

Good Practice Guide on **Rail Workers** and **Diabetes** – Guidance for **Medical Assessors**

Synopsis:

This document provides guidelines and advice for **medical assessors** with regards to **rail workers** and **diabetes**. The content has been peer-reviewed by the Association of Railway Industry Occupational Physicians (ARIOPS) and endorsed as representing current good practice.

RS/506
Issue 1
June 2007

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Published by:
Rail Safety and Standards Board
Evergreen House
160 Euston Road
London NW1 2DX

Approved by RSSB 03 April 2007

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1. Introduction

Concerns about people with **diabetes** and their fitness for safety critical work are based on the knowledge that some of these individuals have a greater than average likelihood of impairment of awareness or concentration, sudden incapacity or loss of consciousness. Although such impairments may be due to gradually developing disorders such as visual impairment or ischaemic heart disease these are normally detectable in the context of the periodic **medical** examination. Hypoglycaemia is of particular concern because it is difficult to assess or predict and may affect otherwise healthy, well controlled patients with **diabetes**.

Studies of type 1 diabetic motor drivers have failed to reveal any convincing evidence of increased crash rates, possibly because the majority were either not affected by hypoglycaemia during the study period or had a very responsible attitude to avoiding driving if they were affected (these studies do not include fatal accidents). On the other hand each year there are hundreds of police reports to the Driver and Vehicle Licensing Agency (DVLA) of collapse at the wheel as a result of hypoglycaemia, which is considered to be a significant underestimate of the true number.

The **rail** environment differs significantly from other workplaces and occupational physicians working in this field are expected to have knowledge of the hazards involved. **Workers** may be exposed to train movements when accessing the lineside environment or be expected to control the movement of trains when performing a signalling role. The physical demands of these jobs and working hours vary considerably. Even in the context of a single job such as train driving the risks may vary depending on the type of locomotive, the route and the train protection measures in operation.

All **rail** occupational physicians will be familiar with the Railway Group Standards (RGS), which have included a general health requirement that:

‘Candidates shall not be suffering from **medical** conditions, or be taking **medical** treatment likely to cause:

- a) sudden loss of consciousness
- b) impairment of awareness or concentration
- c) sudden incapacity
- d) impairment of balance or co-ordination
- e) significant limitation of mobility.’

There has never been a requirement within the RGS specifically relating to **diabetes**.

As the responsibility for **medical** fitness standards is progressively devolved to individual employers it is probable that similar requirements would persist and it is notable that the Technical Specifications for Interoperability (TSI) for the European **rail** network² contain a similar wording.

It is the role of the occupational physician to interpret the word ‘likely’ in the light of their knowledge of occupational medicine and the workings of the **rail** industry.

Three key factors must be addressed:

- a) proper **medical** assessment
- b) safeguards and regular review
- c) strategies for prevention of hypoglycaemia.

2 Medical assessment

In 2004 the British Medical Association published a comprehensive update for healthcare professionals. The report³ focuses on recent changes in our understanding of the epidemiology, aetiology and clinical management of diabetes, placing emphasis on controversial issues and recent advances.

People with diabetes will be subject to the same pre-employment and periodic medical assessment as other individuals in the same occupational groups. Complicating conditions such as ischaemic heart disease or visual impairment will be assessed in the normal way. This guidance concentrates on diabetes and its treatment.

Medical assessment of railway workers with diabetes should focus on three aspects; the diabetic history, the method of treatment and the job characteristics.

2.1 Diabetic history

- a) type of diabetes and date of diagnosis
- b) details of treatment regimen and date of commencing tablets or insulin
- c) most recent HbA1c reading as an index of overall glycaemic control
- d) any episodes of severe hypoglycaemia or ketoacidosis
- e) body weight and body mass index
- f) visual acuity
- g) diabetes related microvascular complications, i.e. retinopathy, neuropathy and nephropathy
- h) macrovascular complications (cardiovascular, cerebrovascular and peripheral vascular disease)
- i) any other risk factors i.e. smoking habit, blood pressure, lipid profiles
- j) involvement in their diabetes care
- k) any previous effect on their ability to work or to drive.

