Identifying people at risk of traffic accidents

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In the document produced for medical practitioners – *At a Glance Guide to the Current Medical Standards of Fitness to Drive* (Drivers Medical Group, 2010) – the Driver and Vehicle Licensing Agency (DVLA) states that: "In the interests of road safety, those who suffer from a medical condition likely to cause a sudden disabling event at the wheel or who are unable to safely control their vehicle from any other cause, should not drive."

For people with diabetes, the main risk to safe driving is treatment-induced hypoglycaemia. Individuals unable to recognise the symptoms and signs of hypoglycaemia are considered by the DVLA to be at high risk of being unable to safely control their vehicle, as are individuals who have suffered recent disabling hypoglycaemia.

The incidence of hypoglycaemia among people with diabetes is highest in those using insulin, but there is also a significant risk among those taking sulphonylureas (Gabriely and Shamoon, 2004). It would be unreasonable and inappropriate to ban all individuals using these treatments from driving. A judgement has to be made about an individual's risk of hypoglycaemia, particularly the risk of sudden and unexpected hypoglycaemia while driving.

Hypoglycaemia unawareness among insulin-treated people with diabetes is a common problem (Gabriely and Shamoon, 2004). To some degree, this unawareness is an almost inevitable consequence of tight glycaemic control in people using insulin, but a blanket policy of banning driving would have a major impact on a large number of peoples' lifestyles. On the other hand, guidance must err on the side of caution to protect the majority of road users.

Cox et al (2010; summarised alongside) focused on a small group of people with type 1 diabetes made up of both people who had and those who had not reported experiencing at least two hypoglycaemia-related driving mishaps during the past year. Although the study population was small, a subgroup with identifiable risks that would make them more prone to traffic accidents was identified. If these results can be reproduced in a larger cohort it will have implications for future driving guidelines for people with diabetes.

> ***"If we can identify individuals at high risk of road traffic accidents, we can work with them to address that risk. Perhaps more importantly, we can identify individuals with impaired awareness of hypoglycaemia who are at low risk of accidents and allow them hold a driving licence."***

The challenge will be to translate these differences in perception and response to hypoglycaemia that can be demonstrated in a research setting into useful clinical measures that can be applied in practice to identify those with diabetes who are at risk of sudden disabling event while driving. If we can identify individuals with diabetes at high risk of road traffic accidents, we can work with them to address that risk. Perhaps more importantly, we can identify individuals with impaired awareness of hypoglycaemia who are at low risk of accidents and allow them hold a driving licence.

Drivers Medical Group (2010) *At a Glance Guide to the Current Medical Standards of Fitness to Drive*. Driver and Vehicle Licensing Agency, Swansea

Gabriely I, Shamoon H (2004) Hypoglycemia in diabetes: common, often unrecognized. *Cleve Clin J Med* **71**: 335–42

DIABETES CARE

Subgroup of drivers with T1D more at risk of collisions

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 Drivers with T1D have more than twice as many driving mishaps as their non-diabetic spouses, possibly due to a vulnerability to hypoglycaemia and its disruptive effects on driving.

2 This randomised, double-blind, crossover trial looked at the effect of euglycaemia (5.5 mmol/L) and progressive hypoglycaemia (3.9–2.5 mmol/L) on participants driving a driving simulator or watching a videotape of the simulator.

3 In total, 38 drivers with T1D participated; 16 reported at least two hypoglycaemia-related driving mishaps during the past year (+history) and 22 had no history of mishaps (–history).

4 Examiners were blind to people with and without a history of driving mishaps (+/–history); participants were blind to their blood glucose levels.

5 During euglycaemia, people in the +history group reported more autonomic and neuroglycopenic symptoms ($P \leq 0.01$) and required more carbohydrate to maintain euglycaemia with the same insulin infusion ($P < 0.09$); during progressive hypoglycaemia, this group released less adrenaline ($P = 0.02$) and showed significant worsening of their driving ($P = 0.03$).

6 The authors concluded that these findings suggest people with T1D who are prone to traffic accidents have detectable differences in the way they perceive and respond to hypoglycaemia.

Cox DJ, Kovatchev BP, Anderson SM et al (2010) Type 1 diabetic drivers with and without a history of recurrent hypoglycaemia-related driving mishaps. *Diabetes Care* **33**: 2430–5

"Thyroid autoimmunity and autoimmunity suggestive of coeliac disease are the most common autoimmune phenomena in T1D."

DIABETES

Residual beta-cell function remains in people with T1D >50 years duration

Readability	✓✓✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓✓✓

1 People with T1D are at risk of developing vascular complications.

2 Although enhancing endogenous insulin production in people with T1D would improve glycaemic control and reduce complications, there has been no study on the residual pancreatic function in people with long-term T1D.

