Out-patient Department for Diabetic Children, Silesian Center of Child and Mothers' Health, Katowice, Poland

Chosen life aspects of diabetic patients. Part 2. A journey and driving a vehicle

Professor Ewa Otto-Buczkowska, MD, PhD
Specialist in pediatrics and diabetology at Upper Silesian Center of Children's and Mothers' Health in Katowice (Poland). Born 1935 in Dąbrowa Górnicza (Poland). Graduated from Silesian Medical Academy in 1959. In 1967 she completed her specialization in pediatrics and in 1994 — in diabetology. Research interest and supervisory experience: since 1960 research work at the Regional Diabetes Center for Children and Adolescents including: investigations concerning the behavior of IRI and HGH in type 1 diabetic children with obesity, or with family history of diabetes; studies on disturbances of calcium metabolism and etiopathogenesis of diabetic osteopathy and on disturbances in the secretion of gastrin, pancreatic polypeptide and glucagon in young diabetics and obese children. Prof. E. Otto-Buczkowska is author, co-author and editor of eighth different handbooks of diabetology and pediatrics and about two hundred other publications. She is a member Polish Diabetological Association; European Association for the Study of Diabetes; International Society for Pediatric and Adolescent Diabetes.

Tomasz Dworzecki
Born on 12.05.1982. In 2001 graduated from The Mahindra United World College of India and in 2007 graduated from the Medical University of Silesia in Katowice, Poland. Currently, completing the internship in Hospital No. 2 in Bytom, Poland. He has already published 7 papers concerning diabetology.

Przemysława Jarosz-Chobot, MD, PhD, Prof. Ass.
Graduated from Medical University of Silesia in 1982, specialist of pediatrics and diabetology. Presently, she is employed at Department of Pediatrics, Endocrinology and Diabetes, Medical University of Silesia. Her postgraduate training involves many stays in different medical centres in Poland and Rotterdam — Holland, Cambridge — UK and Dayton — USA. Her main interests are diabetes in childhood, epidemiology of type 1 DM, insulin therapy, and psychosocial aspects of diabetes. She published more than 120 papers and wrote few manuscripts. Member of: Polish Diabetological Association — PTD (Member of Steering Committee), International Society for Pediatric and Adolescent Diabetes — ISPAD (Advisory Council 1998–2002), European Association for the Study of Diabetes — EASD.

Abstract

Diabetic patient on a journey. Diabetic patient can travel too, however such trip, especially when long and associated with time zone changes, requires very careful preparations. The latter concerns both trip schedule and health problems.

Address for correspondence:
prof. dr hab. med. Ewa Otto-Buczkowska
ul. Jasnogórska 16/21, 44–100 Gliwice
Tel (+48 32) 231 06 11
e-mail: em.buczkowski@pro.onet.pl

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Medical dilemmas in driving license eligibility. Driving a vehicle requires a high psychomotor performance, keenness and quick responses in order to react appropriately to the situation on the road. These functions may be impaired in the course of diabetes.

The course of diabetes may be different in each patient and depends not only on the type of the diabetes and the method of treatment but also, to a large extend, on patients' training and motivation for most careful control. For many years there have been attempts to determine whether the number of automobile accidents among insulin treated diabetic patients is higher then among other drivers. The results are inconsistent. Serious changes in methods of diabetes treatment and strictness of metabolic control that have been introduced during recent years substantially improved

performance of insulin treated diabetic drivers. That is why results obtained many years ago cannot be used to evaluate the risk of accidents among people with diabetes nowadays.
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Diabetic patient on a journey

Due to current possibilities of management and self-monitoring of metabolic condition in particular, patients with diabetes have lots of choices but also lots of duties, in a word: everything has its price.

Travelling became part and parcel of present lifestyle. Diabetic patient may also travel. However, such trip especially when long and associated with time zone change, requires very careful preparations [1, 2]. Their kind depends on varies factors, including:

— type of diabetes and in particular its management;
— general health condition and presence or absence of chronic complications;
— level of metabolic control and possibility of decompensation;
— duration of a journey and possible change of climate;
— means of transport.

Travelling of patient with type 1 diabetes is associated with higher risk of decompensation. However, those patients are in general younger, fitter, better educated, and thus usually much better handling difficult situations.

