CCMTA • CCATM

CANADIAN COUNCIL OF MOTOR TRANSPORT ADMINISTRATORS
CONSEIL CANADIEN DES ADMINISTRATEURS EN TRANSPORT MOTORISÉ

Determining Driver Fitness in Canada:

Part 1: A Model for the Administration of Driver Fitness Programs

and

Part 2: CCMTA Medical Standards for Drivers

Version: Edition 13

Foreword

The Administration of Driver Fitness Programs and the CCMTA Medical Standards for Drivers are intended to enhance the understanding of medical conditions that affect safe driving and aid provincial and territorial governments in their role in assessing driving privileges.

Part 2 of this document the new *Canadian Council of Motor Transport Administrators (CCMTA) Medical Standards for Dr*ivers replaces the publication of the same name, last published in September 2011.

While this document is a departure from how the CCMTA has traditionally articulated driver fitness standards, it reflects the continued collaboration over the past 25 years between the provinces and territories of Canada to create national standards for driver fitness.

These materials are the result of a lengthy and intensive process, begun in 2006 and concluded in 2012 and reflect CCMTA's commitment to:

- anchor its medical standards on the best-evidence available
- focus on functional ability to drive rather than medical diagnosis, and to
- respond to case law establishing that Canadian authorities must individually assess drivers.

These guidelines and standards reflect Canadian jurisdictions' continuing commitment to public safety while allowing the maximum driving privilege possible.

Acknowledgements and thanks

The production of this document was a result of a collaboration of all of the provinces and territories and many individuals from these jurisdictions with various expertises contributed to the final product.

However, CCMTA would also like to specifically thank the province of British Columbia which provided expertise and also the basic template for the production of a national model on determining driver fitness in Canada.

Version history

Document Information and Revision History	
Project	Revising the CCMTA Medical Standards for Drivers
Title	Determining Driver Fitness in Canada: Part 1: Administration of Driver Fitness Programs and Part 2: CCMTA Medical Standards for Drivers
Version	Edition 13
Status	For publishing September

HISTORY			
Edition	***Date***	***Changes made by:***	***Description of Change***
1	Nov 2009	Prepared by Gordium Associates	N/A
2	Dec 2009	Input from DFOG. Changes prepared by Gordium Associates	N/A
3	Feb 2010	Input from DFOG meeting. Changes prepared by Gordium Associates	N/A
4	July 26 2010	Suggested revisions for DFOG meeting September 2010 by M. Fuhr	
5	Sept 2010	CCMTA Secretariat	Examples for CCMTA Board approval of concept Dec 2010
6	April 2011	CCMTA Secretariat	Part 1 update for DFOG, D&V review
7	Aug 2011	CCMTA Secretariat, input from DFOG	Part 1 approved by D&V May 2011, updated with hearing standard additions Aug 2011
8	Jan 2012	CCMTA Secretariat, input from DFOG physicians	Addition of Part 2 after physicians review Sept 2011
9	Feb 2012	CCMTA Secretariat, Editing Committee	Changes reflect DFOG Feb 7-8, 2012 meeting decisions and editorial updates
10	May 2012	CCMTA Secretariat, Editing Committee	Changes after reviews in April by DFOG, D&V and Editorial Committee for CCMTA Board approval
11	Aug 2012	CCMTA Secretariat DFOG	Board approved version (May 2012) with DFOG edits Aug 2012
12	Sept 2012	CCMTA Secretariat	Final version after DFOG call August 30, 2012
13	August 2013	CCMTA Secretariat DFOG	Editorial changes based on implementation experience by jurisdictions (Sept to July) and Secretariat editorial review (June)

Table of contents

BACKGROUND

Chapter 1: Introduction

1.1 Purpose of the model for driver fitness program administration (Part 1)

The purpose of the model for administering driver fitness programs is to provide guidelines to facilitate a consistent approach to driver fitness decision-making by provincial and territorial government driver fitness authorities across Canada.

1.2 Purpose of the CCMTA Medical Standards for Drivers (Part 2)

The purpose of the CCMTA Medical Standards for Drivers is to provide driver fitness authorities with research-based information and standards to support consistent driver fitness decisions within, and across, Canadian jurisdictions.

1.3 How this document is organized

This document consists of 4 parts: Background, Part I, Part II and Appendices.

Background, provides the necessary context for the standards outlined in Parts 1 and 2. The 5 chapters within this part are:

- *Chapter 1: Introduction*, which explains the purpose of the standards
- *Chapter 2: The authority for the CCMTA standards*, which provides an overview of the mandate of the CCMTA and the relationship between driver fitness policy in individual Canadian jurisdictions and the CCMTA standards
- *Chapter 3: Roles and responsibilities in driver fitness,* which reviews the roles of driver fitness authorities and medical practitioners
- *Chapter 4: A changing approach to determining driver fitness,* which reviews changes in the law as well as explains the 'functional' approach to driver fitness
- *Chapter 5: Guiding principles,* which reviews the 4 principles which are the foundation of the CCMTA standards

Part 1, A Model for the Administration of Driver Fitness Programs, provides guidelines and a process model for driver fitness authorities to follow during the driver fitness determination process. The 7 chapters within this part are:

- *Chapter 1: Introduction*
- *Chapter 2: Definitions,* which defines terms used throughout the model
- *Chapter 3: Key concepts,* which explain the conceptual framework for the model
- *Chapter 4: Identifying drivers who may not be fit to drive,* lays out a model for commercial and non-commercial drivers as well as cancelling licences when there is an immediate public safety risk
- *Chapter 5: Assessing fitness to drive,* which provides model on when to request assessments and how to assess the different functions needed for driving
- *Chapter 6: Making a driver fitness determination,* outlines the different issues that must be considered by driver fitness authorities when they make a driver fitness determination
- *Chapter 7: Reassessment,* lays out a process for determining when a reassessment is required and setting the reassessment interval

Part 2: CCMTA Medical Standards for Drivers, contains the medical condition driver fitness assessment standards.

- *Chapter 1: Introduction* is an introduction that outlines the purpose and the format of the medical condition chapters
- *Chapter 2: Medical conditions at-a-glance* is a table of medical conditions that may be used as a quick reference to determine how each affects the functions necessary for driving.
- *Chapters 3 – 23* are the medical condition driver fitness standards

Appendices.

- *Appendix 1: Licence classes,* describes the vehicles that may be driven by commercial and non-commercial drivers
- *Appendix 2: Reciprocity Agreement between Canada and the United States* contains information on the letters between Canada and the US that outline the driver fitness expectations for Canadian commercial vehicle drivers that drive in the U.S.

Chapter 2: The authority for the CCMTA standards

2.1 Canadian Council of Motor Transport Administrators

The *Canadian Council of Motor Transport Administrators* is an organization comprising representatives of provincial, territorial and federal governments of Canada which, through the collective consultative process, makes decisions on administration and operational matters dealing with licensing, registration and control of motor vehicle transportation and highway safety. It also includes associate members from the private sector and other government departments whose expertise and opinions are sought in the development of strategies and programs. CCMTA receives its mandate from, and reports to, the Council of Ministers Responsible for Transportation and Highway Safety.

The executive of CCMTA is made up of a fourteen-member Board of Directors, each representing his/her government who to attend to the overall management of the organization. The Board is responsible for providing overall guidance and specific direction to the standing committees. It reports to the Councils of Ministers and Deputy Ministers through the President of CCMTA, who is also Chair of the Board.

Reporting to the CCMTA Board, the work of CCMTA is conducted by three permanent standing committees. The mandates of the standing committees are as follows:

- The *Standing Committee on Drivers and Vehicles* (D&V) is responsible for all matters relating to motor vehicle registration and control, light vehicle standards and inspections, and driver licensing and control.

- The *Standing Committee on Compliance and Regulatory Affairs* (CRA**)** is concerned with the compliance activities of programs related to commercial driver and vehicle requirements, transportation of dangerous goods and motor carrier operations in order to achieve standardized regulations and compliance programs in all jurisdictions.

- The *Standing Committee on Road Safety Research and Policies* (RSRP) is responsible for coordinating federal, provincial and territorial road safety efforts, making recommendations in support of road safety programs, and developing overall expertise and strategies to prevent road collisions and reduce their consequences.

CCMTA's Vision is to have the safest and most efficient movement of people and goods by road in the world. Its mission is to provide a national forum for development of public policy and programs for road safety and driver and vehicle licensing.

2.2 The mandate of the CCMTA Driver Fitness Overview Group (DFOG)

The Driver Fitness Overview Group reports to the *CCMTA Standing Committee on Drivers and Vehicles*. Members are expected to be a mix of various types of expertise on driver fitness and consist of administrators and medical professionals representing licensing authorities. Medical professionals can include physicians, occupational therapists and nurses.

The mandate of the CCMTA DFOG is to derive a set of driver fitness policies and for jurisdictional use that incorporate the best ideas and principles included in the currently available literature and maintain their currency through periodic review.

