Revisions to the BC Guide for Physicians in Determining Fitness to Drive a Motor Vehicle

Thank you for taking the time to review the Diabetes- Hypoglycemia chapter. Please note that this chapter was previously posted on drivesafe.com for BCMA review for 12 weeks from March 14th – June 12th. Revisions were made to that version and it is being posted on the BCMA website to provide an opportunity for additional review.

Please provide any feedback to:
Dr. John McCracken, OSMV at John.McCracken@gov.bc.ca

Feedback due by:
MONDAY, DECEMBER 31, 2007

The Office of the Superintendent of Motor Vehicles (OSMV), in partnership with the British Columbia Medical Association (BCMA) is revising the BC Guide for Physicians in Determining Fitness to Drive a Motor Vehicle (the Guide).

Once the Guide chapters have been revised, the OSMV will create 2 separate documents:
1. a Physicians Handbook for use by physicians, and
2. an OSMV Driver Fitness Assessment Manual for use by the OSMV

The diabetes chapter that you are reviewing will become the OSMV Driver Fitness Assessment Manual chapter. Once the OSMV Manual chapter is finalized, a briefer chapter on diabetes will be created for the Physician’s Handbook.

Methodology for revisions to the current Guide
This chapter has been drafted using the following process:

1. Dr. Bonnie Dobbs, University of Alberta provided updated research regarding the medical condition and driving.

2. The chapter was revised by OSMV based on Dr. Dobbs’ research as well as a review of the Canadian Medical Association’s (CMA) Determining Fitness to Drive – A Guide for Physicians, and the Canadian Council of Motor Transport Administrators (CCMTA) National Safety Code (NSC).

3. Specifically identified subject matter experts reviewed the draft chapter and provide feedback for revisions.

4. The draft was published on drivesafe.com for review by physicians, stakeholders and the broader road safety community.
5. The draft is now being re-published on the BCMA website for additional review by physicians.

6. The chapter will be further revised and ultimately approved by the OSMV and the BCMA.

Background
The Office of the Superintendent of Motor Vehicles (OSMV), in partnership with the British Columbia Medical Association (BCMA) is revising the BC Guide for Physicians in Determining Fitness to Drive a Motor Vehicle (the Guide). The last major update to the Guide was completed in 1997. The current edition of the Guide is based on consensus opinion of practicing physicians including members of specialty sections within the BCMA. Since the 1997 edition, a number of significant changes have occurred which have created a need to undertake another major revision to the Guide.

Changes in the law
• Developing case law has established that government must consider fitness to drive on an individual basis. This means that, where possible, the OSMV must move away from the current diagnostic model for determining driver fitness to a primarily functional model for determining driver fitness. The functional model focuses on the individual’s functional ability to drive, including the individual’s ability to compensate for their condition, when determining ability to drive safely.

Strength of evidence
• The evidence for setting the standards in the current Guide is consensus opinion of subject-matter experts. While this type of evidence is valid, it is not as strong as evidence from epidemiological, experimental or descriptive studies. The OSMV is committed to revising the Guide so that, as much as current research allows for, the guidelines in the Guide are based on research studies. Nonetheless, expert opinion will remain a key component of establishing driver fitness standards.

Other jurisdictions
• Consistency with national and international standards is an important consideration for the OSMV. Commercial drivers, in particular, need to be able to drive in other jurisdictions; if the BC standards for driver fitness were to significantly depart from standards accepted in other jurisdictions, this may create a hardship for commercial drivers.
1. OVERVIEW

For individuals with diabetes, both acute and chronic complications of the disease may affect fitness to drive. This chapter focuses on hypoglycemia (abnormally low blood glucose), an acute complication arising from the treatment of diabetes that may result in impaired sensory, motor and cognitive functions.

Hyperglycemia (abnormally high blood glucose) may cause blurred vision, confusion, and eventually diabetic coma. For the purposes of this manual, these are considered transient conditions.\(^1\) Over time, people with diabetes often develop co-morbidities caused by their prolonged exposure to hyperglycemia. These complications of diabetes include retinopathy (see Vision), neuropathy (see Neurological Disorders), nephropathy (see Renal Diseases), cardiovascular disease (see Cardiovascular Diseases), and peripheral vascular disease (see Peripheral Vascular Diseases).

While it is clear that the risk of hypoglycemia is an important consideration when assessing the fitness of drivers with diabetes, research indicates that the chronic complications of diabetes are more likely to be responsible for impaired fitness to drive than episodic incidents of hypoglycemia. Therefore, the effect of chronic complications always must be considered when assessing fitness to drive for people with diabetes.