Type 2 diabetes is generally more stable then type 1 and accompanied by lower risk of acute complications. However, when the latter occur (ketoacidosis, hyperosmotic hyperglycaemia or hypoglycaemia in patients treated with sulphonylurea derivatives) it is practically impossible to treat them without hospitalisation. Moreover, type 2 diabetic patients are usually older, more often suffer from chronic complications, and are also less efficient in self-management of the disease.

Therefore all patients must undertake very careful preparations. Those should be started several weeks before departure and concern all aspects of the trip:

— patient should get all necessary vaccinations at least a month earlier;
— it is very important to check thoroughly scope of services of different health insurance offers (drugs, specialist consultation in outpatient clinic, hospital treatment, home transportation). Being abroad, such insurance policy should be carried everywhere patient goes;
— it is advisable, to obtain addresses of health care institutions providing a professional medical help before the day of departure or just after arrival to the destination point. Internet might be very useful;
— patient should get an official letter from his/her doctor informing about diagnosis, type of diabetes, general health condition of a patient, and type of management, allergies or sensitivity to any foods or medications. It should also list all the medications and devices that patient uses. Such letter explains also the need to carry syringes and drugs across the border in case of control;
— extra prescription from patient's doctor could be useful in case of loss of medicines;
— if necessary, patient should call airlines at least 2 days in advance to request meals that are low in sugar, fat, and cholesterol;
— patient should be provided a diabetes identity card or jewellery engravement stating about the disease in case of emergency.

Before a trip patient should be provided with:

— dressings, anti-allergic and anti-irritation and anti-sunburn creams;
— medicines for cold, anti-vomiting and antidiarrhoeic drugs (very important);
— medicines and devices necessary in treatment of diabetes, including insulin, test strips and lancets, glucose meter batteries, and insulin pump supplies; their supplies should allow for unforeseen prolongation of the trip. Patients using pumps should take supplies of long-acting insulin and regular insulin or rapid-acting insulin analog, as well as syringes in case of pump malfunction.

All patients should carry part of those supplies all the time beside them. It would be the best to use a separate bag for it. In addition, such bag should contain food supplies in form of simple and complex carbohydrates (chocolate bars, hard candies, crackers, sandwiches, box of juice) as well as medicines used in case of acute complications: kit for glucagon injection (travel companions should be instructed how and when to use it), glucose tablets or other form of glucose ready to immediate use in case of hypoglycemia, patients with diabetes, even those who do not use insulin, during longer journeys should carry certain amount of rapid-acting insulin analog in case of hyperglycemia followed by nausea and vomiting.

Four–six weeks before departure patient should consult a doctor, preferably in a specialistic hospital where

he/she would be provided with a complete instruction concerning diet and alteration of management due to duration of the journey and stay abroad as well as change of climate, time zones etc. This applies in particular to trips to distant continents.

There is no need of any essential change in timing and amount of insulin doses when patient is crossing less than six time zones. The journey across six and more time zones changes timing of meals and sleep as well as the scheme of insulin administration. In general, while traveling eastward days become shorter and so less insulin is needed, whereas trip to the west makes day longer and insulin requirement increases. To make such adjustment easier and to keep track of shots and meals through changing time zones patient should keep watch on his/her home time zone until the morning after arrival. During the entire trip patient should check the blood glucose at least every 4–6 hours.

Patients using insulin pumps may continue the usual administration of basal doses and injections before the meals. In case of pump failure, and necessity of switching into multiple injections treatment, patient should take 2–3 shots of long-acting insulin of overall amount equal to the basal dose. Injections of regular and rapid-acting insulin analog should be given before each meal, according to demands.

Patients taking oral agents for diabetes treatment should take them as usual, according to the local time zone. It is safe to keep the blood glucose at a slightly higher level in order to decrease the risk of hypoglycemia.

While packing as well as during the entire trip one must make sure that insulin and other medications are safe from being misplaced and subjected to extreme weather conditions. That is why certain points must be kept in mind:

— during the journey all the medications and supplies must be packed in a carry-on luggage rather then in checked baggage;
— insulin should not be stored neither in the trunk of a car or a bus, nor in the glove compartment since temperatures in those places may reach extremes and alter the potency of insulin;
— in warm climates it might be necessary to store insulin in a refrigerator or in thermal insulated containers. Refrigerated insulin should be inspected before use for crystals, since they can alter its potency. Humidity and extreme temperatures may also affect glucose meters and test strips. Therefore it is recommended to perform frequent quality control checks using glucose solutions;
— if during the trip patients need to buy insulin, they must remember to match the type of insulin ('U-40', 'U-80', 'U-100') with syringes, otherwise they will draw up the wrong amount.