The occupational physician needs to ensure that sufficient documentary evidence exists to justify the advice given to the employer and may choose to obtain this information in a structured way from the employee and their diabetes specialist (see section 8.1).

2.1.1 Hypoglycaemia

Recently published research commissioned by the Department for Transport⁴ gives some insight into the frequency of hypoglycaemia events (other research has produced similar findings^{5&6}). The study calculated the proportion of subjects having hypoglycaemia and the rate of hypoglycaemia events per year.

Care must be taken when interpreting these figures since in every group most people had no hypoglycaemia events at all (the median annual rate was zero), emphasising that severe episodes were confined to a few individuals.

Hypoglycaemia was classified as symptomatic or asymptomatic (only identified on biochemical testing). Symptomatic hypoglycaemia may be mild and easily rectified by the individual, or severe i.e. requiring third-party assistance or causing coma or seizure.

Severe hypoglycaemia

Type 2 diabetes treated with sulphonylureas. Only 7% of this group reported having at least one severe hypoglycaemic episode per year and the figure ranged between 0 and 7 episodes.

Type 2 diabetes treated with insulin for less than two years. The figures for this group were very similar to the sulphonylurea treated group.

Type 2 diabetes treated with insulin for more than 5 years. About 25% of this group reported at least one episode of severe hypoglycaemia with a range of 0 to 10 episodes per year.

Type 1 diabetes less than 5 years since diagnosis. 22% of this group had experienced at least one severe hypo, ranging from 0 to 23 attacks per year.

Type 1 diabetes of over 15 years duration. 46% of this group reported having at least one severe hypo, with a range from 0 to 32 episodes per year.

Mild hypoglycaemia

Type 2 diabetes groups had median rates of mild hypoglycaemic episodes which were considerably lower than those in Type 1 diabetes. The highest median rates of mild, symptomatic hypoglycaemia were observed in those with Type 1 diabetes started on insulin over the previous five years (rather than individuals with a duration of diabetes of over 15 years). In contrast, the Type 2 diabetic patients treated with insulin for less than 2 years were comparable to the sulphonylurea treated group and this has important implications occupationally.

2.1.2 Factors predicting episodes of hypoglycaemia

It has been difficult to identify reliable clinical factors that are predictive of hypoglycaemia risk.

Recent episodes of severe hypoglycaemia (i.e. requiring intervention from a third party) are probably the most reliable predictor of future severe hypos. Recurrent, recent, daytime episodes, especially those resulting in hospitalisation or accidents are of greatest concern.

Blood glucose monitoring results that fall within the range 3-4 mmol/l, especially in the absence of symptoms, may be an indicator of hypoglycaemia risk. These patients may also have HbA1c within the normal range.

Patients who attempt to maintain their blood glucose within the normal range at all times may encounter more hypoglycaemic episodes. In both the DCCT⁵ and UKPDS⁶ studies there was a two to three times increase in severe hypoglycaemic episodes in the intensively treated groups, compared to those on 'routine' therapy.

Lack of awareness of hypoglycaemia (see below) is a major concern when considering candidates for safety critical work.

Longer time since diagnosis and longer time on insulin are also associated with more episodes of hypoglycaemia. However in patients with type 2 diabetes recently started on insulin the risk is similar to that experienced by those on sulphonylureas, at least for the first two years.

Patients who have a poor understanding of diabetes and its treatment, or who fail to become involved with the management of their condition, tend to have more hypos.

Other factors that may indicate an increased risk of hypoglycaemia at work include variable exercise demands or eating habits and recent changes in treatment.

C peptide levels, a measure of residual insulin secretion, may offer some hope of a future clinical indicator of hypoglycaemia risk as higher levels of C peptide were associated with reduced risk of hypoglycaemia in the DfT research.

Guidance exists for healthcare professionals⁷ who are asked to provide information about people with diabetes in connection with driving or employment.