Specific responsibilities include:

- develop strategies for all driver fitness issues using a driver fitness model which is a functional approach to determines the impact on the functions of driving.
- recommend uniform medical standards to be used by administrators in assessing a person's medical fitness to operate a motor vehicle.
- maintain and manage the CCMTA Medical Standards document.
- act as liaison on behalf of CCMTA with other organizations (e.g.: Canadian Medical Association, U.S. Federal Highway Administration (FMCSA), medical specialty societies).
- act as a clearing house for all activities under its purview.
- identify areas of concern and direct activities accordingly.

2.3 The relationship between individual Canadian jurisdictions' driver fitness policies and the CCMTA standards

All Canadian provinces and territories have the authority to establish their own driver fitness policies and procedures. All have a medical review board or unit acting in an advisory capacity to the jurisdiction's licensing body (the Registrar) on medical matters that may affect a person's fitness to drive. However, in order to support a consistent approach to driver fitness across the country, the provinces and territories agreed to publish CCMTA Medical Standards for Drivers.

In 1985, medical standards for drivers were identified as part of the National Safety Code (NSC) initiative undertaken to achieve uniformity among the provinces and territories, on many aspects relating to the administration of drivers and vehicles. The rationale being that licence transfers upon a change of province of residence should not be complicated by divergent medical requirements. The classification of driver licences adopted by the provinces and territories as part of the NSC is shown in Appendix 1. A Medical Advisory Committee (MAC), comprised of physicians appointed by each jurisdiction, was created to identify and reconcile interprovincial medical standard variances and produce a harmonized standard. The basis for developing the harmonized medical standards was primarily publications from the Canadian Medical Association (CMA) and other medical speciality associations.

In 2000, CCMTA created a Driver Fitness Project Group to carry out a standards review, with attention to risk, compensation, accommodation, functional focus and whether and how to assess for each medical standard. This approach reflected recent trends relating to evidence based medicine rather than standards in determining an individual's fitness to drive.

In 2008, a Driver Fitness Overview Group in 2008 was formed to:

(i) consolidate the work of the MAC and Driver Fitness to avoid duplicate work, duplicate reporting and record keeping and to house all medical related issues under the same umbrella, and

(ii) produce one central CCMTA medical document.

In 2011 the Driver Fitness Overview Group developed new driver fitness standards in conjunction with subject matter experts including researchers, general practitioners and medical specialists, and administrators from Canadian driver fitness authorities. The standards are intended as a guide in establishing basic medical qualifications to drive for both commercial and non-commercial drivers and are intended for use by both physicians and driver fitness authorities.

Although no jurisdiction in Canada is legally required to adopt the CCMTA standards, the majority are adopted by the driver fitness authorities. This achieves a uniformity of standards across Canada which supports both road safety and inter-provincial harmonization.

All medical standards, and subsequent changes, contained in Part 2 of this document are approved by all jurisdictions through a ballot process which requires a two thirds majority for approval.

2.4 The relationship between Canadian jurisdictions' driver fitness standards for commercial drivers, the CCMTA standards and the North American Free Trade Agreement

Under the North American Free Trade Agreement, the United States and Canada reached agreement on reciprocity of the medical fitness requirements for drivers of commercial motor vehicles (CMVs) effective March 30, 1999. The countries determined that the medical provisions of U.S. Federal Motor Carrier Safety Regulations (FMCSRs) and the Canadian National Safety Code (NSC) are equivalent (see Appendix 2).

There were three exceptions for Canadian drivers. Those who are (i) insulin-treated diabetics,(ii) hearing-impaired at a defined level, or (iii) have epilepsy are not permitted to operate CMVs in the United States. U.S. regulations prohibit individuals with those conditions from operating CMVs in the United States while they are allowed to drive commercial vehicles in Canada.

Also drivers from either country operating under a medical waiver or who are operating under medical *grandfather rights* are prohibited from operating in international commerce.

Because the reciprocal agreement between the United States and Canada identifies the CCMTA standards as the standard for commercial drivers, this means that regardless of individual provincial or territorial standards, **drivers of CMVs must meet or exceed the CCMTA standards if they drive in the United States.**

Commencing in January 2012, both countries agreed to adopt a unique identifier code to be displayed on the licence and the driving record to identify a commercial driver who is not qualified or disqualified from operating a commercial vehicle in the other country.

In Canada, the identifier code will be “W”, and defined as: “restricted commercial class – Canada only”. In the United States, the identifier code “V” will indicate the U.S. driver is only allowed to drive in the U.S. and is not medically qualified to drive in Canada.

Chapter 3: Roles and responsibilities in driver fitness

All Canadian jurisdictions work in partnership with physicians, health care professionals and other agencies, to implement and administer driver fitness programs. The following paragraphs highlight examples of the roles and responsibilities of key participants in assessing and determining driver fitness.

3.1 Government driver fitness authorities

On a day-to-day basis, government driver fitness authorities make the final driver fitness decision as to whether a driver is fit to drive.

3.2 Medical practitioners

Medical practitioners play a key role in identifying and assessing drivers who may be unfit to drive. In some jurisdictions they have a legal duty to report certain medical conditions. In addition to this reporting duty, medical practitioners may also conduct assessments and provide information to the driver fitness authority regarding a driver's diagnosis, prognosis, treatment and extent of impairment. Sometimes medical practitioners are asked to comment directly on driving ability.

In some Canadian jurisdictions, during an appeal, or reconsideration, of a decision, medical specialists provide written or oral opinions when a driver asks for a review of the driver fitness decision.

3.3 Allied health care practitioners

Allied health care practitioners such as occupational therapists, driver rehabilitation therapists and physiotherapists may be asked to conduct assessments of drivers and comment on the driver's functional ability to drive. As well, in some jurisdictions, reports initiated by allied health professionals because of a driver fitness concern may be accepted and steps taken by the driver fitness authority.

Chapter 4: A changing approach to determining driver fitness

Traditionally CCMTA medical standards were based mostly on the diagnostic model. That is, the standards were based primarily on the medical condition and the presumed group characteristics of people with that condition rather than on how the medical condition affected the functions necessary for driving on an individual basis. In terms of an evidentiary basis, the standards reflected the consensus opinion of practicing physicians.

Three developments have had a significant impact on the procedure for the administration of driver fitness programs and the medical condition guidelines:

1. A Supreme Court of Canada decision established the requirement to individually assess drivers. The '*Grismer*'[1] case held that each driver must be assessed according to the driver's own personal abilities rather than presumed group characteristics.

2. Nationally and internationally, driver fitness authorities are moving toward adopting a functional approach to driver fitness. This means assessing the impact of a medical condition on the functions necessary for driving. The functions necessary for driving are cognitive, motor, and sensory. These are described in detail in Chapter 5.

3. CCMTA has increased its emphasis on using research evidence, where it exists, as the basis of its driver fitness standards. Each medical condition in Part 2 is included because the best available evidence shows that the medical condition causes impairment of one or more of the functions necessary for driving, or has been associated with an elevated risk of crash or impaired driving performance. The model for this work was drawn from British Columbia's approach to medical conditions and fitness to drive which in turn was based on an integrated review by Dr. B. Dobbs.

[1] British Columbia (Superintendent of Motor Vehicles) v. British Columbia (Council of Human Rights), [1999] 3 S.C.R. 868

The four principles articulated on the following pages reflect the CCMTA's changing approach to driver fitness and are the foundation of the new standards in Part 2.

Chapter 5: Guiding principles

The driver fitness approach is guided by the following four principles. By following these principles, Canadian driver fitness authorities will ensure that drivers are given the maximum licensing privilege possible taking into account their medical condition, its impact on the functions necessary for driving, and the driver's ability to compensate for the condition. These principles are the foundation of the *Administration of Driver Fitness Programs* in Part 1 of this document.

5.1 Principle 1 - Risk management

Principle

Driver fitness authorities will administer their driver fitness programs using a risk management approach.

Discussion

Risk is often defined as a formula: that is, risk is the likelihood of an uncertain event multiplied by the consequence if the event were to take place. This means that a highly likely event with serious consequences is a greater risk than an unlikely event with minor consequences. Risk management is the process of identifying risks and taking action to minimize either the likelihood or consequence of an event.

In *Grismer*,[2] the Supreme Court of Canada indicated that people with some level of functional impairment may have a driver's licence because society can tolerate a degree of risk in order to permit a wide range of people to drive. Unfortunately, there are no reliable formulas to calculate risk as it relates to fitness to drive. The impact of a medical condition may be specific to an individual and the ability to compensate for the medical condition may also vary by individual. As well, because the driving environment is complex and continuously changing, it is difficult to

[2] British Columbia (Superintendent of Motor Vehicles) v. British Columbia (Council of Human Rights), [1999] 3 S.C.R. 868

determine exactly what level of impairment means a person is not fit to drive. Because of these limitations, driver fitness authorities cannot precisely calculate the risk presented by a driver with a particular medical condition. Despite the fact that this risk cannot be precisely calculated, driver fitness authorities can still use a risk management approach when conducting activities associated with their driver fitness programs.

5.2 Principle 2 - Functional approach

Principle

Driver fitness determinations will be based primarily on functional ability to drive, and other available relevant materials, but no longer solely on diagnosis.