Staying in the same position for a longer time, as it usually happens during the flight, impairs blood circulation. Therefore it is important to change the position from time to time and take walks along the board of the plane. It is equally important to pay attention to one's feet. Patient should wear comfortable shoes and avoid walking barefoot. At any sign of infection he/she should get medical care. Thus, each day one's feet should be carefully checked for cuts, scratches, blisters, swelling, redness and etc.

Trip will be safe only if it is very well prepared [2].

Medical dilemmas on driving license eligibility

A matter of medical contraindications for driving vehicles has become very controversial [3–20]. Since a car in a modern society is an increasingly important tool of daily life, the number of people who want to use it rises. On the other hand, number of people with different health problems, who may be hazardous drivers also increases. Many factors contribute to such state of affairs. Among all, the most important is the expansion of life expectancy and ability to cure or at least slow down effects of many diseases due to incredible progress of medical and technical knowledge. If we add that due to the same progress cars became more powerful, bigger and above all faster, we will find that we cannot ignore any longer problem of more or less handicapped drivers. Thus there is a necessity to reassess many indications and contraindications for driving license eligibility. We should pursue a compromise between right of each person to acquire a driving license and safety of all traffic participants.

Driving a vehicle requires a high psychomotor performance, keenness and quick responses in order to react appropriately to the situation on a road. These functions may be impaired in the course of diabetes. However, is diabetes the only disease that carries such a risk?

There are many diseases, in course of which a sudden drop in fitness and thus in capability to drive may occur. A simple example of such illness is heart disease that affects a considerably large part of society and may manifest as myocardial infarction, cardiac arrhythmias and many others that lead to ischemia and fainting or even death [21]. We should not forget that administration of many medicines (not even mentioning alcohol and narcotics) may impair capability to drive and result in a car accident. Should we then treat diabetic patient in somehow special way?

Medical approval of driving eligibility must take into consideration the category of driving license that is to

be issued and, what follows, class of vehicles person can drive. One must remember that variety of vehicles is constantly expanding (for example motorboats) as well as distances that people drive are constantly increasing and these all must correlate with assessment of ones ability to drive.

Doctor who is assessing such eligibility is obliged to inform the patient about the danger that temporary or permanent impairment of ones driving ability may bring and about the preventive measures of risk (for example hypoglycemia of diabetic patients).

It is nowadays certain that diabetes itself cannot be a criterion that decides about granting driving license or assessing somebody incapable of driving.

The course of diabetes may be different in each patient and depends not only on the type of the diabetes and its management but also, to a large extend, on patient's training and motivation for most careful control.

At present criteria based on distinction between types of diabetes and its treatment seem very inappropriate. It is well known that well trained and highly motivated type 1 diabetic patient, equipped with adequate devices providing good metabolic control, may be metabolically much more stable then type 2 diabetic patient with poor control.

The type of treatment is not a sufficient criterion either. Although patients treated with insulin may undergo hypoglycemic episodes and thus loose capability to drive much easier, this risk can be greatly reduced by preventive measures. On the other hand patients treated with oral agents, especially with sulphonylurea derivatives, may also display metabolic instability of various intensity, substantially impairing their driving capability.

For many years there have been attempts to determine whether the magnitude of accidents among insulin treated diabetic patients is higher then among other drivers. The results are inconsistent [6, 11, 12, 15, 22–24].

As it was mentioned above, recent years have brought essential changes in diabetes treatment that allows for minimizing the risk of hypoglycemia. Introduction of new types of insulin, especially its analogs, both rapid and long-acting, as well as new methods of its administration improved the possibilities of good metabolic control [25]. Methods of insulin administration have changed. Continuous subcutaneous insulin infusion (CSII) via an insulin pump has been more commonly used. Pumps that are implanted into abdominal integument have been introduced as well. Delivery of insulin via pulmonary route becomes more and more feasible. Great hopes of improvement in metabolic control are set on methods of continuous glucose monitoring system (CGMS, Guardian). All these improvements will eventually enable reducing the risk of diabetes complications , both acute and chronic, radically.

That is why, considering recent and coming modernizations, results obtained many years ago, when good metabolic control was much harder to achieve, cannot be used to evaluate the risk of accidents among people with diabetes nowadays.