3 The authors sought to evaluate the extent of pancreatic beta-cell function in 411 people with insulin-dependent diabetes of 50 years or longer duration from the Joslin 50-year Medalist Study.

4 The study sample comprised 192 men and 219 women with an mean age of 67.2±7.4 years, a mean age at diagnosis of diabetes of 11.0±6.5 years and a mean duration of diabetes of 56.2±5.8 years.

5 Random serum C-peptide levels showed that 67.4% of the participants had levels in the minimal range (0.03–0.2 nmol/L) or sustained range (≥0.2 nmol/L).

6 Higher random C-peptide levels were associated with lower HbA_{1c}, older age at onset, higher frequency of HLA DR3 genotype and responsiveness to a mixed-meal tolerance test.

7 Results indicated that residual beta-cells in people with T1D of long-standing duration were in a steady state of cellular apoptosis and proliferation.

8 The authors found that the enhancement of endogenous insulin production could be a viable therapeutic approach in T1D, even among those with a T1D duration of >50 years.

Keenan HA, Sun JK, Levine J et al (2010) Residual insulin production and pancreatic beta-cell turnover after 50 years of diabetes: Joslin Medalist Study. *Diabetes* **59**: 2846–53

DIABETOLOGIA

Healthcare costs increase with severity of DR

Readability	✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

1 To determine the prevalence and healthcare costs of diabetic retinopathy (DR), 251 386 people within an eye clinic catchment area in Sweden were identified.

2 The catchment comprised 12 026 people with diabetes (1149 had T1D; 10 877 had T2D); those with and without DR were identified and healthcare costs evaluated.

3 Any DR was present in 41.8% of people with T1D (n=480) and in 27.9% of people with T2D (n=3035); sight-threatening DR was present in 12.1% of people with T1D (n=138) and in 5.0% of people with T2D (n=540).

4 The annual average healthcare cost of any DR was calculated as €72; this cost increased with severity of DR (€26 for background retinopathy; €257 for proliferative DR; €216 for maculopathy).

Heintz E, Wiréhn A-B, Bourghardt Peebo B et al (2010) Prevalence and healthcare costs of diabetic retinopathy: a population-based register study in Sweden. *Diabetologia* **53**: 2147–54

DIABETES CARE

Thyroid and coeliac autoimmunity prevalent in T1D

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The authors investigated diabetes-specific autoantibodies and additional autoimmune phenomena in 28 671 young people (aged <30 years) with T1D.

2 At lease one beta-cell antibody was present in 81.6% of participants; people negative for beta-cell antibodies were significantly younger at T1D onset.

3 A total of 4901 participants (19.6%) had elevated titres of at least one thyroid antibody, with female predominance (62%; P<0.0001).

4 Antibodies to tissue transglutaminase were found in 10.7% of the cohort, who were those who had T1D for significantly longer; parietal cell antibodies were present in 283 people and were associated with older age.

5 Thyroid autoimmunity and autoimmunity suggestive of coeliac disease were found to be the most common autoimmune phenomena in T1D.

Warncke K, Fröhlich-Reiterer EE, Thon A et al (2010) Polyendocrinopathy in children, adolescents and young adults with type 1 diabetes. *Diabetes Care* **33**: 2010–12

DIABETES

Enteroviral infection may cause T1D in children positive for islet autoantibodies

Readability	✓✓
Applicability to practice	✓
WOW! factor	✓

1 The authors investigated whether enteroviral infections predicted progression to T1D in 2365 genetically predisposed children repeatedly positive for islet autoantibodies.

2 Genetically susceptible children were screened for autoantibodies at ages 9, 12, 15 and 24 months, and annually thereafter.

3 A total of 140 children seroconverted for islet autoantibodies at a median age of 4 years; of these, 50 developed T1D at a median age of 8.7 years after a median follow-up of 4.1 years from the first appearance of islet autoantibodies.

4 The risk of progression to T1D in the cohort following detection of enteroviral RNA in serum was significantly increased and the authors concluded that progression from islet autoimmunity to T1D may increase following an enteroviral infection.

Stene LC, Oikarinen S, Hyöty H et al (2010) Enterovirus infection and progression from islet autoimmunity to T1D. *Diabetes* **59**: 3174–80

DIABETOLOGIA

Treatment with GAD-alum preserves insulin secretion

Readability	✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓

1 Alum-formulated glutamic acid decarboxylase GAD_{65} (GAD-alum) is a major auto-antigen in T1D, which may preserve residual insulin secretion.