Discussion

Although there are some exceptions to this general principle, a functional approach to determining driver fitness means that, when making driver fitness determinations, the focus is on the effect that a medical condition has on the functions necessary for driving rather than making a decision based solely on a diagnosis. This is because many medical conditions may result in a wide range of impairment – from mild to severe – and drivers may vary in their own ability to compensate for the impairment.

5.3 Principle 3 - Individual assessment

Principle

Driver fitness determinations will be based on the individual driver's characteristics and abilities rather than the presumed group characteristics and abilities of people with that medical condition.

Discussion

A Supreme Court of Canada decision has established the requirement to individually assess drivers. *Grismer* held that each driver must be assessed according to the driver's own personal abilities rather than presumed group characteristics.

The driver fitness standards outlined in Part 2 are, however, based on presumed group characteristics of individuals with each medical condition. However, consistent with the decision in *Grismer*, driver

fitness authorities must make driver fitness determinations on an individual basis. This means that the standards are the starting point for decision-making but they may not apply to every individual. This is because, in some situations, individuals who would otherwise not be fit to drive have learned strategies, or utilize devices, to compensate for their functional impairment. For example:

- a driver with limited peripheral vision may use the strategy of turning their neck to the left and right to ensure they have a full field of view, or
- a driver who is unable to use their lower limbs may have their vehicle modified for hand controls.

Conversely, an individual who on the face of the standard would be fit to drive, may be found unfit. For example:

- a driver with a visual defect that can be compensated for may lack insight into the impact that their medical condition has on their driving and therefore would be at risk of not compensating properly. Because of their lack of insight, this driver would not be fit to drive.

5.4 Principle 4 – Reviewing and considering the best information available

Principle

Driver fitness authorities will review and consider the best information available when making driver fitness determinations.

Discussion

For each driver, driver fitness authorities will gather the best information that is available and required to determine fitness. Depending upon the nature of the functional impairment, the best information may include results of specialized functional assessments that clearly indicate whether or not an individual is fit to drive, such as a cognitive road test that assesses impairment of cognitive ability as it relates to driving. For other impairments there may be no assessment tools available that can accurately measure the impact of a medical condition on the functions necessary for driving. For example, in the case of drivers with episodic impairments, driver fitness authorities have to rely on the results of medical assessments and informed opinion as the best information available for determining fitness to drive.

Driver fitness authorities will generally rely on the medical condition standards to make driver fitness determinations. However, because each individual is unique, authorities also review and consider other available and relevant information when making driver fitness determinations.

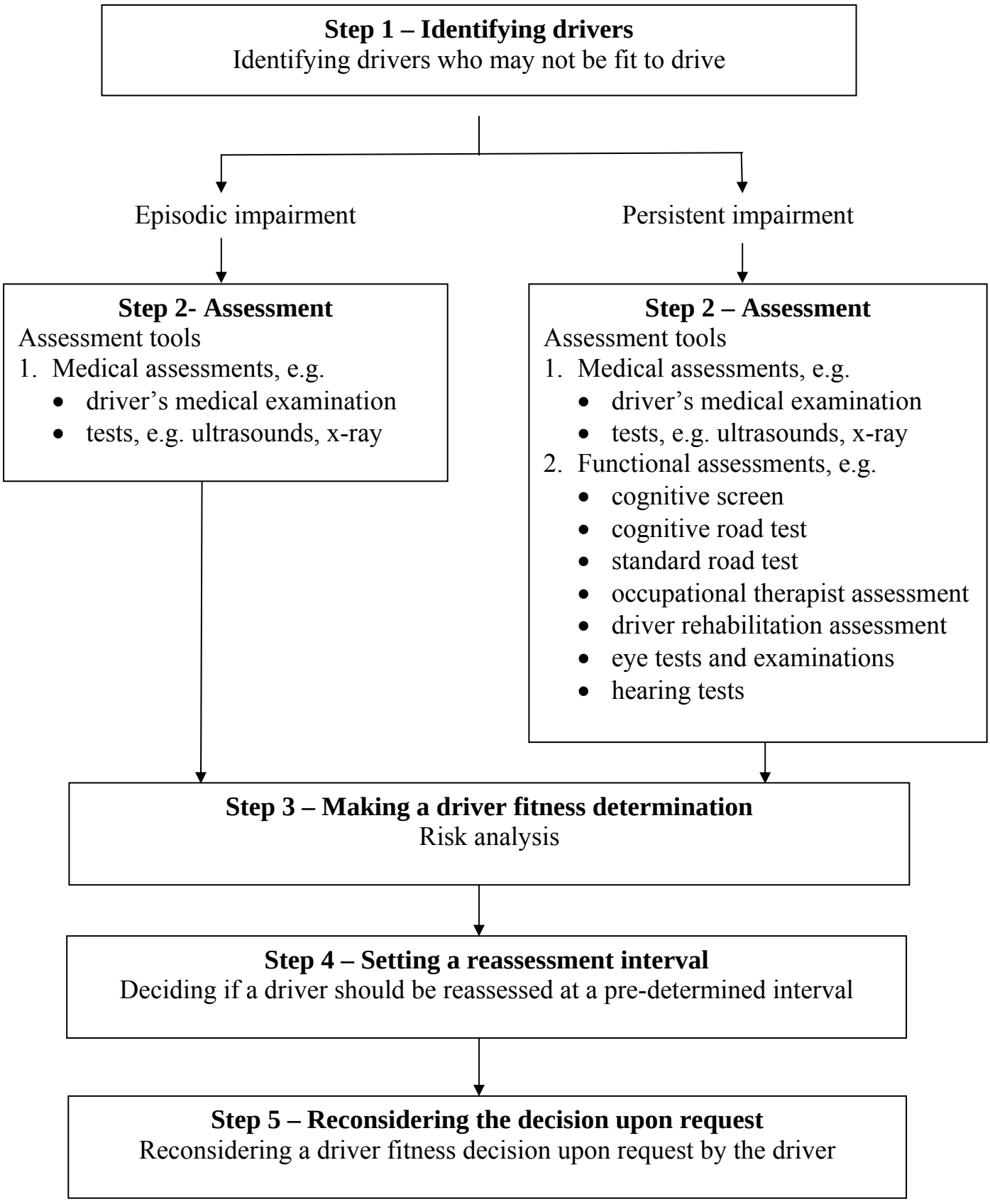
PART 1:

A MODEL FOR THE ADMINISTRATION OF DRIVER FITNESS PROGRAMS

Chapter 1: Introduction

Individual territorial and provincial driver fitness authorities will administer their driver fitness programs in a variety of ways. However, to support the consistent use of the medical condition standards, guidelines for the administration of driver fitness programs have been articulated for the use of provinces and territories. These guidelines have been organized under five key activities:

1. identifying drivers who may not be fit to drive
2. assessing drivers: assessment tools
3. making a decision regarding driver fitness: risk analysis
4. deciding if a driver should be reassessed at a pre-determined interval, and
5. reconsidering a driver fitness decision upon request by the driver.


Step 1 – Identifying drivers
Identifying drivers who may not be fit to drive
Episodic impairment
Persistent impairment
Step 2- Assessment
Assessment tools
1. Medical assessments, e.g.
• driver's medical examination
• tests, e.g. ultrasounds, x-ray
Step 2 – Assessment
Assessment tools
1. Medical assessments, e.g.
• driver's medical examination
• tests, e.g. ultrasounds, x-ray
2. Functional assessments, e.g.
• cognitive screen
• cognitive road test
• standard road test
• occupational therapist assessment
• driver rehabilitation assessment
• eye tests and examinations
• hearing tests
Step 3 – Making a driver fitness determination
Risk analysis
Step 4 – Setting a reassessment interval
Deciding if a driver should be reassessed at a pre-determined interval
Step 5 – Reconsidering the decision upon request
Reconsidering a driver fitness decision upon request by the driver

Chapter 2: Definitions

Assessment	means using any kind of test or examination to gather information about a driver's functional ability to drive. Assessments may be either functional assessments or medical assessments (see definitions of these terms) and lead to a driver fitness determination.
Authority	See definition of 'Driver fitness authority'
Cognitive assessment	means a cognitive assessment that has been specifically designed to assess impairment of the cognitive functions needed for driving. A cognitive assessment may be conducted in-office or through a cognitive road test.
Cognitive road test	means a road test that has been specifically designed to assess impairment of the cognitive functions needed for driving.
Cognitive screen	means a cognitive screen that has been specifically designed to screen for impairment of the cognitive functions needed for driving. A cognitive screen is the first step in determining cognitive fitness to drive. Depending on the results of a cognitive screen, a cognitive assessment may be required.
Commercial driver	means a driver with a commercial class licence (Class 1-4) as determined by the licensing authority, or a driver deemed to be a commercial driver as determined by the licensing authority.
Condition	means a term of licensing that is imposed on an individual or an individual's licence by the authority. The terms 'condition' and 'restriction' are used interchangeably in many Canadian jurisdictions. For the purposes of these guidelines, 'condition' includes the concept of 'restriction'. All authorities use conditions on a driver licence as part of their driver fitness program. These are generally enforceable at roadside: example: 'wear corrective lenses' Some authorities also place conditions on the individual driver. These are not enforceable at roadside:

example: ‘you must not drive if your dialysis treatment is delayed or circumstances do not allow you to maintain your dialysis schedule’

Credible report means a report that provides objective information about a driver’s driving ability, e.g. information about observed driving infractions (running stop sign) or poor driving (failure to notice pedestrians; not staying in lane). A credible report may also be a report of damage to a driver’s car that a driver cannot explain. Credible reports may come from any source including health care professionals, the police, front-line licensing staff, family members or other concerned members of the public.