Thus, there is a necessity of conducting new analysis of large populations, concerned with occurrence of accidents among each group of diabetic patients in respect to other drivers.

Results obtained by Cox at al. and recently published are worrisome [26]. Namely, they indicate that diabetes treated with insulin is a very serious risk factor, worsening capability to drive. However, without ignoring them, one must very carefully relate to those results. The group of subjects was relatively small, counted 37 people with diabetes treated with insulin. Their driving abilities were assessed with a use of simulator. Their blood glucose was leveled down to hypoglycemic concentration (2.2 mmol/L) using insulin infusion. Monitoring during the test involved: blood sugar level, EEG recording as well as symptoms of hypoglycaemia. Behavior of subjects and their responses to situations simulated on the screen in respect to their blood sugar level was then reported.

However, this way of assessing ones eligibility provoked many debates. Antagonists point out that conditions, which this simulation was performed in, were far from physiological and real life situations. They emphasized the fact that for many people using a simulator is a challenge itself, and since subjects were in addition connected with EEG recorder, blood sugar level recorder as well as to the drippers with insulin and glucose, circumstances became even more stressful and far from physiological. That could have greatly impaired their reactions to simulated situations and ability of self-control.

Carried out by Mathiesen and Borch-Johnsen [24] analysis of car accidents rate in the group of 7.599 drivers with diabetes revealed that within 3-year period, rate of accidents among drivers with diabetes was 0.7/ /1000 people per year, whereas among other drivers it was 4.5–5.5/1000 people per year.

Hypoglycaemic stupors are thought to be the predominant cause of driving capability worsening [3, 4, 8, 10, 11, 14, 17, 20, 26–29]. However one should keep in mind that such impairment may also be due to neuropathy and retinopathy.

Currently, there are no strict regulations defining how to assess driving eligibility . Many countries try to create such guidelines. However, these are usually imperfect and so more and more often patients seek their rights in court.

Diabetes is one of many diseases that may increase the risk of driving ability impairment. Number of risk factors, that this disease is associated with, is relatively big, maybe even bigger than with other diseases. However, in most cases it is possible in diabetes to predict risky situations and certain conditions and successfully prevent them.

It is very important to state what class of vehicles may person with diabetes drive: motor cars, motorcycles, lorries and minibuses (weight and number of seats), buses, motorboats and etc.

In this respect there are big differences between countries. In European countries diabetic patients receiv-ing insulin therapy are usually allowed to drive cars with nine or less number of seats. In some countries diabetics treated with insulin are banned from driving buses but are eligible to drive medium lorries of 3.5 tons in weight or less. Regulations concerning other types of vehicles, for example motorboats are not defined.

Bigger differences among countries occur between their regulations concerning diabetics on oral hypoglycemic agents. In some countries these patients are not forbidden to drive any class of vehicles. In others, there is a distinction between types of medications used for treatment (sulphonylurea derivatives or biguanides), in others restrictions apply to international tours.

Very big differences exist in very large countries such as Australia and USA where regulations vary across the country, from very strict to very liberal, depending on the state.

In European Union last decade has brought a substantial change in law concerning granting a driving license. It was greatly liberalized. In 1980 regulations limited access to driving license very strictly. Those restrictions did not apply only to patients with chronic complications such as angiopathy and polineuropathy, but also diabetics treated with insulin. With time those regulations became more liberal and in 1991 patients treated with insulin were eligible for driving license of categories A, B and B+E and subcategories A1 and B1 provided that they had valid medical approval and underwent intermittent re-assessments. For any other category such patients were not eligible. In 1996 there was further relaxation in the rules of European Union. Currently, the law only in a very general way states that every diabetic patient, who does not manifest any symptoms that may be dangerous to other road users is eligible for driving license. However, it does not specify symptoms and possible risk associated with them.

Differently to most European countries, legislation in United Kingdom states that diabetic patients can drive a vehicle up to 3.5 tones with a trailer and a minibus of less then 9 seats [9, 30, 31]. Drivers that need other types of driving license for employment would be assessed individually.

In Poland regulations are very liberal too. Doctors assessing eligibility for driving have fairly large discretion in respect to type of the disease they judge as not dangerous to other road users as well as type of driving license they grant.

Taking into account tremendous progress in abilities to manage and control diabetes it seems reasonable to liberate law to such extent, provided that doctor assessing ones ability to drive and issuing medical approval is competent enough. Lack of sufficient knowledge about diabetes may result in a dangerous mistake. Therefore, it is very important that such decision is made on basis of diabetologist's opinion.