About diabetes mellitus and hypoglycemia

Diabetes is a chronic and progressive disease characterized by hyperglycemia (high blood glucose). It appears in two principal forms:\(^2\):

- type 1 diabetes, formerly called insulin-dependent diabetes mellitus (IDDM) or juvenile diabetes
- type 2 diabetes, formerly called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes.

Type 1 diabetes can occur at any age, but it primarily appears before age 30. Type 2 diabetes usually occurs in individuals over the age of 40. Type 1 and type 2 also differ in the underlying defect, and type of therapeutic control. Type 1 is characterized by the inability to produce insulin and often more marked fluctuations in blood glucose. Daily insulin injections are always required to manage type 1 diabetes. Type 2 diabetes is characterized by an impaired ability to recognize and utilize insulin, and eventually diminished insulin production. Therapeutic control often is achieved by diet alone or in

---

\(^1\) Provide a reference to that portion of the manual that discusses transient conditions (not yet drafted).

\(^2\) Other types of diabetes include gestational diabetes, other specific types (those due to genetic defects in \(\beta\)-cell function, genetic defects in insulin action, diseases of the exocrine pancreas, drug or chemical induced diabetes, etc.), and pre-diabetes. These types of diabetes are less common than type 1 and type 2 diabetes and are not discussed in this chapter.
combination with oral antihyperglycemic agents\(^3\), but people with type 2 diabetes whose blood glucose cannot be controlled in this way require treatment with insulin.

Anyone who requires treatment with insulin is at risk of hypoglycemia. Those with type 2 diabetes treated with insulin secretagogues (oral medications that stimulate the secretion of insulin) or metformin (an oral medication that enhances the effect of insulin) also may experience hypoglycemia, although the frequency with this treatment is lower than with insulin. Hypoglycemia may occur for a number of reasons, including reduced food intake, unusual level of physical exertion, and alteration of insulin dose.

Hypoglycemia can result in two types of symptoms, neurogenic (autonomic) and neuroglycopenic.

**Neurogenic symptoms of hypoglycemia**

The body’s immediate response to low blood sugar is to secrete hormones that counteract insulin, including adrenaline. The presence of adrenaline causes neurogenic (or autonomic) symptoms such as tremulousness, palpitations, anxiety, sweating, hunger, and paresthesias (tingling and numbness). People with diabetes learn to recognize these symptoms as evidence of hypoglycemia and respond by consuming sugary liquids or starchy foods to increase their blood glucose level.

**Neuroglycopenic symptoms of hypoglycemia**

Neuroglycopenic symptoms are the direct result of impaired brain function due to low glucose levels. These symptoms include confusion, weakness or fatigue, severe cognitive failure, seizure and coma. As the blood glucose level falls, higher cortical function (insight, judgment, calculation, speech and memory) is the first to be affected. Next, a person will experience stupor, characterized by confusion, slurred speech, slow reaction times, poor judgment and lack of coordination. If the level continues to fall, there will be loss of consciousness, seizures and potentially brain damage or death.

**Hypoglycemia unawareness**

Another complicating factor is hypoglycemia unawareness, which is the inability to recognize the autonomic symptoms of hypoglycemia or a failure of such warning signs to occur prior to impaired brain function. If the initial autonomic symptoms caused by the release of adrenaline are missed, a person experiencing hypoglycemia can only rely on the neuroglycopenic symptoms as an indicator of low blood glucose. Because these symptoms appear in the context of cognitive impairment, they are not easily recognized by the hypoglycemic individual and may delay or prevent self-treatment.

**Severe hypoglycemia**

Severe hypoglycemia is commonly defined as hypoglycemia that requires outside intervention to abort, or that produces an alteration in level of consciousness or loss of consciousness. The altered or reduced level of consciousness prevents a person experiencing severe hypoglycemia from taking appropriate action.

\(^3\) Oral antihyperglycemics also may be referred to as oral hypoglycemics.
Prevalence

Prevalence of diabetes

Based on research conducted by the National Diabetes Surveillance System, it is estimated that approximately 5% of Canadians aged 20 years and older have been diagnosed with diabetes. Diabetes is somewhat more prevalent in males, and the overall prevalence of diabetes increases with age as shown in Figure 1 below. It is estimated that 5 to 10% of diagnosed diabetes is type 1, and 90 to 95% is type 2.