Driver means any person with any class of valid, suspended or cancelled driver licence and a person applying for any class of driver’s licence

Driver fitness authority means the body within each province or territory that makes driver fitness determinations. This may be abbreviated in the standards as the ‘authority’.

Driving record includes:

- the length of time an individual has been licensed
- driving offences
- driving sanctions applied
- current and past licence conditions
- motor vehicle related Canadian Criminal Code convictions
- crash history, and
- past road test results.

Functional assessment is any kind of assessment that involves direct observation or measurement of the functions necessary for driving. Functional assessments include:

- paper-pencil cognitive screen
- computer-based cognitive assessments
- cognitive road test
- standard road test
- occupational therapist assessment
- driver rehabilitation assessment
- eye tests and examinations, and
- hearing tests

Medical assessment	is any kind of assessment that provides information regarding an individual's medical condition and/or their response to, or compliance with, treatment. Medical assessments include: • driver fitness assessments completed by physicians including specialists • ultrasounds • blood tests, and • other medical tests that are not requested by authorities but are often submitted by physicians and provide useful information regarding an individual's medical condition.
Medical condition	is any injury, illness, disease or disorder that is identified in Part 2 of this document or that may impair the functions necessary for driving. Impairment resulting from medications and/or treatment regimes that have been prescribed as treatment for a medical condition are considered as medical conditions. General debility and a lack of stamina are also considered as medical conditions that may impair the functions necessary for driving.
Non-commercial driver	means a driver with a non-commercial class licence (class 5 or 6) as determined by the driver fitness or licensing authority.
Incidence of a medical condition	means the annual number of new cases of a medical condition.
Prevalence of a medical condition	means the global occurrence of a medical condition.
Reassessment	is the process of re-assessing a driver, and making a new determination of fitness, for a driver with a previously reported medical condition. Reassessment is at the discretion of, and initiated by, the driver fitness authorities at the expiration of a scheduled reassessment interval or at any time in response to a credible report indicating that a driver may not be fit to drive.
Restriction	See definition of 'Condition'
Standard road test	means a road test conducted by a government authorized driver-examiner. Standard road tests were traditionally designed for assessing driving skill, not driver fitness. They may be used, however, under certain circumstances to assess motor and sensory functional ability to drive..

Chapter 3: Key concepts

The following are explanations of the key concepts underlying these guidelines. An understanding of these concepts is necessary in order to use the guidelines effectively.

3.1 Functions needed for driving

The functions necessary for driving can be categorized as either cognitive, motor, or sensory (vision and hearing). Sensorimotor functions are a combination of sensory and motor functioning and are considered as a subset of motor functions. Sensorimotor functions are, for the most part, reflexive or automatic, e.g. the response to your hand being placed on a hot stove or the ability to sit upright.

Within each category, the functions that are most relevant to the driving task are described in the tables below. Although the functions necessary for driving are described individually, **driving is a complex perceptual-motor skill which usually takes place in a complex environment and which requires the functions to operate together.**

Cognitive functions needed for driving

Function	Description	Example in the driving context
Divided attention	the ability to attend to two or more stimuli at the same time	attending to the roadway ahead while being able to identify stimuli in the periphery
Selective attention	the ability to selectively attend to one or more important stimuli while ignoring competing distractions	isolating the traffic light from among other environmental stimuli
Sustained attention (vigilance)	the capacity to maintain an attentional activity over a period of time	attending to the roadway ahead over an extended period of time
Short-term or passive memory	the temporary storage of information, or the brief retention of information, that is currently being processed in a person's mind	remembering roadway sign information such as that related to freeway exits or construction areas; signs related to caution ahead, etc.

Cognitive functions needed for driving		
Function	**Description**	**Example in the driving context**
Working memory (the active component of short-term memory)	the ability to manipulate information with time constraints/taking in and updating information	processing environmental information related to the driving task on a busy freeway
Long term memory	memory for personal events (autobiographical memory) and general world knowledge (semantic memory)	knowing: • your way from home to the grocery store • the meaning of traffic signs, and • the rules of the road
Choice/ complex reaction time	the time taken to respond differentially to two or more stimuli or events	responding when a cat darts onto the edge of the road at the same time a pedestrian steps onto the roadway
Tracking	the ability to visually follow a stimulus that is moving or sequentially appearing in different locations	visually following other cars on the road
Visuospatial abilities	processes dependent on vision such as the recognition of objects, the ability to mentally rotate objects and determinations of relationships between stimuli based on size or color	understanding where a tree and other objects are in relation to the car
Executive functioning (see also central executive functioning below)	those capabilities that enable an individual to successfully engage in independent, purposeful, and self-serving behaviours. Disturbances in executive functioning are characterized by disturbed attention, increased distractibility, deficits in self-awareness, and preservative behaviour.	

Cognitive functions needed for driving		
Function	**Description**	**Example in the driving context**
Central executive functioning (see also executive functioning above)	that part of working memory that is responsible for 'supervising' many cognitive processes including encoding (inputting information from the external world), storing information in memory, and retrieving information from memory. Central executive (CE) functioning includes abilities such as planning and organization, reasoning and problem solving, conceptual thought, and decision making. CE functioning is critical for the successful completion of tasks that involve planning or decision making and that are complex in nature	making a left turn at an uncontrolled intersection.
Visual information processing	the processing of visual information beyond the perceptual level (e.g. recognizing and identifying objects and decision making related to those objects). Visual information processing involves higher order cognitive processing. However, because of the visual component, references to visual information processing often are included within the visual domain.	

Motor functions needed for driving (including sensorimotor)		
Function	**Description**	**Example in the driving context**
Coordination	the ability to execute smooth, accurate, controlled movements	executing a left hand turn; shifting gears, etc.
Dexterity	readiness and grace in physical activity; especially skill and ease in using the hands	inserting keys into the ignition; operating vehicle controls, etc.
Gross motor abilities	gross range of motion and strength of the upper and lower extremities, grip strength, proprioception, and fine and gross motor coordination	
Range of motion	the degree of movement a joint has when it is extended, flexed, and rotated through all of its possible movements	Range of motion of the extremities (e.g. ankle extension and flexion) is needed to reach the gas pedal and brake and upper body range of motion (e.g. shoulder and elbow flexion) is necessary for turning the steering wheel. Range of motion of the head and neck is necessary for looking at the side and rear for vehicles and for identifying obstacles at the side of the road or cars approaching from a side street.
Strength	the amount of strength a muscle can produce	lowering the brake pedal
Flexibility	the ability to move joints and muscles through their full range of motion. Muscle strength and flexibility often go hand in hand.	getting in and out of the car, operating vehicle controls, fastening the seat belt
Reaction time	the amount of time taken to respond to a stimulus	depressing the brake pedal in response to a child running out on the roadway, swerving to avoid an animal on the road

Sensory functions needed for driving – Vision		
Function	**Description**	**Example in the driving context**
Acuity	the spatial resolving ability of the visual system, e.g. the smallest size detail that a person can see	reading directional signs
Visual field	an individual's entire spatial area of vision when fixation is stable, i.e. the extent of the area that an individual can see with their eyes held in a fixated position	seeing cars approaching from the left or right
Contrast sensitivity	the ability to perceive differences between an object and its background, e.g. the ability to detect a gray object on a white background or to see a white object on a light gray background	seeing traffic lights or cars at night
Glare recovery	the process in which the eyes recover visual sensitivity following exposure to a source of glare	adapting to the reflection of the sun from a car dashboard or oncoming headlights when driving at night
Perception	the process of acquiring, interpreting, selecting, and organizing sensory information	

Sensory functions needed for driving – Hearing		
Function	**Description**	**Example in the driving context**
Hearing	Ability to hear or communicate	The ability to hear or communicate is of paramount importance for the operation of certain commercial vehicles including a passenger bus, ambulance or other emergency vehicles

3.2 Functional ability and driving outcomes

Cognitive

Individuals with progressive or irreversible declines in cognitive function cannot compensate for a cognitive impairment.

Motor

Research on motor functions and driving indicates considerable variability in the association between the different motor functions and driving outcomes. Overall, the research suggests that a significant level of impairment in motor functions is needed before driving performance is affected to an unsafe level.

Sensory – vision

Results from studies investigating the relationship between visual abilities and driving performance are, for the most part, equivocal. It may be, as suggested for motor abilities, that a significant level of visual impairment is needed before driving performance is affected.

Sensory – hearing

The effect of impaired hearing on driving is difficult to define and most hearing-impaired drivers are conscious of their impairment and compensate by being more cautious and alert and by making more use of their mirrors than drivers with normal hearing.