It is very difficult, if not impossible to elaborate guidelines that would unmistakably state criteria for driving license eligibility. Thus, there is an agreement that medical approval should be made by a doctor that is supervising the patient, and must be based on a complete set of records of the course of the disease. It should focus on the level of metabolic stability, frequency and intensity of symptoms of hypoglycemia and patient's ability to recognize warning symptoms soon enough to prevent hypoglycemic stupor. Very important is opinion about patient's knowledge of diabetes, in particular about preventive measures and self-management of hypoglycemia. Patient's motivation to maintain metabolic stability should also be assessed.

It is beyond any doubt that diabetes and in fact its both acute and chronic complications are a risk factor for a car accidents. It is possible to eliminate or at least reduce such risk without discriminating people with diabetes. Several things can be done to achieve it.

One of them is an effort to keep metabolic stability what would result in lower number of events of acute complications including hypoglycemic stupor. However, in order to achieve it patient needs good education [2, 14, 20, 27–29]. Very interesting way of teaching is program called BGAT (Blood Glucose Awareness Training) and program HAATT (Hypoglycemia anticipation, awareness and treatment training) [5]. It teaches patients how to recognize warning symptoms of hypoglycemia. The results, in form of substantially reduced rate of car accidents caused by diabetic patients are very encouraging [4, 5]. Such training seems to be very important and especially helpful to patients that keep their blood sugar level low, since those patients have relatively narrow range of levels between those that evoke first warning symptoms of hypoglycemia and those that lead to neuroglycopenia.

Drivers with diabetes, in particular those treated with insulin, must be aware that driving a car should be considered an exertion and thus preventive measures like during every exercise should be undertaken [27]:

— patient should check his/her blood glucose before deciding to drive;

— one should not attempt to drive if blood glucose level ranges between 5–4 mmol/L; an additional dose of carbohydrates should be eaten first;
— patient should stop driving immediately (or as soon as it is safe to do so) if the blood glucose level is below 4 mmol/L;
— one should not start driving until at least 45 min after successfully treated hypoglycaemia;
— it is necessary to keep accessible, rapidly absorbable carbohydrates that should be eaten immediately in case when warning symptoms of hypoglycaemia occur;
— if the journey last more than two hours it is important to make stops to check the blood sugar level, eat a meal or snack and rest;
— patient should consider maintaining so called 'controlled hyperglycaemia'. It is recommended that patients with high risk of hypoglycaemia (e.g. pregnancy) or during situations associated with risk (driving should be ranked among such) keep their blood sugar level before the meal around 110 mg/mL (max 140 mg/mL);
— patient, during the journey should always have supplies of medicines and food in case of unexpected prolongation of the trip due to some unforeseen troubles (traffic jam, car failure an etc.).

Pregnant women with diabetes are in a group of patients that require special care and attention. During well managed pregnancy blood sugar levels should be lower than in other patients, and pregnancy itself is conducive to hypoglycaemia. Thus, prevention of such event is very important in that group of patients. Pregnant women should be given comprehensive information about increased risk of hypoglycaemia and about necessity of making sure that blood glucose level is high enough.

Proper education of diabetic patient about the risk factor of the disease is vital to the safety of both patient and other road users. It is also taken into consideration in case of car accident and subsequent judicial proceedings or problems connected with damages and others. Therefore, certificate of completion of training on prevention of hypoglycemic stupor, signed by both patient and educator, should be included in documents, together with evaluation of patient's health based on the complete course of the disease and opinion of other specialist (ophthalmologist, neurologist). Clearly stated date of reassessment of patient's eligibility to drive should be given as well.

All those information are crucial when car accident was patient's fault. There are cases when doctors are prosecuted (also by the patient or his family) for not providing patient with sufficient information about the risk of hypoglycaemia during driving and methods of its prevention.

Therefore patients must be fully aware that diabetes is a very serious risk factor for car accidents and thus potential danger to traffic. They must not treat their illness as an excuse that would absolve them of responsibility in case of car accident.

Are diabetic patients hazardous drivers in comparison to other people?

To answer this question analysis of recent data involving drivers of various groups of diabetic, as well as other types of patients and healthy people must be conducted.

Is driving license a privilege or simply a right of diabetic patient?

It does not seem just to discriminate in any way diabetic patients among people suffering from other diseases if only all preventive measures are obeyed.

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