2.1.3 Hypoglycaemia unawareness

Hypoglycaemia unawareness occurs when the person does not experience the early symptoms of hypoglycaemia (such as hunger, nausea, tremor, sweating or palpitations) but develops unsteadiness, confusion or reduced awareness at the outset and progresses to incapacity or unconsciousness without being able to take corrective action.

Hypoglycaemia unawareness can occur in up to one third of those with type 1 **diabetes**, especially longstanding **diabetes** or after glycaemic control has been rapidly improved⁸. Frequent episodes of hypoglycaemia are thought to contribute to reduced awareness while careful diabetic control to avoid repeated hypoglycaemia can reverse the tendency to unawareness.

Consider the following questions when assessing individuals:

"What symptoms tell you that your blood glucose is getting low?"

Patients who report sweating, shaking, tremor and palpitations as their 'early warning symptoms' are likely to have adequate awareness. Those who report confusion, slurred speech and unsteadiness or difficulty walking are likely to have impaired awareness.

"Are you usually able to detect hypoglycaemia before your partner, or are they usually the first to realise that you are 'hypo' and draw your attention to it?"

The value of the patient's testimony is strengthened if corroborated by a spouse, partner or friend. An even more objective gauge of hypoglycaemic warning is to check the patient's diary of home blood tests or down-loaded meter results. Regular blood glucose readings of 3-4 mmol/l without symptoms are a likely indicator of impaired hypoglycaemia awareness. An HbA1c measurement within the normal range should also lead to careful consideration of the possibility of unrecognised hypoglycaemia.
(Dr K McLeod)⁷

2.1.4 Other factors

Whilst most risk arises from the effects of hypoglycaemia (see above), the risk of drowsiness and blurring of vision due to hyperglycaemia should be borne in mind. There is also potential for symptoms such as thirst and polyuria to distract attention and reduce efficiency. There is a great deal of variation between individuals in the level of blood glucose at which these symptoms become apparent. However, caution should be exercised where there is evidence of the blood glucose in excess of 12mmol/l on a regular basis and above 15mmol/l on an occasional basis during working hours.

2.2 Treatment

Dietary measures are always required in the management of **diabetes**. Many patients with type 2 **diabetes** will also require treatment with tablets, and some of them go on to require insulin. People with type 1 **diabetes** usually require insulin from the outset.

In the absence of diabetic complications individuals treated with diet alone will rarely be restricted in their employment providing they are subject to regular **medical** review.

Those receiving treatment where there is a risk of hypoglycaemia may require restriction or modification of their duties depending on the magnitude of the risk. Because of the variability between individuals and over time, each case should be assessed individually.

Insulin secretagogues

- a) Sulphonylureas (e.g. gliclazide, tolbutamide, glibenclamide, chlorpropamide). These drugs act mainly by augmenting insulin secretion and consequently are effective only when some residual pancreatic beta-cell activity is present. Because of the increased output of insulin, the patient is at increased risk of low blood glucose (hypoglycaemia) and this is more of a problem with longer acting drugs such as chlorpropamide and glibenclamide.
- b) Meglitinide analogues (repaglinide, nateglinide) act in a similar way to the sulphonylureas but have a shorter duration and earlier time of action. They may be preferable for certain patients because of a reduction in the severity and frequency of hypoglycaemic events, especially when mealtimes are erratic.

Biguanides (metformin). This drug alters the sensitivity of the cells to insulin, thereby improving the action of insulin and also reducing the amount of extra glucose produced by the body. Since it acts only in the presence of endogenous insulin it is effective only if there are some residual functioning pancreatic beta cells. Metformin rarely causes hypoglycaemia.

Alpha-glucosidase inhibitors (acarbose). This drug delays the absorption of food after meals, thus reducing the high levels of glucose in the post-absorptive state. It also may cause abdominal upset but when used alone will rarely cause hypoglycaemia.