Figure 1 - Prevalence of Diabetes in Canada

Prevalence and predictors of hypoglycemia

A study of people with type 1 diabetes conducted in 1993 estimated that the incidence of mild hypoglycemia (hypoglycemia for which a person is able to treat themselves) to be 28 episodes per person per year. The incidence of severe hypoglycemia was estimated to be 0.31 episodes per person, per year. Since the mid 1990’s there has been an increased therapeutic emphasis on tight glycemic control, which has been shown to significantly reduce the complications of diabetes. Unfortunately, the use of more intensive treatment to maintain glycemic control has increased the risk of hypoglycemia by as much as two or three times. This suggests that these estimates on the prevalence of hypoglycemia in type 1 diabetes may be low.

While people with type 2 diabetes who are treated with insulin are at risk of hypoglycemia, the frequency is lower than for those with type 1 diabetes. The incidence of severe hypoglycemia for type 2 diabetes treated with insulin secretagogues is about 1 to 2% per year, with higher risk for longer use, older age, and the use of chlorpropamide and other long-acting secretagogues. The concomitant use of beta blockers and insulin previously has been thought to increase the risk of hypoglycemia; however, this theoretical concern is not often seen in practice.
For anyone with diabetes, a history of severe hypoglycemia, hypoglycemia unawareness, and low blood glucose levels are consistent predictors of future hypoglycemia.

**Prevalence and predictors of hypoglycemia unawareness**

It is estimated that 25% of all those treated with insulin will experience one or more episodes of hypoglycemia unawareness. In type 1 diabetes, hypoglycemia unawareness increases with the duration of diabetes and the likelihood increases if autonomic neuropathy is present. In type 2 diabetes, hypoglycemia unawareness is relatively uncommon.

Factors that may be associated with hypoglycemia unawareness include older age, duration of diabetes, presence of autonomic neuropathy, species of insulin, degree of metabolic control, and number of hypoglycemic events.

**Diabetes mellitus and crash risk**

Although there is some variability in results of research on drivers with diabetes, there is clear evidence to show that both private and commercial drivers with diabetes are at an increased risk of motor vehicle crashes.

It has been shown that diabetes treatment modality is an important consideration in determination of risk for drivers. Study results consistently indicate that individuals taking insulin have an elevated risk of crashes. Some studies have also shown an elevated risk of crash for drivers with type 2 diabetes who are treated with a combination of oral antihyperglycemics (secretagogues and non-secretagogues). Those treated by diet alone or with a single oral antihyperglycemic agent have shown no elevated risk of crash.

A relationship between hypoglycemia and crashes has also been found. Despite a lack of data from studies of large samples of people with diabetes, a number of small studies have shown a relationship between hypoglycemic reactions and motor vehicle crashes.

While research has established clear links between diabetes, hypoglycemia and motor vehicle crashes, the variable results of these studies indicate that decisions about driving should be based on assessment of individual medical history and circumstances including:

- treatment modality
- incidence of hypoglycemia
- hypoglycemia unawareness
- presence of chronic complications of diabetes.

**2. EFFECT ON FUNCTIONAL ABILITY TO DRIVE**

The neuroglycopenic symptoms associated with severe hypoglycemia can significantly impair the sensory, motor, and cognitive functions required for driving. There are studies that suggest that mild hypoglycemia may also impair these functions.
Condition | Potential impact on driving | Primary Functional Ability Affected
---|---|---
Diabetes mellitus
• Mild hypoglycemia | Episodic impairment | Sensory
• Severe hypoglycemia | Episodic impairment | Incapacitation

3. GUIDELINES

The following are general guidelines respecting fitness to drive. The specific circumstances of individual drivers should be taken into account when applying these guidelines.

These guidelines are based on the Canadian Medical Association’s *Determining Medical Fitness to Operate Motor Vehicles, 7th edition* (2006) and the Canadian Diabetes Association’s *Clinical Guidelines for Diabetes and Private and Commercial Driving*, 2003.

Subject to the following guidelines, individuals with diabetes may drive if they have no chronic complications of diabetes that make them unfit to drive, including eye disease, renal disease, neuropathy (autonomic, sensory, or motor) or cardiovascular disease.