However, the ability to hear or communicate is of paramount importance for the operation of certain commercial vehicles including a passenger bus, ambulance or other emergency vehicles

3.3 Types of impairments

The types of impairments described below are described as if they existed in isolation from each other. In practice, however, a person may have more than one type of impairment and, under some circumstances, an impairment that was initially identified as transient, may become persistent. As well, some conditions, in particularly, mental illness, can be both persistent and episodic. That is, a driver may have a persistent mental illness but acute episodes only occur episodically. Finally,

episodic impairments, for example epilepsy, may result in sudden incapacitation when an event occurs.

Transient impairment

Transient impairments are a temporary impairment of the functional ability to drive where there is little or no likelihood of a recurring episodic, or ongoing persistent, impairment. Examples of transient impairments are:

- the after-effects of surgery, e.g. the time to recover from the anaesthetic and the surgery itself
- fractures and casts, post-orthopaedic surgery
- concussion
- conscious sedation (short-term)
- invasive medical tests
- injury
- use of orthopaedic braces (including neck), and
- infections.

Driver fitness programs do not need to know when a driver has experienced a transient impairment and do not assess drivers with transient impairments. In these cases, a doctor may rely on best practices to tell a patient, for example, "don't drive for 6 weeks after your abdominal surgery." The Canadian Medical Association (CMA) Guide for Physicians when Determining Fitness to Drive, 8th edition contains guidelines for physicians for many transient impairments associated with a range of medical conditions.

Persistent impairment

A persistent impairment is an ongoing or continuous impairment to a function necessary for driving. The potential impacts of persistent impairments on the functions necessary for driving are generally **measurable**, **testable** and **observable**. Although the condition may be progressive, the progression is usually slow and sudden deterioration is unlikely. Persistent impairments may be stable, e.g. loss of leg, or progressive, e.g. arthritis.

Episodic impairment

An episodic impairment is the result of a medical condition that does not have any ongoing measurable, testable or observable impact on the

functional ability to drive but that may result in an unpredictable sudden or episodic impairment of the functions needed for driving.

For example, the medical condition that gives rise to the impairment may be testable, e.g. the size of an abdominal aortic aneurysm, or known, e.g. epilepsy, but the precipitating event that negatively impacts the functional ability to drive, e.g. the rupture of the aneurysm or an epileptic seizure, is not predictable. The source of the potential impairment is known and the inevitability of functional impairment is known in the event that the episodic impairment occurs, but when it will occur is not known.

Sudden incapacitation

Sudden incapacitation means the sudden loss of the functions necessary for driving. It may be the result of a total or partial loss of consciousness, narcolepsy, overwhelming pain, seizures or other episodic event.

3.4 Important considerations when determining fitness

Insight

Insight means that a driver:

- is aware of their medical condition
- understands how the condition may impair their functional ability to drive, and
- has the judgment and willingness to comply with their treatment regime and any conditions of licensing.

Physicians will often use terms such as "impaired awareness," "decreased metacognition," or "lack of awareness regarding deficits" on a medical assessment to indicate that an individual lacks insight.

An individual's level of insight is a critical consideration when assessing the risk of an episodic impairment of functional ability due to a psychiatric disorder. Because of this, there is a specific guideline regarding insight in the Psychiatric Disorders standard.

Compensation

Persistent impairments

Compensation is the use of strategies or devices by a driver with a persistent impairment to compensate for the functional impairment caused by a medical condition. Treatment for a condition, e.g. medication, is not a type of compensation. Where available or known, possible

compensation strategies for each medical condition are included in the driver fitness standards in Part 2 of this document.

Whether an individual can compensate for a persistent impairment depends upon the function that is impaired. Individuals with impairments in motor function, vision or hearing may be able to compensate for those impairments. Individuals with progressive or irreversible declines in cognitive function cannot compensate for a cognitive impairment.

Episodic impairments

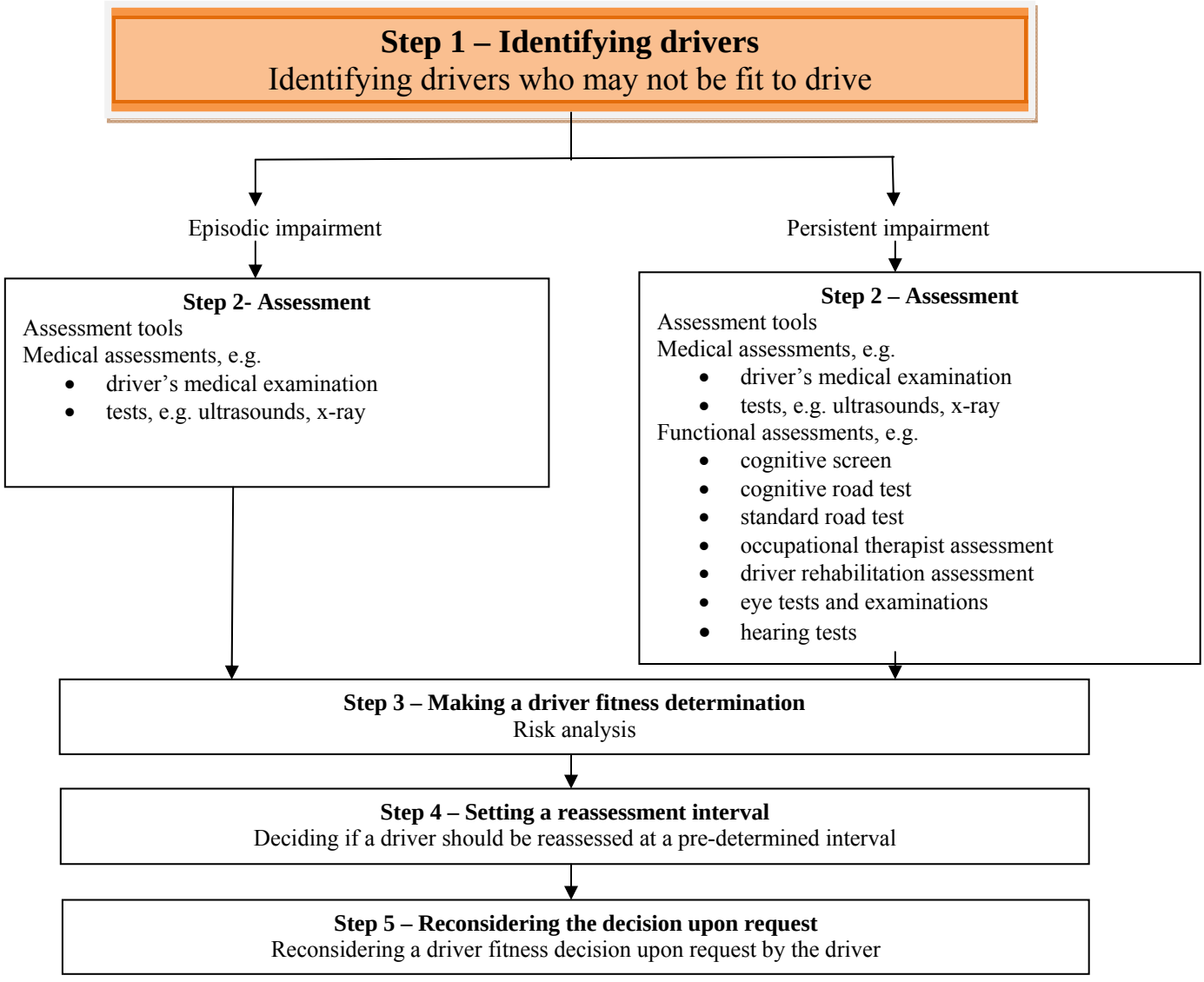
An individual cannot compensate for an episodic impairment.

Chapter 4: Identifying drivers who may not be fit to drive

4.1 Overview

Identifying drivers who may not be fit to drive, and who therefore pose a risk to public safety, is a key function of driver fitness authorities.

The driver fitness medical condition standards in *Part 2: CCMTA Medical Standards for Drivers* of this document support authorities by identifying the most common medical conditions that are of concern. This model does not include transient impairments because transient impairments are a temporary impairment of the functional ability to drive where there is little or no likelihood of a recurring episodic, or ongoing persistent, impairment.



4.2 All Drivers

Model Standard

4.2.1 Provincial and Territorial driver fitness authorities put in place mechanisms to identify individuals whose functional ability to drive may be impaired by a medical condition that may affect driving.

Rationale

All Canadian jurisdictions have the legal authority to examine a driver's fitness and ability to drive. Authorities are specifically concerned with individuals whose fitness and ability to drive may be impaired by medical conditions. This includes individuals who may be impaired by medications or treatment regimes prescribed as treatment for a medical condition, general debility or a lack of stamina.

4.3 Non-commercial Drivers (Class 5, 6, 7)

Model Standard

4.3.1 Authorities will routinely identify non-commercial drivers for a review of driver fitness, for example:

(a) at age 75

(b) at age 80

(c) every 2 years over age 80

Rationale

The functional declines associated with aging are well documented. These functional declines in healthy aging drivers are unlikely to lead to unsafe declines in driving performance, except in the case of extreme old age. However, aging is also associated with increased risk for a broad range of medical conditions, such as visual impairments, musculoskeletal disorders, cardiovascular disease, diabetes, and cognitive impairment and dementia. These medical conditions and medications used to treat them may affect fitness to drive.