Thiazolidinediones (pioglitazone and rosiglitazone). Reduce peripheral insulin resistance, leading to a reduction of blood-glucose concentration. When used alone, they will rarely cause hypoglycaemia.

Insulin. People with type 1 **diabetes** are treated with insulin. Insulin may also be necessary for those with type 2 **diabetes** if diet, exercise and oral agents fail to control blood glucose. Where there is insulin resistance in type 2 **diabetes**, large quantities of insulin are required and this may place the patient at risk for hypoglycemia. Overall those with type 2 **diabetes** who have commenced insulin within the last two years have no more hypoglycaemia than those on tablets alone.⁴

Insulin is available in short, medium and long acting formulations that may be used singly or in combination. This provides some opportunity for people with **diabetes** to adjust their treatment to suit their lifestyle while reducing the chance of hypos. Regimes with three or four daily injections have proved to be the most effective in terms of diabetic control but may be associated with increased risk of hypoglycaemia in some cases. Newer insulins such as the short acting analogues (Lispro, Aspart) and the long acting Glargine are useful for reducing hypos post-prandially and nocturnally respectively.

2.3 Job characteristics

The primary concern for the person with **diabetes** is the development of impairment of awareness or concentration while performing their duties thereby placing themselves or others at risk. In the worst case the impairment could be due to sudden loss of consciousness. Careful consideration of job characteristics will help to identify situations where such impairment could be dangerous, for example:

- a) operation of equipment requiring constant vigilance
- b) safety critical decision making
- c) lookout duties
- d) working alone
- e) working on or near lines where trains have not been stopped ('red zone')
- f) responsibility for the safety of others
- g) irregular meal breaks or access to eating facilities
- h) inability to hand over to others when impending hypo or need for treatment/food
- i) lack of opportunity to modify duties or introduce adjustments
- j) driving duties associated with job
- k) large fluctuations in the level of physical exertion.

In addition it is possible to consider how existing 'fail safe' technology e.g. train protection, cab warning or vigilance warning systems or signalling systems would mitigate the risks arising from **diabetes** or its treatment.

3 Safeguards and regular review

Diabetes UK's Driving and Employment Working Party has produced the following guidelines⁹ for assessing the suitability of people with insulin-treated **diabetes** for employment where there may be a risk of injury or harm to themselves or to the public.

- a) people should be physically and mentally fit in accordance with non-diabetic standards
- b) **diabetes** should be under regular (at least annual) specialist review
- c) **diabetes** should be under stable control
- d) people should self-monitor their blood glucose, and be well educated and motivated in **diabetes** self-care
- e) there should be no disabling hypoglycaemia (low blood sugar), and normal awareness of individual hypoglycaemic symptoms
- f) there should be no advanced **diabetes**-related eye or kidney disease (retinopathy or nephropathy), nor severe symptomatic peripheral or autonomic nerve damage (neuropathy)
- g) there should be no significant circulation disorders of heart, legs or brain (coronary heart disease, peripheral vascular disease or cerebrovascular disease).

Suitability for employment should be re-assessed annually by both an occupational physician and **diabetes** specialist; and should be based on the criteria outlined above.

4 Prevention of hypoglycaemia

Over the past decade an increasing number of people with **diabetes**, including those who use insulin, have worked safely in occupations that were considered unsuitable in the past. These people understand the importance of avoiding hypoglycaemia at work and adopt a variety of strategies to achieve that:

- a) maintaining a detailed knowledge of their **diabetes** and its treatment
- b) frequent blood glucose monitoring
- c) establishing a routine that includes regular meals and snacks
- d) being able to react appropriately to changes in their blood glucose
- e) keeping blood glucose high enough to avoid hypos during critical work periods
- f) carrying carbohydrate food in case hypos are threatened or meal breaks are delayed
- g) working closely with their doctor to choose tablets or insulins that are less likely to cause hypos
- h) choosing insulin regimes that are more flexible.