**Type 2 diabetes treated with diet and exercise alone or combined with metformin, acarbose, or thiazolinediones**

**Private and Commercial Vehicles – all licence classes**

Individuals may drive if they:
• report to OSMV if they begin insulin therapy
• remain under regular medical supervision to ensure that any progression in their condition or development of chronic complications does not go unattended

**Type 2 diabetes treated with insulin secretagogues (sulfonylureas, repaglinide, nateglinide)**
Please provide approval and comments by Monday, December 31, 2007
Send to: Dr. John McCracken, OSMV Medical Consultant
e-mail: John.McCracken@gov.bc.ca  Tel: 250-356-5634

<table>
<thead>
<tr>
<th>Private and Commercial Vehicles – all licence classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals may drive if they:</td>
</tr>
<tr>
<td>• have a good understanding of their condition</td>
</tr>
<tr>
<td>• routinely follow their physician’s instructions about diet, medication, glucose monitoring and the prevention of hypoglycemia</td>
</tr>
<tr>
<td>• remain under regular medical supervision to ensure that any progression in their condition or development of chronic complications does not go unattended</td>
</tr>
<tr>
<td>• stop driving and treat themselves immediately if hypoglycemia is identified or suspected</td>
</tr>
<tr>
<td>• do not drive until at least 45 to 60 minutes after effective treatment if their blood glucose is between 2.5 and 4.0 mmol/L</td>
</tr>
<tr>
<td>• report to OSMV if they begin insulin therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diabetes (type 1 or type 2) treated with insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Vehicles – classes 5 to 8</td>
</tr>
<tr>
<td>Individuals may drive if they:</td>
</tr>
<tr>
<td>• remain under regular medical supervision to ensure that any progression in their condition or development of chronic complications does not go unattended</td>
</tr>
<tr>
<td>• understand their diabetic condition and the close interrelationship between insulin and diet and exercise</td>
</tr>
<tr>
<td>• routinely follow their physician’s advice regarding prevention and management of hypoglycemia</td>
</tr>
<tr>
<td>• when on long drives, test their blood glucose concentration immediately before driving and approximately every 4 hours while driving, and have a source of readily available, rapidly absorbable glucose</td>
</tr>
<tr>
<td>• do not drive when their glucose level is below 4.0 mmol/L</td>
</tr>
<tr>
<td>• do not begin to drive when their glucose level is between 4.0 and 5.0 mmol/L unless they first take prophylactic carbohydrate treatment</td>
</tr>
<tr>
<td>• stop driving and treat themselves immediately if hypoglycemia is identified or suspected</td>
</tr>
<tr>
<td>• do not drive until at least 45 to 60 minutes after effective treatment if their glucose is between 2.5 and 4.0 mmol/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commercial Vehicles – classes 1 to 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals may drive if:</td>
</tr>
<tr>
<td>• They obtain and retain an initial certificate of competency in blood glucose measurement from an approved diabetic clinic.</td>
</tr>
<tr>
<td>• They carry the following supplies whenever they are driving:</td>
</tr>
<tr>
<td>• blood glucose self-monitoring equipment</td>
</tr>
</tbody>
</table>
Please provide approval and comments by Monday, December 31, 2007
Send to: Dr. John McCracken, OSMV Medical Consultant
e-mail: John.McCracken@gov.bc.ca  Tel: 250-356-5634

- a source of readily available, rapidly absorbable glucose
- They test their blood glucose concentration 1 hour or less before driving and approximately every 4 hours while driving.
- They stop driving if their glucose level falls below 6 mmol/L (108 mg/dL) and do not resume driving until their glucose level has risen to 6.0 mmol/L or higher following food ingestion.
- Their work schedule has been approved by their treating physician as compatible with their insulin regimen

Individuals may not drive if:
- blood tests indicate uncontrolled diabetes; i.e.:
  - HbA1C ≥ 12%, or
  - ≥ 10% of BG levels <4.0 mmol/L.
- there has been a significant change in insulin therapy (i.e. introduction of insulin, or a change in type of insulin or number of injections) until monitoring and assessment indicates a stable and effective blood glucose control.
- there is evidence of inadequate self-monitoring of blood glucose (unreliable or no home blood glucose measurement) or inadequate knowledge of the causes, symptoms and treatment of hypoglycemic reactions.

Initial application for a commercial licence and annual medical recertification

Individuals applying for a class 1 – 4 licence must be medically certified and those who hold a class 1 – 4 licence must be recertified annually. For medical certification and recertification, individuals must:
- provide to OSMV
  - a Doctor’s Medical Report Re Diabetic Driver form completed by the treating physician. To complete this form, the applicant must have the results of an HbA1C test taken within the previous 3 months
  - a Driver’s Diabetes Questionnaire form completed by the applicant
  - an Examination of Visual Function form completed by an optometrist or ophthalmologist, or the results of a vision examination including testing of visual fields completed within the previous year
- have available for the treating physician
  - records of medical care for the previous 24 months for initial certification and 12 months for recertification
  - a log of blood glucose measurements performed at least twice daily for the previous six months or since diagnosis if diagnosed less than six months previous.