Although there are many age-associated medical conditions that may affect driving, there is a particularly strong association between cognitive impairment and dementia and impaired driving performance. A large, national population-based study done in Canada in 1991 showed that 25%

of the population 65 and older have some form of cognitive impairment or dementia, rising to 70% for those 85 and older.

Because of the association between age and many chronic medical conditions, aging drivers are more likely to have one or more of these conditions. A 2003 survey found that 33% of Canadian s age 65 and older had 3 or more chronic medical conditions. The survey also found that the average number of chronic conditions increases with age.

With an increased rate of multiple medical conditions, there is also a greater likelihood that aging drivers will be taking multiple medications. With each additional medication taken, there is an increased risk of side effects and adverse interactions between medications, which may affect fitness to drive. While in many cases the adverse effects may be temporary or avoidable, where specific medications or dosages are required there may be a persistent impairment of the functions needed for driving.

As a group, older drivers are less likely to be involved in a crash than other age groups. However, the reason for this is that older drivers spend less time driving than others. When driving exposure is considered, older drivers show an increased crash risk, an increased risk for at-fault crash, and an increased risk of being injured and dying in a crash.

Statistics from British Columbia show that at about age 70, the ratio of at-fault crashes begins to rise, climbing to 2.5 for drivers who are 81 and older.

An examination of driver fatality rates, adjusted for driving exposure, indicates that there are two high risk age groups: ages 16 to 19 and 65 and older. Older drivers are also more likely to be injured in a crash and to incur more severe injuries than younger drivers.

Unlike younger driver crashes, most traffic fatalities involving older drivers occur during the day time, on week-days, and in safe road conditions, with the majority of the crashes involving another vehicle.

4.4 Commercial Drivers

Model Standard

4.4.1 Authorities are mandated under CCMTA's National Safety Code to evaluate commercial drivers for driver fitness at the time of licence application and then at periodic intervals, for example:

(a) up to age 45, every 5 years thereafter

(b) from age 45 to age 65, every 3 years thereafter, and

(c) from age 65, annually.

Rationale

The rationale under 'non-commercial drivers', in Section 4.3.1 also applies to commercial drivers. In addition, commercial drivers drive a variety of vehicles including large trucks, passenger carrying vehicles such as buses and emergency vehicles. Commercial drivers also spend many more hours at the wheel, often under far more adverse driving conditions, than do the drivers of non-commercial vehicles. They are usually unable to select their hours of work and cannot readily abandon their passengers or cargo should they become unwell when on duty. Drivers operating emergency vehicles are frequently required to drive while under considerable stress by the nature of their work, and often in inclement weather where driving conditions are less than ideal. Should a crash occur, the consequences are much more likely to be serious, particularly where the driver is carrying passengers or dangerous cargo such as propane, chlorine gas, toxic chemicals or radioactive substances.

Because of this greater exposure, commercial drivers are routinely screened at regular intervals, even if there is no evidence that the driver has a known or possible medical condition.

4.5 Cancelling or restricting a licence because of an immediate public safety risk

Model Standard

4.5.1 If information obtained at any time reveals an immediate risk to public safety, authorities may direct that a licence be cancelled or restricted without further assessment.

4.5.2 If an authority has cancelled or restricted a licence because of an immediate public safety risk, the program may review the decision once further information is received.

Rationale

In most cases, authorities will not direct that a licence be restricted or cancelled based only on preliminary information received. However, there are times when cancellation or restriction may be warranted prior to further assessment. For example, a credible report may indicate that an individual's functional ability to drive is severely impaired. The authority would cancel the driver's licence for public safety reasons and could review the decision once further information was received.

Chapter 5: Assessing fitness to drive

5.1 Overview

Assessing fitness to drive means using any kind of test or examination to gather information about a driver's functional ability to drive. Driver fitness authorities have a variety of tools at their disposal to assess the impact of medical conditions on the functions necessary for driving. These can be categorized as either medical or functional assessments. The appropriate type of assessment depends both upon the function that is impaired and the nature of the impairment.

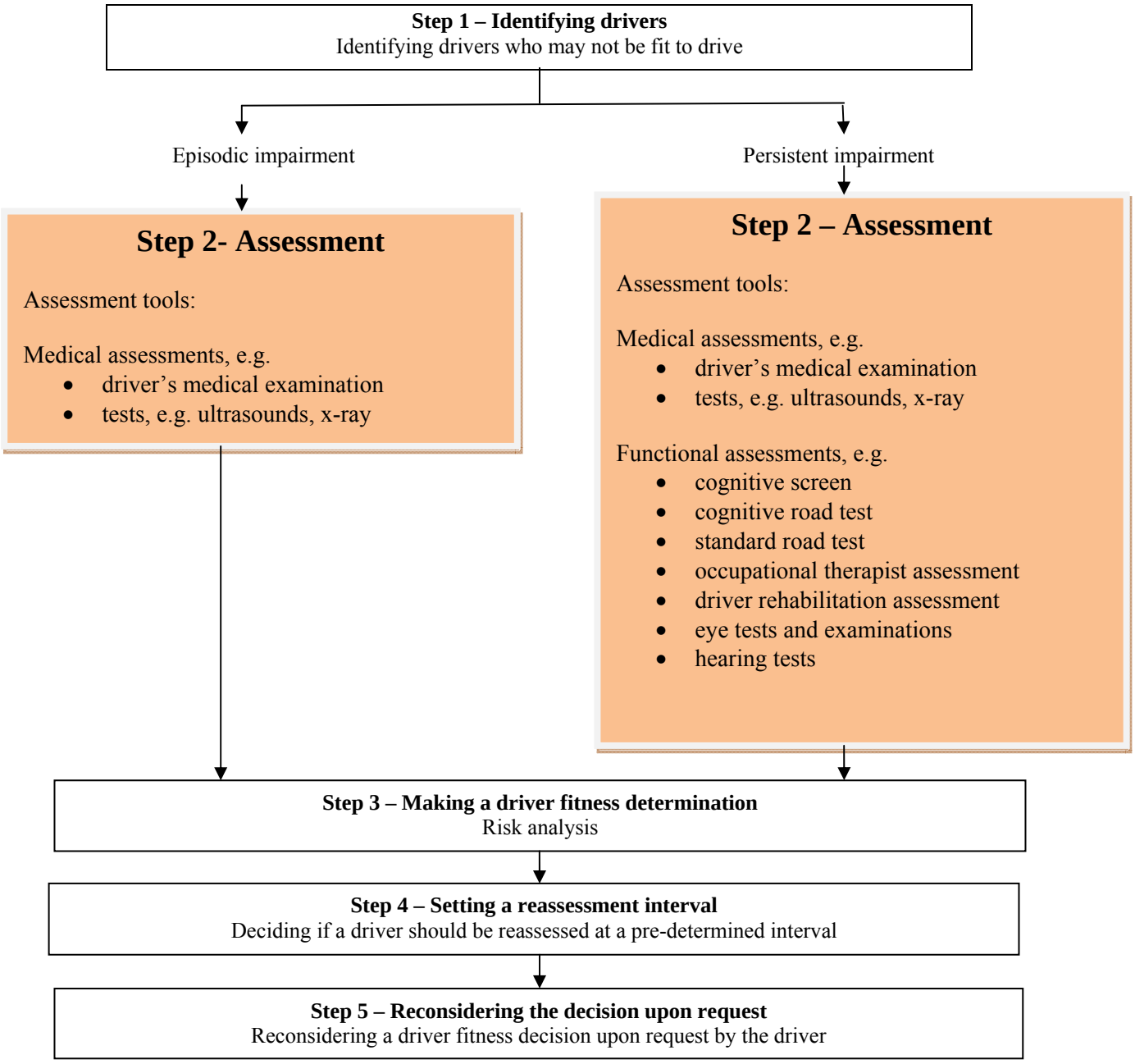
A functional assessment is any kind of assessment that involves direct observation or measurement of the functions necessary for driving. Functional assessments include:

- paper-pencil cognitive screen
- computer-based cognitive assessments
- cognitive road test
- standard road test
- occupational therapist assessment
- driver rehabilitation assessment
- eye tests and examinations, and
- hearing tests.

A medical assessment is any kind of assessment that provides information regarding an individual's medical condition and/or their response to, or compliance with, treatment. Medical assessments include:

- driver fitness reports completed by physicians including specialists
- ultrasounds
- blood tests, and
- other medical tests that are not requested by driver fitness authorities but are often submitted by physicians and provide useful information regarding an individual's medical condition.

During assessment, driver fitness authorities collect the information required to make a driver fitness determination.


Step 1 – Identifying drivers
Identifying drivers who may not be fit to drive
Episodic impairment
Persistent impairment
Step 2- Assessment
Assessment tools:
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Step 2 – Assessment
Assessment tools:
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Functional assessments, e.g.
cognitive screen
cognitive road test
standard road test
occupational therapist assessment
driver rehabilitation assessment
eye tests and examinations
hearing tests
Step 3 – Making a driver fitness determination
Risk analysis
Step 4 – Setting a reassessment interval
Deciding if a driver should be reassessed at a pre-determined interval
Step 5 – Reconsidering the decision upon request
Reconsidering a driver fitness decision upon request by the driver

5.2 Requesting functional assessments

Model

5.2.1 If an authority decides further information on a driver's functional ability to drive is necessary in order to make a driver fitness determination, the authority will request a functional assessment.

