

Train driving and diabetes – keeping safety on track

Dr Paul Grant

Consultant Diabetologist, Royal Sussex County Hospital, Brighton, UK

Dr Harry Phoolchund

Consultant Occupational Physician, Sigma Occupational Health Ltd, London, UK

Correspondence to:

Dr Paul Grant, Consultant Diabetologist, Royal Sussex County Hospital, Eastern Road, Brighton BN2 5BE, UK; email: drpaul.grant@doctors.org.uk

Dr Harry Phoolchund, Consultant Occupational Physician, Sigma Occupational Health Ltd, 52 Wimborne Drive, Pinner, Middlesex HA5 1NQ, UK; email: harry.phoolchund@sigmaoh.co.uk

Received: 13 April 2015

Accepted in revised form: 13 May 2015

Abstract

Despite disability legislation, some people with diabetes (particularly those taking insulin) still experience discrimination in the work that they are allowed to perform.

Some occupations have strict medical standards that people with diabetes may not be able to meet. These usually apply where a job is unusually risky, e.g. because it involves operating heavy machinery or vehicles, with a risk of harm to the employee or others in case of sudden incapacity. People with diabetes have successfully challenged employers who sought to exclude them from jobs simply because they were 'diabetic', rather than assessing them as individuals.

We look at the phenomenon of diabetes control related to train driving and the criteria that should be achieved to ensure safety for both the individual and their passengers.

Copyright © 2015 John Wiley & Sons.

Practical Diabetes 2015; 32(6): 200–203

Key words

diabetes mellitus; hypoglycaemia; insulin; safety critical work; train driving

Introduction

Diabetes is covered by the Equality Act 2010, which makes it illegal for employers to refuse a job to someone simply because of their disability.¹ As a result of this act, people with diabetes can no longer be banned from a particular role simply because they have diabetes; instead their fitness to do the job must be individually assessed. The only employer exempt from the Equality Act is the Armed Forces, where a blanket ban on recruiting people with diabetes still applies.²

Some occupations have strict medical standards that people with diabetes may not be able to meet. These usually apply where a job is unusually risky, e.g. because it involves operating heavy machinery or vehicles, with a risk of harm to the employee or others in case of sudden incapacity. The most common reason for people with diabetes not meeting medical standards is the potential risk of hypoglycaemia. For example, historically, people with type 1 diabetes or those with type 2 diabetes who require insulin in the UK are not allowed to become train drivers or commercial airline pilots. Vehicle licensing regulations are strict relating to HGV and PSV licensing; however, times change and there are now several people with type 1 diabetes who have been allowed to fly civil aircraft.³ The Faculty of Occupational Medicine of the Royal College of Physicians has also published guidance

for assessing fitness for blue light driving (emergency drivers, e.g. police officers, fire crews or paramedics), including drivers on insulin.⁴

This article focuses in particular on the safety of individuals with type 1 or type 2 diabetes requiring insulin being able to drive trains, and should therefore be seen as a suggestion of guidance in order to trigger debate on the matter.

In relation to train driving, the current legislation which provides medical standards for train drivers is the 'Train Driving Licences and Certificates Regulations 2010' (TDLCR 2010).⁵ This legislation states that: 'Drivers must not be suffering from any medical conditions or be taking any medication, drugs or substances which are likely to cause – (a) a sudden loss of consciousness, (b) a reduction in attention or concentration, (c) sudden incapacity, (d) a loss of balance or coordination.'

The document 'Guidance on Medical Fitness for Railway Safety Critical Workers' GOGN3655 Issue 2 (2014) further states that: 'Modern treatments and risk assessment methods have enabled some insulin treated individuals to perform safety critical roles just as well as other people.' It goes on to say that: 'People with diabetes have successfully challenged employers who sought to exclude them from jobs simply because they were "diabetic",

rather than assessing them as individuals. This means that a “blanket ban” for people with diabetes is no longer acceptable, except where there is a legal requirement.⁶

Example case history

A 36-year-old female employee has been under the care of the hospital diabetes service. She was originally diagnosed with type 1 diabetes eight years earlier. At that time she was already working as a train conductor and was concerned that she would lose her job as a consequence of her new diagnosis – however, this was not the case and she was able to continue working so long as there was regular ongoing diabetes team and occupational health review. She has a long held ambition to become a train driver.