2 This study comprised 70 young people (aged 10–18 years) with recent-onset T1D who were randomised to a double-blind treatment with either 20 µg of GAD-alum or placebo on day 1, followed by a boost 1 month later.

3 At 30-months follow-up there was a significant preservation of residual insulin secretion (as measured by C-peptide) in the GAD-alum group, compared with the placebo group.

4 Insulin secretion preservation was evident in the GAD-alum group within 6 months of diabetes diagnosis.

5 C-peptide decreased significantly less in the GAD-alum group compared with the placebo group after 4 years.

Ludvigsson J, Hjorth M, Chéramy M et al (2010) Extended evaluation of the safety and efficacy of GAD treatment of children and adolescents with recent-onset type 1 diabetes. *Diabetologia* [Epub ahead of print]

DIABETOLOGIA

Increased beta-cell function following immunosuppression

Readability	✓✓✓
Applicability to practice	✓
WOW! factor	✓✓

1 The authors sought to determine whether immunosuppression therapy can reinstate beta-cell function in people with long-term T1D.

2 Pancreatic beta-cell function was examined in 22 people with long-term T1D (median duration, 27 years) receiving rapamycin monotherapy as a preconditioning for islet transplantation and in 14 people with long-term T1D (median duration, 17 years) awaiting islet transplantation without rapamycin.

3 Median fasting C-peptide increased from <0.03 nmol/L at baseline to 0.039 nmol/L at study end in the rapamycin group (P=0.005).

4 In 12 people, C-peptide concentration increased to ≥0.076 nmol/L; exogenous insulin requirement decreased significantly in these responsive people.

5 It was concluded that pancreatic beta-cell function can be increased in some people with long-term T1D.

Piemonti L, Maffi P, Monti L et al (2010) Beta-cell function during rapamycin monotherapy in long-term type 1 diabetes. *Diabetologia* [Epub ahead of print]

DIABETES CARE

Vitamin D deficiency plays a role in the development of CAC in people with T1D

Readability	✓
Applicability to practice	✓✓
WOW! factor	✓

1 The study objective was to determine the relationship between vitamin D deficiency (as measured by serum levels of 25-hydroxyvitamin D [25{OH}D]) and the progression of coronary artery calcification (CAC) in 374 adults with T1D.

2 CAC was measured at baseline and at 3- and 6-year follow-up; 25[OH]D was measured at 3-year follow-up.

3 Results showed that 65% of participants had a normal level (>30 ng/mL), 25% had an insufficient level (20–30 ng/mL) and 10% had a deficient level (<20 ng/mL) of 25[OH]D.

4 Vitamin D deficiency was associated with the presence of CAC at 3-year follow-up; in people free of CAC at 3 years, vitamin D deficiency was found to predict future CAC development in those with the vitamin D receptor M1T CC genotype.

Young KA, Snell-Bergeon JK, Naik RG et al (2011) Vitamin D deficiency and coronary artery calcification in subjects with type 1 diabetes. *Diabetes Care* [Epub ahead of print]

DIABETIC MEDICINE

Hypoglycaemia fear increased among women with T1D

Readability	✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓

1 This study aimed to examine fear of hypoglycaemia and its association with demographic and disease-specific variables in an adult population with T1D.

2 The Swedish Hypoglycaemia Fear Survey (Swe-HFS) Worry and the Swe-HFS Aloneness subscales were posted to all adults (n=1387) with T1D identified through the local diabetes registries of two hospitals in Sweden.

3 Participants' self-reports and medical records were used to obtain demographic and disease-specific information. Univariate analysis and multiple stepwise linear regression analysis were used in the statistical analyses of the data.

4 More than half (n=764; 55%) of the population contacted participated in the study (mean age 43.3 years; mean HbA_{1c} 7.0% [53 mmol/mol]).

5 Results from both the Swe-HFS Worry and Swe-HFS Aloneness subscales were significantly associated with: frequency of severe hypoglycaemia, number of symptoms during mild hypoglycaemia, gender and hypoglycaemic unawareness. Frequency of severe hypoglycaemia was identified as the most important factor associated with fear of hypoglycaemia.

6 The authors found that women in this cohort were more affected by fear of hypoglycaemia than men. This is the first study to the authors' knowledge to document gender differences in fear of hypoglycaemia in adults with T1D.

Anderbro T, Amsberg S, Adamson U et al (2010) Fear of hypoglycaemia in adults with type 1 diabetes. *Diabet Med* **27**: 1151–8

> *"The authors found that women in this cohort were more affected by fear of hypoglycaemia than men. This is the first study to the authors' knowledge to document gender differences in fear of hypoglycaemia in adults with T1D."*