5.2.2 An authority may request a functional assessment of an individual with a persistent impairment; it will not request a functional assessment of a driver who has only episodic impairments.

Rationale

Consistent with the functional approach to driving fitness, a driver fitness program requests an assessment of an individual's functional ability to drive whenever that information is necessary in order to make a driving fitness determination.

Persistent and episodic impairments

Whether or not a functional assessment is appropriate depends upon the type of impairment. Because persistent impairments are measurable, testable and observable, it is possible to assess an individual's functional ability to drive through observation by a physician or other health care practitioner or an OT or driver rehabilitation specialist. Because episodic impairments are not measurable or testable, there is no way to functionally assess how the impairment impacts an individual's ability to drive.

5.3 Requesting medical assessments

Model

5.3.1 If an authority decides that further information on a driver's medical condition(s) or the driver's response to, or compliance with, treatment is required, the authority will request a medical assessment.

Rationale

To ensure that the driver fitness authority bases its driver fitness determinations on complete and accurate medical information, they request additional medical assessments whenever further information

regarding an individual's medical condition, or the individual's response to, or compliance with, treatment is required.

5.4 Assessing the cognitive functions needed for driving

Model

5.4.1 Generally, further information on an individual's cognitive function will be required when a credible report indicates that:

(a) there may be some loss of cognitive function

(b) there is some loss of cognitive function and it is unknown whether the individual possesses sufficient cognitive function to drive, or

(c) the driver has a medical condition at a stage usually associated with a loss of cognitive function.

5.4.2 Authorities will rely on the results of cognitive screens or cognitive assessments that have been specifically designed to screen for, or assess, impairment of the cognitive functions needed for driving**.**

5.4.3 When the result of a cognitive screen is indeterminate, authorities will request a cognitive assessment of a driver.

5.4.4 Authorities will use the best available road test to assess possible cognitive impairment of the functions needed for driving.

5.4.5 Notwithstanding standards 5.4.2 to 5.4.4, if a cognitive screen, or cognitive road test is not accessible, an authority may request an occupational therapist or driver rehabilitation specialist assessment, or a gerontologist assessment, of a driver with a persistent cognitive impairment who may not be cognitively fit to drive.

Rationale

Cognitive screens

Historically, there has been a lack of reliable screening tools for the identification of individuals whose cognitive impairment or dementia

poses a risk for adverse driving outcomes. Scores on mental status tests such as the Mini Mental Status Exam (MMSE) often are used for making decisions about driving competency. However, there is now a significant amount of evidence indicating that, while the MMSE and similar tests are useful as tools for identifying cognitive decline, they are not good predictors of an individual's driving competence, particularly for those whose cognitive impairment is less severe. In addition, the scores of these tools are very sensitive to language ability and education. The *Determining Medical Fitness to Operate Motor Vehicles, CMA Driver's Guide*, 8th edition states that the MMSE does not have sufficient sensitivity or specificity to be used as a single determinant of driving ability. However, abnormalities on tests including the MMSE, clock drawing and Trails B should trigger further in-depth testing of driving ability.[3]

Standard neuropsychological or cognitive tests such as Trails A, Trails B, Digit Span, or the MOCA (Montreal Cognitive Assessment), designed to assess cognitive functions (e.g. attention, memory, executive functioning) also are used for decision making about driving competency. However, although these standardized tests sometimes correlate with measures of driving performance (e.g. on-road performance, crash rates), the absence of a strong and consistent relationship, as well as the lack of established cutpoints for categorizing drivers as 'safe' and 'unsafe', preclude using these tests for determination of driving competency at this time.

Recent research has focused on the development of a battery of tests using complex cognitive tasks (tasks that require the use of multiple cognitive functions simultaneously), hypothesizing that this type of testing would be a better predictor of driving performance. This research has led to the development of new screening tools that may be considered for use by driver licensing authorities.

Standard road tests

Standard road tests are conducted by provincial and territorial driver examiners who assess whether an individual has mastered the skills needed for driving. Standard road tests are not traditionally designed to measure whether or not there is an impairment of the cognitive functions needed for driving.

[3] P. 29

5.5 Assessing motor function

Model

5.5.1 Generally, further information on a driver's motor function will be required when a credible report indicates that there is some loss of motor function and:

(a) it is unknown whether the individual possesses sufficient movement and strength to perform the motor functions necessary for driving the types of motor vehicles permitted under the class of licence held or applied for

(b) it is unknown whether pain associated with a medical condition, or the medications used to treat a medical condition, adversely affect the individual's motor function, and/or

(c) it is unknown whether the individual can safely operate the type of motor vehicles permitted under the class of licence held or applied for using the vehicle modifications and devices that may be required to compensate for their functional impairment.

5.5.2 Authorities may request a standard road test where the authority needs to confirm that the individual is able to use adaptive driving equipment or vehicle modifications.

5.5.3 Authorities will request an occupational therapist or driver rehabilitation specialist assessment if further information is required on an individual's motor function and a standard road test will not be able to provide the required information.

Rationale

Research on motor functions and driving indicates considerable variability in the association between the different motor functions and driving outcomes. Overall, the research suggests that a significant level of impairment in motor functions is needed before driving performance is affected to an unsafe level.

Occupational therapist or driver rehabilitation specialist assessments

Occupational therapists and other specialists with expertise in driver rehabilitation are trained to perform both in-office and on-road assessments of an individual's functional ability to drive. In particular, driver rehabilitation specialists are trained to evaluate an individual's ability to compensate for motor deficits during simulated and on-road testing and determine requirements for adaptive driving equipment and vehicle modifications.

Standard road tests

Standard road tests are conducted by provincial and territorial driver examiners who assess whether an individual is able to use driving skills. Road test examinations are not specifically designed to measure whether or not there is an impairment of the motor functions needed for driving. Because of this, the use of standard road tests to evaluate driver fitness should be limited to instances where the driver examiner can easily and safely determine whether or not the motor impairment prevents safe use of the vehicle, e.g. use of hand controls or a prosthetic device.

5.6 Assessing sensory function – vision

Model

5.6.1 Generally, further information on a driver's visual function is be required when a credible report indicates that there is some loss of visual function and:

(a) it is unknown whether the individual possesses sufficient vision necessary for driving the types of motor vehicles permitted under the class of licence held or applied for

(b) it is unknown whether pain associated with the condition, or the medications used to treat the condition, adversely affect the individual's visual function, and/or

(c) it is unknown whether the individual can safely operate the type of motor vehicles permitted under the class of licence held or applied for using the vehicle modifications and devices that may be required to compensate for their functional impairment.

5.6.2 Authorities will request an occupational therapist or driver rehabilitation specialist assessment – which will generally include an on-road assessment - if further information is required on whether a driver's vision is such that they are fit to drive.

Rationale

Although there are tools that measure, for example, visual acuity and visual field, the vision standards for driving are based on consensus opinion of subject matter experts. This is because there is no research that has identified what level of vision impairment makes a person unable to drive safely.

The loss of certain visual functions can be compensated for adequately, particularly in the case of long-standing or congenital impairments. When a person becomes visually impaired, the capacity to drive safely varies with their ability to compensate. As a result, there are people with visual deficits who do not meet the vision standards for driving but who are able to drive safely. Because of this, further assessment may be required for drivers who do not meet the stated vision standards.

5.7 Assessing sensory function – hearing

Model

5.7.1 Generally, further information on a driver's hearing function can be obtained when a report indicates that there is some loss of function.

Rationale

There are a number of tools that measure hearing performance, for example audiometric tests and the whisper test. However, the function relating to the driving test has not been determined as there is little research that has identified what level of hearing impairment makes a person unable to drive safely.

The focus of hearing tests relate to the ability to hear or communicate is of paramount importance for the operation of certain commercial vehicles including a passenger bus, ambulance or other emergency vehicles.

5.8 Assessing drivers with multiple functional impairments

Standard

5.8.1 If an authority decides that more than one of the functions necessary for driving needs to be assessed, the authority will request functional assessments in the following order:

(a) assessments of cognitive function

(b) assessments of sensory function, and

(c) assessments of motor function.

5.8.2 If the results of an assessment indicate that an individual's cognitive, motor or sensory function is impaired to the extent that the individual is not fit to drive, the authority may make a driver fitness determination without requesting further assessments of the other functions necessary for driving.

Rationale

Some drivers may have impairments to more than one of the functions necessary for driving. In this situation, an authority prioritizes requests for functional assessments based on the functions that may be impaired. Because there are assessment tools available to specifically measure cognitive impairment as it relates to driving – and a driver cannot compensate for cognitive impairment - if an individual's cognitive function may be impaired that function will be assessed first. Sensory functions are assessed next, followed by motor functions. If an assessment indicates that a function is impaired and a driver is not fit to drive there is no need to continue with further assessments of the other functions that may be impaired.