Over time, her overall diabetes control was variable but improved following attendance on the local Type 1 Diabetes Structured Education course – this seeks to help improve diabetes self-management through the principles of carbohydrate counting and insulin dose adjustment. Figure 1 demonstrates the longitudinal pattern of her HbA_{1c} over time.

Day-to-day capillary blood glucose monitoring appeared stable, with a pre-meal range of 3.7–6.8mmol/L and a 2 hour post-meal range of 5.2–8.5mmol/L. There has fortunately been little in the way of hypoglycaemia. Certainly, no episodes requiring third party assistance have been reported and hypoglycaemia awareness remained intact. The patient is keen and determined to apply for a role as a train driver and, given the fact that her overall control was good, it has been difficult to find a reason not to explore this. There was no clinical requirement to consider the use of insulin pump therapy or a continuous glucose monitoring system (CGMS) in view of the fact that regular, fastidious blood glucose monitoring was ongoing and no micro- or macrovascular complications of diabetes had developed over time. Following discussion, the local diabetes team and the occupational health team at her place of employment are monitoring her diabetes status until the employer makes a decision regarding train driving for

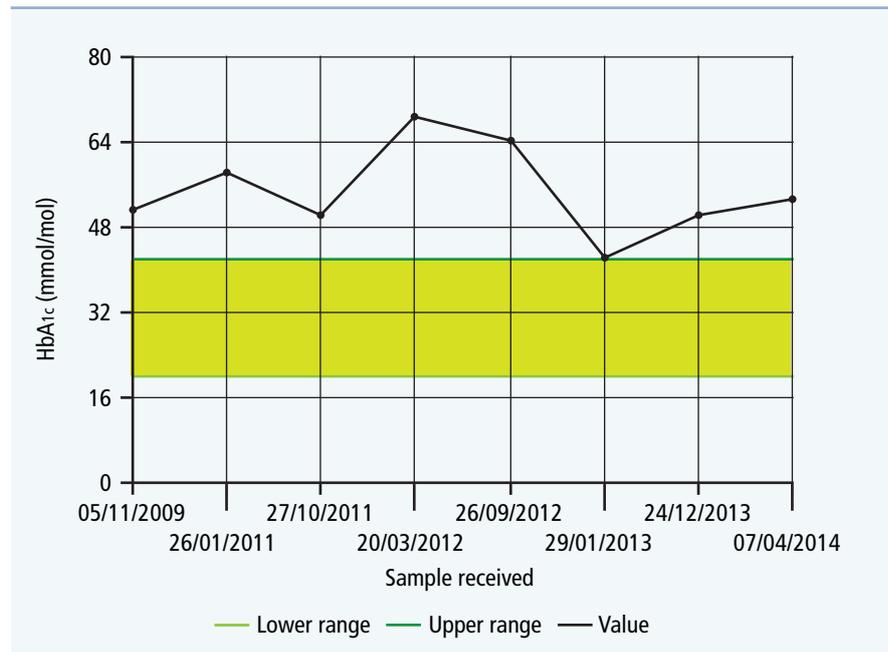


Figure 1. Longitudinal pattern of HbA_{1c} over time in the example case history

employees on insulin. This is a sensitive issue at the moment as no train operating company in the UK has so far allowed train driving on insulin, and understandably relates to the fitness to perform safety critical work alongside the concern of insulin as a ‘high-risk’ medication in terms of hypoglycaemia susceptibility.

Development of occupational health guidance

The ‘Guidance on Medical Fitness for Railway Safety Critical Workers’ GOGN 3655 gives general guidance on railway workers who have diabetes.⁶ Taking this into account and the available literature on diabetes treated with insulin, particularly the risks of sudden incapacity due to hypoglycaemia and the concern about hypoglycaemia without warning, the following suggested approach has been developed by the authors to reflect current expert knowledge and published referenced resources.^{3,7–11}

1. The following information is necessary before a train driver with diabetes treated with insulin is allowed to be considered for driving.

- The employee, if they have type 1 diabetes, must have been stable on insulin for at least six months.
- If the employee has type 2 diabetes requiring insulin, he/she should have had a stable regimen for at least three months.

