Rarely/Sometimes (N=406)**	**Never (n=82)**	**Rarely (n=86)**	**Sometimes (n=238)**
It is inconvenient [a]	41.4% (168/406)	42.7% (35/82)	39.5% (34/86)	41.6% (99/238)
I prefer to eat so I know my blood glucose is OK while driving (e.g. jelly beans)	36.2% (147/406)	41.5% (34/82)	37.2% (32/86)	34% (81/238)
I don't have test strips or lancets at hand	5.7% (23/406)	8.5% (7/82)	8.1% (7/86)	3.8% (9/238)
I have good awareness of my blood glucose	5.7% (23/406)	11% (9/82)	5.8% (5/86)	3.8% (9/238)
Checking is painful	4.4% (18/406)	3.7% (3/82)	4.7% (4/86)	4.6% (11/238)
I have checked recently [b]	2.2% (9/406)	1.2% (1/82)	1.2% (1/86)	2.9% (7/238)
Short trip [b]	1% (4/406)	0% (0/82)	0% (0/86)	1.7% (4/238)
I forgot [b]	1% (4/406)	0% (0/82)	1.2% (1/86)	1.3% (3/238)
Didn't know you should [b]	0.5% (2/406)	1.2% (1/82)	1.2% (1/86)	0% (0/238)
	Do you check your blood glucose level immediately before you drive a motor vehicle?			
Risk profile of driver	**Never/Rarely/Sometimes (N=341)**	**Never (n=68)**	**Rarely (n=67)**	**Sometimes (n=206)**
One or more severe hypoglycaemic events during the past 6 months	15.2% (52/341)	8.8% (6/68)	20.9% (14/67)	15.5% (32/206)
Impaired awareness of hypoglycaemia	23.2% (79/341)	13.2% (9/68)	23.9% (16/67)	26.2% (54/206)
Impaired awareness of hypoglycaemia *AND* one or more severe hypoglycaemic events during the past 6 months	6.7% (23/341)	1.5% (1/68)	10.4% (7/67)	7.3% (15/206)

[a] This is a composite of four predefined options that fall within the reason of ”inconvenience”, namely; “It is fiddly and inconvenient to check in a vehicle”; ”I can't properly dispose of used test strips or

lancet"; "Checking takes too long"; and "Checking requires a suitable place". If a respondent indicated any one of these reasons it was marked under "inconvenience".
[b] Taken from open text box.

Of those drivers who had experienced a severe hypoglycaemic event in the past six months, 15% rarely, if at all, performed SMBG before driving. Furthermore, 6% of these drivers reported both a history of severe hypoglycaemia and IAH. There is a clear need for intervention to improve pre-driving SMBG consistency, especially for drivers with T1D who fall within the "at-risk" category.

References

Austroads. (2016). Assessing fitness to drive for commercial and private vehicle drivers: medical standards for licensing and clinical mangement guidelines. (AP-G56-16). Retrieved from http://www.austroads.com.au/drivers-vehicles/assessing-fitness-to-drive

Cox, D. J., Ford, D., Ritterband, L., Singh, H., & Gonder-Frederick, L. (2011). Disruptive effects of hyperglycemia on driving in adults with type 1 and 2 diabetes. Diabetes, 60(Suppl 1), A223.

Cox, D. J., Gonder-Frederick, L. A., Kovatchev, B. P., Julian, D. M., & Clarke, W. L. (2000). Progressive hypoglycemia's impact on driving simulation performance. Occurrence, awareness and correction. Diabetes Care, 23(2), 163-170.

Cox, D. J., Kovatchev, B. P., Gonder-Frederick, L. A., Summers, K. H., McCall, A., Grimm, K. J., & Clarke, W. L. (2005). Relationships between hyperglycemia and cognitive performance among adults with type 1 and type 2 diabetes. Diabetes Care, 28(1), 71-77.

Cox, D. J., Singh, H., Clarke, W. L., Anderson, S. M., Kovatchev, B. P., & Gonder-Frederick, L. A. (2010). Metabolic demand of driving among adults with type 1 diabetes mellitus (T1DM). Ann Adv Automot Med, 54, 367-372.

Little, S., Leelarathna, L., Barendse, S., Walkinshaw, E., Tan, H., Lubina Solomon, A., . . . Amiel, S. (2014). Severe hypoglycaemia in type 1 diabetes mellitus: underlying drivers and potential strategies for successful prevention. Diabetes/Metabolism Research and Reviews, 30(3), 175-190.

Seaquist, E. R., Anderson, J., Childs, B., Cryer, P., Dagogo-Jack, S., Fish, L., . . . Vigersky, R. (2013). Hypoglycemia and diabetes: a report of a workgroup of the American Diabetes Association and the Endocrine Society. Diabetes Care, 36(5), 1384-1395.

Signorovitch, J. E., Macaulay, D., Diener, M., Yan, Y., Wu, E. Q., Gruenberger, J. B., & Frier, B. M. (2013). Hypoglycaemia and accident risk in people with type 2 diabetes mellitus treated with non-insulin antidiabetes drugs. Diabetes, Obesity and Metabolism, 15(4), 335-341.

Songer, T. J., & Dorsey, R. R. (2006). High risk characteristics for motor vehicle crashes in persons with diabetes by age. Annu Proc Assoc Adv Automot Med, 50, 335-351.

Trawley, S., Holmes-Truscott, E., & Speight, J. (2016). Inconsistent blood glucose checking before driving among drivers with type 1 diabetes: Results from the Australian YourSAY: Glucose Monitoring study. Diabetes Research and Clinical Practice, 121, 173-177.