Severe Hypoglycemia and Hypoglycemia Unawareness

Private Vehicles – classes 5 to 8
Severe hypoglycemia
Individuals who have had a severe hypoglycemic episode within the previous six months may drive if:
- their treating physician has indicated to OSMV that they have re-established stable glycemic control and OSMV has determined that they are fit to resume driving. The period of time required to re-establish glycemic control will vary on a case-by-case basis.
- upon return to driving, they test their blood glucose immediately before driving and approximately every hour while driving
- they do not drive or stop driving if their blood glucose level falls below 6.0 mmol/L and they do not resume driving until their blood glucose level has risen above 6.0 mmol/L after food ingestion

If after six months there are no further episodes, they may drive if they follow the regular guidelines for drivers with diabetes.

Hypoglycemia Unawareness
Individuals who have experienced an episode of hypoglycemia unawareness may not drive for a minimum of 3 months after the episode. After 3 months, individuals may drive if:
- their treating physician has indicated to OSMV that they have regained glycemic awareness and have stable glycemic control, and OSMV has determined that they are fit to resume driving
- they follow the blood glucose monitoring guidelines for individuals with a history of severe hypoglycemia

Where hypoglycemia unawareness is persistent
If after 3 months, an individual has persistent hypoglycemia unawareness, they may drive if:
- their treating physician has indicated to OSMV that they have stable glycemic control and are willing and able to take steps to ensure they do not become hypoglycemic while driving, and OSMV has determined that they are fit to resume driving.
- they retain a blood glucose log and review it at least monthly with their treating physician
- they follow the blood glucose monitoring guidelines for individuals with a history of severe hypoglycemia for as long as their hypoglycemia unawareness persists.

Commercial Vehicles – classes 1 to 4

Severe hypoglycemia
Individuals who have had a severe hypoglycemic episode within the previous six months may drive if:
- they have provided their treating physician with a blood glucose log of at least 4 readings per day for 30 days, in which less than 5% of the readings are below 4.0
mmol/L

- their treating physician has indicated to OSMV that they have re-established stable glycemic control and OSMV has determined that they are fit to resume driving. The period of time required to re-establish glycemic control will vary on a case-by-case basis.
- upon return to driving, they test their blood glucose immediately before driving and approximately every hour while driving, and do not drive if their blood glucose level is below 6.0 mmol/L.

If after six months there are no further episodes, they may drive if they follow the regular guidelines for drivers with diabetes.

**Hypoglycemia Unawareness**

Individuals with persistent hypoglycemia unawareness may not hold a class 1 to 4 licence. Those who have experienced an episode of hypoglycemia unawareness may not drive for a minimum of 3 months after the episode. After 3 months, they may drive if:

- they have provided their treating physician with a blood glucose log of at least 4 readings per day for 30 days, in which less than 5% of the readings are below 4.0 mmol/L
- their treating physician has indicated to OSMV that they have regained glycemic awareness and have stable glycemic control, and OSMV has determined that they are fit to resume driving.
- they follow the blood glucose monitoring guidelines for individuals with a history of severe hypoglycemia.
7. REASSESSMENT

How frequently should a driver fitness assessment be repeated for this medical condition?

<table>
<thead>
<tr>
<th>Commercial Drivers – classes 1 to 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated with insulin</td>
</tr>
<tr>
<td>• Reassessed annually using DMER, Examination of Visual Functions form, Driver’s Diabetes Questionnaire, and Doctor’s Medical Report re Diabetic Driver form.</td>
</tr>
<tr>
<td>• If initial assessment indicates blood glucose levels and treatment have not been stable, then reassessed one year after initial assessment for stability of condition and treatment and if stable, then reassessed as above.</td>
</tr>
<tr>
<td>• Reassess if insulin therapy is initiated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Private Drivers – classes 5 to 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>All, regardless of treatment</td>
</tr>
<tr>
<td>• If initial assessment indicates blood glucose levels and treatment have been stable, then re-assessed every five years thereafter.</td>
</tr>
<tr>
<td>• If initial assessment indicates blood glucose levels and treatment have not been stable, then reassessed one year after initial assessment for stability of condition and treatment, and if stable, every five years thereafter.</td>
</tr>
<tr>
<td>• Non-insulin treated drivers reassessed if insulin therapy is initiated.</td>
</tr>
</tbody>
</table>