- In any driver taking insulin, the introduction of a new drug or class of insulin should trigger a further period of observation of up to three months for a new insulin, and two months for the addition of an oral hypoglycaemic medication.

- A report should be obtained from the employee’s diabetes consultant covering the previous three years or since diagnosis, whichever is sooner, with the following information:

- History of diabetes, evidence of any complications (renal, neurological, ophthalmological) and any other medical conditions.

- Confirmation that the employee has adequate awareness of clinical symptoms of impending hypoglycaemia.

- There should be a record of regular blood sugars throughout the day (essentially by the use of a recording glucose meter with a non-deletable memory with three months’ capacity to allow review); the blood glucose target to fall between 5mmol/L and 10mmol/L for over 90% of the readings, and an HbA_{1c} of less than 69mmol/mol (8.5%).

- Continuous glucose monitoring should be seen as essential certainly for a baseline assessment and, in terms of ongoing usage, can be considered if supported and agreed by the treating consultant diabetologist. Device specifications to be determined by recommendation from the clinician.

- A history of hypoglycaemia that resulted in a seizure, loss of consciousness, impaired cognitive function or required the assistance of others within the previous year, unless there is a clear reason, should make the employee unfit for train driving.
- Information should be sought as to the employee's awareness of hypoglycaemia. If the record of blood sugars shows levels of $<3.5\text{mmol/L}$ without any symptoms, this should be a cause for concern.

2. Commencement of train driving can only be undertaken with compliance to the following restrictions/conditions.

- The employee should take his/her blood sugar at the start of a shift and every 2 hours during the shift. This should be by means of a non-deletable recording glucose meter with a three months' memory capacity. It is the responsibility of the line manager to always check and establish if a blood glucose diary is being maintained and to refer to occupational health (OH) if the diary is not being maintained or if there is other cause for concern. If there is any lack of clarity, then a low threshold for the use of continuous glucose monitoring is advised. Pending an OH assessment, the employee is restricted from driving.
- On commencing a shift, the employee should inform the line manager that he/she is fit to undertake train driving.
- If at any time during the shift the employee feels hypoglycaemic or the blood glucose is found to be less than 5mmol/L on testing, he/she should stop driving and inform the line manager.
- Following any feelings of hypoglycaemia, or blood glucose less than 5.0mmol/L , driving should not resume until at least 45 minutes after consuming an amount of rapidly absorbable glucose equivalent to 15g of glucose (e.g. 4 'Glucotabs', which contains 4g of fast-acting glucose per tablet) and a normal blood glucose ($>5\text{mmol/L}$) has been recorded. For such a situation, every employee concerned should have an emergency supply of fast-acting glucose on his/her person or within easy reach within the driver's cab. In addition, a slow-acting carbohydrate (10–20g)

should be consumed to help maintain the blood glucose level above 5mmol/L and to prevent it from falling again, e.g. a slice of bread, a piece of fruit, a couple of digestive biscuits or a packet of crisps.

- Alcohol should be avoided during the 24 hours preceding a shift.
- Changes in the insulin regimen or the introduction of a new oral hypoglycaemic agent are a period of high risk for hypoglycaemic episodes. If any changes of insulin regimen, or new hypoglycaemic agent, are proposed, the employee should be restricted from driving until review in OH: this is likely to lead to a period of restriction from driving for up to two to three months.
- If the employee suffers a hypoglycaemic episode requiring the assistance of others, whether on duty or off work, he/she should stop driving pending a review in OH.
- An update report should be obtained annually from the employee's diabetes consultant.
- There should be close collaboration between OH, the employee, the line manager and human resources (HR) so that the following responsibilities are clearly understood and adhered to:
 - The employee is responsible for his/her own health, monitoring his/her blood glucose as recommended by OH, reporting any adverse symptoms or hypoglycaemia to his/her line manager.
 - A signed agreement with each driver will be proposed to ensure each driver understands the significant commitment he/she will have to make.
 - The line manager is responsible to check and ensure that the blood glucose diary is being maintained for every shift and inform OH and restrict the employee from driving duties if this is not done.
 - The line manager should be aware of, and be able to accommodate, the following from an operational perspective: regular checks of blood sugar during each shift, breaks for snacks if necessary, the requirement not to drive if blood sugar at any time is less than 5mmol/L or if there is evidence of hypoglycaemia.
 - HR managers and senior management within the organisation should be fully aware of the potential

impact of having drivers on insulin on operational capacity.