5 Fitness for safety critical work

The employer is responsible for ensuring that the risks to health and safety are adequately assessed and controlled (Health and Safety at Work Act 1974 etc; Railways and Other Guided Transport Systems (Safety) Regulations 2006 [ROGS]). When considering the risks arising out of an employee's **medical** condition or treatment the employer will seek the advice of their occupational health provider. The need for adequate liaison between management and occupational health is obvious.

5.1 Hypoglycaemia or impairment unlikely

Medical restrictions are not normally necessary for employees with uncomplicated **diabetes** treated with diet alone or with tablets that are unlikely to cause hypoglycaemia. These individuals should be reassessed annually by a member of the occupational health team, with referral to the responsible occupational physician when necessary. Some providers may choose to incorporate a self declaration approach similar to that used by the DVLA and the employee should be reminded to report any progression in their condition including changes in treatment and **medical** complications^{10&11}

5.2 Hypoglycaemia or impairment possible

Where **diabetes** is treated with insulin or other medication that is associated with hypoglycaemia then a more detailed assessment will have been carried out and the responsible occupational physician will be involved. Communication with the **diabetes** specialist will normally be necessary.

Unlike the situation in civil aviation or road transport there are no legally based prohibitions on the employment of insulin treated diabetic patients in the **rail** industry. This means that individual assessment will be required and reasonable adjustments must be considered for each case, while maintaining the control of risk within the working environment.

The responsible occupational physician will want to consider the outcome of the **medical** assessment in the light of current **medical** knowledge, their knowledge of the **rail** industry, relevant information from other transport sectors and discussion with the responsible manager. The occupational physician should be able to explain how they have reached their decision.

If the employee is considered fit for safety critical duties, subject to any adjustments, then the occupational physician should discuss strategies for 4 Prevention of hypoglycaemia and ensure that there are 3 Safeguards and regular reviews in accordance with the recommendations of **Diabetes UK**.

6 Summary

Where there is concern that a **rail** worker with **diabetes** may have an increased risk of injury or harm to themselves, or to others in the **rail** environment, because of their condition or its treatment then an individual assessment will be required.

Before the responsible doctor can issue a statement of fitness for safety critical work, with or without restrictions, they must be satisfied that:

- a) a full **medical** assessment involving the occupational physician and the diabetic specialist has been carried out
- b) the job has been properly assessed and any adjustments or special arrangements will be adequate
- c) the criteria for safeguards and **medical** review (section 3) can be met
- d) strategies for the prevention of hypoglycaemia are adequate.

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Further reading - **diabetes** and fitness in other occupations

In order to place **diabetes** and the railway fitness criteria in context, a brief description of other transport and safety critical related fitness standards is provided. Some of these are well developed and based, at least in part, on scientific evidence. In some cases the evidence and standards will be equally relevant to the **rail** environment whereas in others there are important differences, such as train protection technology or green zone working.

Motor drivers

The Secretary of State for Transport acting through the **medical** advisers at the Drivers **Medical** Group, DVLA, has the responsibility to ensure that all licence holders are fit to drive. The DVLA at-a-glance guidelines¹ are aimed at doctors and set out the **medical** requirements for Group 1 private (car, motorcycle) and Group 2 vocational (lorries, buses) driving licences.

The DVLA has a programme of research² into **medical** aspects of fitness to drive and have produced research report number 40⁴ which examines the role of risk analysis in the evaluation of fitness to drive.

People with **diabetes** controlled by tablets or diet alone may hold Group 1 or 2 licences providing they do not suffer from frequent hypoglycaemic episodes likely to impair driving, unawareness of hypoglycaemia or other complications such as visual impairment.

Applicants are required to make a self declaration using form DIAB1³ and further information is gathered from the attending physician using form DIAB3.

Subject to the same conditions insulin treated diabetics may hold a Group 1 licence but the law prevents them from holding a Group 2 licence regardless of how well the condition is controlled. However, regulation changes in April 2001 allow 'exceptional case' drivers to apply for or retain their entitlement to drive class C1 vehicles (3500-7500kgs lorries) subject to annual **medical** examination.