- It is also necessary to obtain the commitment of senior management in the organisation prior to the introduction of this approach for drivers on insulin.

Conclusions

Despite disability legislation, some people with diabetes (particularly those taking insulin) still experience discrimination. If an individual is well controlled with stable capillary glucose values and no significant hypoglycaemia and intact awareness then, from a medical perspective, it should be acceptable for them to undertake safety critical work. The 2010 Equality Act itself unfortunately does not make a distinction with regard to such a 'disability' as diabetes between someone employed in a role who subsequently goes on to develop diabetes and an individual who has pre-existing diabetes who is applying *de novo* to undertake such work.

With regard to train driving, the situation is complex: on the one hand, it can be argued that a train driver who is well controlled on insulin should be able to drive. This needs to be balanced against the operational implications of having a train driver on insulin: arrangements need to be made to enable regular blood glucose measurements, as recommended above. Furthermore, the business needs to be able to cope with rare situations of a driver being temporarily removed from driving duties, at short notice, in the event that the blood glucose is less than 5mmol/L . At a time when the railway sector is under enormous pressure to maintain punctuality, and timetables for the travelling public, and avoid cancelling trains, the potential business impact of a driver on insulin needs to be considered.

Finally, there is a risk of a driver having a hypoglycaemic episode when driving on the mainline. With the safety systems in place in the driver's cab on modern trains, the train would normally stop, and there would be no direct risk to passengers. However, the impact on business continuity, and the reputational risk following such an incident, would be considerable for the train operating company (TOC). In addition, there would be a further risk of the driver

Operator-presence control

A **dead man's switch** is a switch that is automatically operated if the human operator becomes incapacitated, such as through death, loss of consciousness or being bodily removed from control. These switches are usually used as a form of fail-safe where they stop a machine with no operator from potentially dangerous action. They are commonly used in this manner in locomotives, lawn mowers, tractors, personal watercraft, outboard motors, and chainsaws. On some machines, these switches merely bring the machines back to a safe state, such as reducing the throttle to idle or applying brakes while leaving the machines still running and ready to resume normal operation once control is re-established. With modern railway systems, the driver is typically alone in an enclosed cab. Electrically or pneumatically linked dead-man's controls involve relatively simple modifications of the controller handle, the device that regulates traction power. If pressure is not maintained on the controller, the train's emergency brakes are applied and the train stops. The driver does not necessarily need to be dead for this to function

having a hypoglycaemic episode in an isolated situation (in the driver's cab) for an extended time before any assistance (medical or otherwise) can reach him/her.

The operational issues highlighted above will need to be carefully considered by senior management in each TOC before train driving on insulin is allowed. Furthermore, to our knowledge, no TOC in the UK has yet allowed train driving on insulin. There is a risk that the first TOC to do so will face a number of applications for the train driver role from individuals who have diabetes and are on insulin: because of disability legislation, rejection will not be appropriate, leading to an increasing burden, possibly non-sustainable, on the TOC concerned.¹²

The UK Civil Aviation Authority has been through a similar process recently, undertaking individualised assessment of insulin treated pilots and, subject to safety and risk analysis, medical certification of fitness to fly may be approved. An operational protocol requires pre-flight and hourly in-flight blood glucose monitoring, using conventional capillary test strips, with results recorded in the pilot's log-book. CGMS measuring interstitial glucose is presently considered insufficiently validated under these specific circumstances.^{13,14} It should be noted that this initiative currently applies to commercial multi-crew aviation, so that a co-pilot in the cockpit will be present.

Modern technological approaches to diabetes management may also come in handy – when CGM systems are linked to continuous subcutaneous insulin infusion, there is the

option to include a 'low glucose suspend' function to enable insulin delivery to be halted when there is a marked drop in glucose levels acutely in order to avoid the occurrence of hypoglycaemia.^{15,16}

We hope that the proposed guidance above forms a sound basis to help clinicians manage such patients, for individuals with diabetes to understand the need for exemplary control and to provide reassurance for TOCs, as well as act as a basis for further discussion.