The following qualifying conditions must be met:

- a) There must have been no hypoglycaemic attacks requiring assistance whilst driving within the last 12 months. There must have been regular monitoring of the condition by checking blood glucose levels at least twice daily and at times relevant to driving. If an application is successful, there will be a future need to continue to monitor blood glucose levels at least twice daily and particularly, at times relevant to driving C1/C1+E vehicles.
- b) Arrangements must be made for an examination every 12 months by a hospital consultant who specialises in **diabetes**. On examination, the consultant will require sight of blood glucose records for the last 3 months.
- c) There must be no other condition, which would render a person a danger when driving C1 vehicles.
- d) There will be a requirement to sign an undertaking to comply with the directions of doctor(s) treating the **diabetes** and report immediately to DVLA any significant change in the condition.

The House of Commons Science and Technology Select Committee published their Third Report⁴ in March 2000. The report, and the evidence given to the Committee, contains a detailed appraisal of **diabetes** and driving.

Firefighters

The Fire and Rescue Service have produced advice on the **medical** and occupational evidence for recruitment and retention of firefighters⁶. In the past, insulin treated firefighters were excluded from operational firefighting duties but that has been successfully challenged over the last decade or so. Current occupational health practice is to follow a policy of individual consideration of people with **diabetes** who wish to be firefighters. Guidelines produced by **Diabetes** UK are followed and firefighters often adopt specific coping strategies to safely maintain a normal work pattern.

At the moment there is a number of operational insulin treated firefighters who have performed their duties without mishap due to hypoglycaemia. The Home Office brigades have amassed hundreds of man-years of experience in this area and a number of coping strategies have been identified that will

help insulin-using firefighters to work safely. However, because of DVLA requirements, these individuals are not permitted to drive fire appliances because they are not eligible for a Group 2 licence.

Seafarers

The Maritime and Coastguard Agency approve doctors to carry out **medical** assessments of seafarers and the MCA have produced an Approved Doctors Manual⁷

The emphasis is to ensure there is no condition that represents an unacceptable health risk to the individual seafarer, other crew members or the safety of the ship. This goes beyond the risk of sudden incapacity and extends to fitness to undertake the full range of tasks on board ship and to cope with living conditions at sea. In particular the focus of **medical** assessment is on:

- a) fitness to navigate a ship safely
- b) fitness in both physical and psychological terms to deal with emergencies at sea
- c) freedom from foreseeable risk of disease while at sea, especially where this might either spread to others on board, require emergency treatment or lead to evacuation or diversion.

Requirements vary depending on the type of vessel and its purpose however people with **diabetes** requiring treatment with insulin are normally excluded from watch keeping duties and service in distant waters. In many cases there are specific regulatory requirements that apply.

Pilots and aircrew

The Civil Aviation Authority **Medical** Division sets and implements **medical** requirements for professional flight crew, private pilots and air traffic controllers.

The Joint Aviation Requirements (JAR) are a series of regulations covering the whole of aviation that have been, or are being, implemented by the European states of the Joint Aviation Authorities (JAA). The JAA have produced a Manual of Civil Aviation Medicine⁸, which is advisory only but indicates that patients who are treated with insulin are unfit to fly, and those on sulphonylureas are fit only to hold a private pilots licence. However some countries have found these restrictions too onerous and will issue national private pilots licences (NPPL) for use within their own borders. In the UK the **medical** criteria for the NPPL are aligned with the DVLA group 1 and 2 standards. Therefore it is possible for insulin treated individuals to obtain a pilots licence in certain cases.

Within civil aviation the '1% rule' is widely adopted for multicrew operations. This states that the risk of a professional pilot becoming incapacitated should be no more than 1% per annum. The rationale for this rule will be found in the DVLA report 40 and the JAA Manual.

Flight engineers and air traffic controllers are subject to similar but less stringent criteria.

The situation continues to evolve and a new system of European aviation regulation (EASA – the European Aviation Safety Agency) was introduced in September 2003, and will gradually supersede the JAR.

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