From a business perspective, an optimal solution would be for any decision to allow train driving on insulin to be taken jointly by all TOCs, with the support of the Railway Safety and Standards Board and the Office of Rail Regulation.

Acknowledgments

Many thanks to Professor Ken Shaw for advice, Josie Wilson and Sara Moore, expert Specialist Diabetes Nurses at Brighton and Sussex University Hospitals, and Megan Taylor, Occupational Health Nurse Manager.

Declaration of interests

There are no conflicts of interest declared.

Both authors contributed equally to the production of this document.

References

1. Equality Act 2010. www.legislation.gov.uk/ukpga/2010/15/contents [last accessed 15 March 2015].
2. Legislative Scrutiny: Armed Forces Bill – Joint Committee on Human Rights. www.publications.parliament.uk/pa/jt201012/jtselect/jtrights/145/14513.htm [last accessed 21 March 2015].
3. Heller SR, Nicholson AN. Aircrew and type 1 diabetes mellitus. *Aviation Space & Environmental Medicine* 2006;77:454–8.

Key points

- People with diabetes on insulin therapy need to be judged on an individual basis when it comes to assessing fitness to undertake safety critical work
- No train operating company in the UK has as yet allowed train driving to be undertaken by individuals with diabetes – that is, those with type 1 diabetes or type 2 diabetes subsequently treated with insulin
- Clear parameters for safe and stable glycaemic control, with avoidance of hypoglycaemia are key from a safety perspective

4. Faculty of Occupational Physicians of the RCP. Guidelines for assessing fitness for blue light driving, July 2013. www.fom.ac.uk/wp-content/uploads/FOM-Guide-re-blue-light-driving.pdf [last accessed 18 March 2015].
5. Office of Rail Regulation. Train Driving Licences and Certificates Regulations 2010. TDLCR 2010. http://orr.gov.uk/_data/assets/pdf_file/0003/4998/train-driving-licences-regulations-2010-guidance.pdf [last accessed 20 March 2015].
6. Rail Safety and Standards Board Limited. Guidance on Medical Fitness for Railway Safety Critical Workers. GOGN3655 Issue 2 (June 2014). www.rgsolnline.co.uk/Railway_Group_Standards/Traffic%20Operation%20and%20Management/Guidance%20Notes/GOGN3655%20Iss%202.pdf [last accessed 19 March 2015].
7. Graveling AJ, Frier BM. Impaired awareness of hypoglycaemia: a review. *Diabetes Metab* 2010; 36:S64–S74.
8. Ogundipe OO, *et al.* Impaired hypoglycaemia awareness and employment in people with type 1 diabetes. *Occupational Med* 2011;61:241–6.
9. Diabetes and Driving, Position Paper of the American Diabetes Association. *Diabetes Care* 2014;37(Suppl 1):S97–S103.
10. Cox DJ, *et al.* Type 1 diabetic drivers with and without a history of recurrent hypoglycaemia-related driving mishaps: physiological and performance differences during euglycaemia and the induction of hypoglycaemia. *Diabetes Care* 2010;33:2430–5.
11. Rail Safety and Standards Board Ltd. Good Practice Guide on Rail Workers & Diabetes – Guidance for Medical Assessors. RS/506 Issue 1 Draft 1a 2007.
12. www.diabetes.org.uk/Information-for-parents/Growing-up/Work-and-discrimination/ [last accessed 7 March 2015].
13. Diabetes UK. Pilots with diabetes allowed to fly commercial aircraft. www.diabetes.org.uk/About_us/News_Landing_Page/Pilots-with-diabetes-allowed-to-fly-commercial-aircraft/ [last accessed 23 March 2015].
14. Civil Aviation Authority. UK CAA Policy for the Medical Certification of Pilots and ATCOs with Diabetes. www.caa.co.uk/docs/2499/P027-Diabetic%20Certification%20Guidance.pdf [last accessed 23 March 2015].
15. Grant P. A new approach to diabetic control: fuzzy logic and insulin pump technology. *Med Eng Phys* 2007;29:824–7.
16. Wilmot E, *et al.* Insulin pump therapy: a practical guide to optimising glycaemic control. *Pract Diabetes* 2014;31:121–5a.