5.9 Assessing drivers with multiple medical conditions

Model

5.9.1 If a driver has multiple medical conditions that result in a cumulative or combined effect on the functions necessary for driving such that the medical conditions cannot be considered individually or independently, the authority will request

functional assessments (where applicable) of each function that may be impaired, even if the medical condition standards for each identified medical condition indicate that the individual is fit to drive.

5.9.2 Authorities should request functional assessments of individuals with multiple medical conditions that cannot be considered independently, unless the driver fitness standards for any of the identified medical conditions clearly indicate that the individual is not eligible for a licence.

Rationale

The impact of multiple medical conditions on functional ability to drive is very important when making determinations about fitness to drive. Research results indicate that drivers with multiple medical conditions are, in general, at higher risk for crashes and at-fault crashes than those with a single medical condition.

The driver fitness standards in Part 2 each focus on a single medical condition, e.g. cardiovascular disease, and the standards are written as if an individual only had one medical condition. This is because the number of combinations of illnesses and medications is simply too large to make reliable and valid driving standards that could support making decisions about driving fitness for specific individuals.

This means that the driver fitness standards cannot always be relied upon in order to make a driver fitness determination for a driver with more than one medical condition. While the standards for each individual medical condition may indicate that the individual is eligible for a licence, if the medical conditions have a cumulative effect on the functional ability to drive, the individual may, in fact, not be eligible.

5.10 Time period during which assessments are valid

Model

5.10.1 Generally, an authority will accept the results of any assessment conducted within the previous one-year period, even if completed for another purpose, as long as it provides the required information.

Rationale

Assessments may be costly and time-consuming for drivers, authorities and health care providers. If an assessment has already been conducted that provides the information required for a driver fitness determination, there is no need for an individual to be re-assessed, so long as the results of the assessment are still reliable. Because many conditions are progressive, and an individual's abilities may change over time, assessment results generally only continue to be reliable for a limited period of time after completion of the assessment.

5.11 Time limits for drivers to complete assessments

Model

5.11.1 Whenever a driver fitness program requests an assessment, it will inform the individual of the time period within which the assessment must be completed.

5.11.2 Upon request, a driver fitness authority may extend the time period for an individual to comply with a request for an assessment. In considering whether to extend the time period, the authority will consider information from the driver regarding the circumstances that necessitate an extension, such as

(a) work commitments

(b) the driver's location,

(c) the driver's degree of mobility, and/or

(d) availability of assessors.

5.11.3 If a driver does not comply with a request for an assessment within the time period or extension:

(a) the authority will direct that the driver's licence be cancelled, in the case of a driver who is already licensed, or

(b) will direct that a licence not be granted, in the case of an individual who has applied for a licence.

Rationale

Both for public safety and administrative fairness reasons, driver fitness determinations must be made as soon as possible after an individual is identified. A driver's licence is a privilege. Where further information is

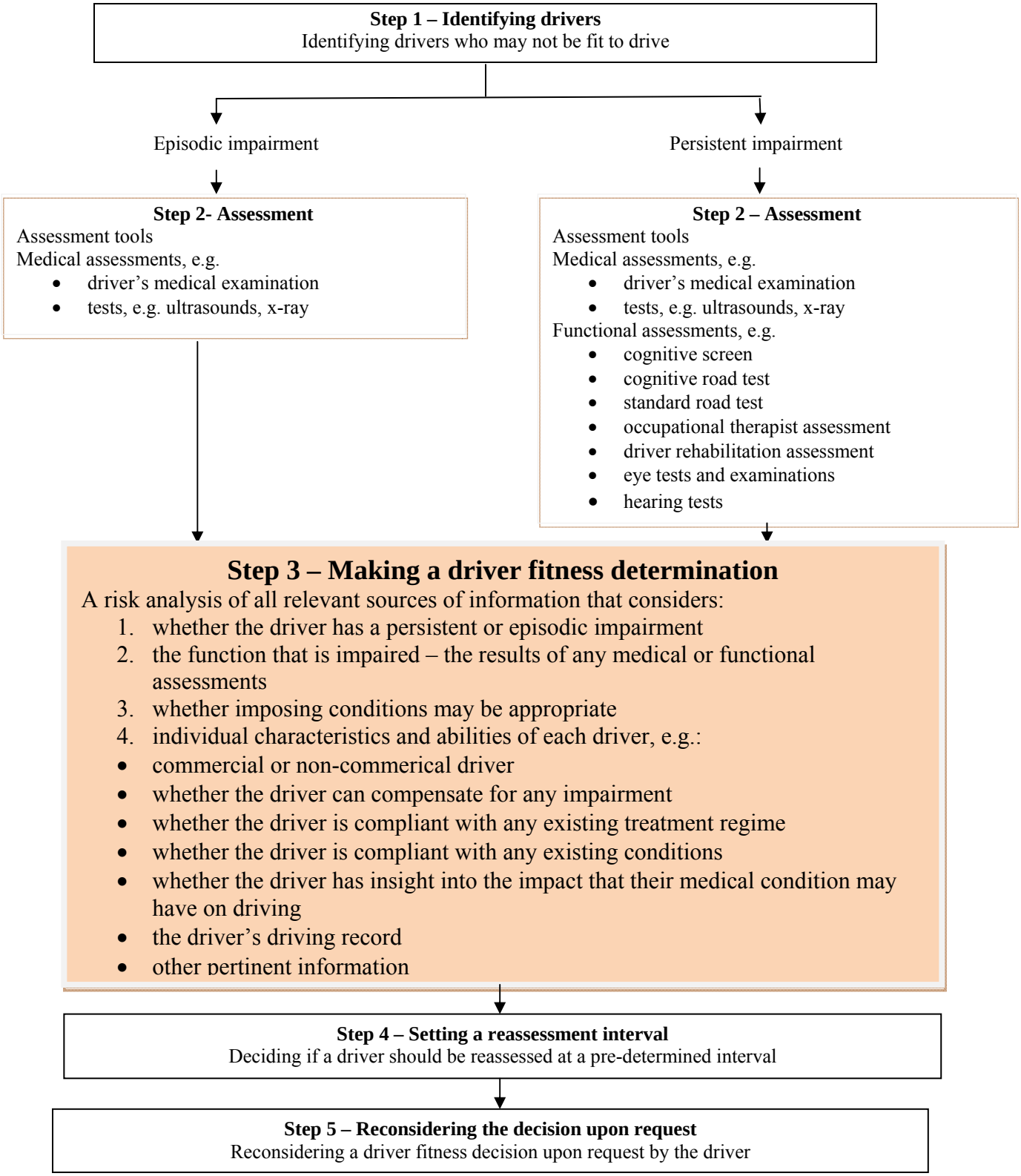
required to make a determination, this means individuals must comply with requests for assessments in a timely fashion. If an individual does not comply with a request for an assessment, jurisdictions have the authority to direct the licence be suspended or cancelled.

Chapter 6: Making a driver fitness determination

6.1 Overview

When making a driver fitness determination, a driver fitness authority will review all of the information gathered during assessment, will consider the degree of risk presented by a driver and will determine whether that individual should be licensed. In some cases, an individual can only be licensed if they follow certain conditions that will reduce the level or risk of impairment. Driver fitness authorities have the ability to place conditions on either an individual or an individual's licence if they are necessary to ensure the safe operation of a motor vehicle

The standards outlined in Part 2 are based on the best available evidence regarding degree of risk and identify where the use of conditions may be appropriate to reduce risk; they guide decision-makers in determining the degree of risk presented by individual drivers.


Step 1 – Identifying drivers
Identifying drivers who may not be fit to drive
Episodic impairment
Persistent impairment
Step 2- Assessment
Assessment tools
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Step 2 – Assessment
Assessment tools
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Functional assessments, e.g.
cognitive screen
cognitive road test
standard road test
occupational therapist assessment
driver rehabilitation assessment
eye tests and examinations
hearing tests
Step 3 – Making a driver fitness determination
A risk analysis of all relevant sources of information that considers:
1. whether the driver has a persistent or episodic impairment
2. the function that is impaired – the results of any medical or functional assessments
3. whether imposing conditions may be appropriate
4. individual characteristics and abilities of each driver, e.g.:
commercial or non-commerical driver
whether the driver can compensate for any impairment
whether the driver is compliant with any existing treatment regime
whether the driver is compliant with any existing conditions
whether the driver has insight into the impact that their medical condition may have on driving
the driver's driving record
other pertinent information
Step 4 – Setting a reassessment interval
Deciding if a driver should be reassessed at a pre-determined interval
Step 5 – Reconsidering the decision upon request
Reconsidering a driver fitness decision upon request by the driver

6.2 Sources of information for making a driver fitness determination

Model

6.2.1 Driver fitness authorities will make driver fitness determinations based on the medical condition standards and using a risk assessment analysis that considers:

(a) whether the individual has a persistent or episodic impairment

(b) the function that is impaired – the results of any medical or functional assessments

(c) whether imposing conditions may be appropriate, and

(d) the individual characteristics and abilities of each driver, for example:

- whether the driver is a commercial or non-commercial driver
- whether the driver can compensate for any impairment
- whether the driver has insight into their medical condition and how it may affect their functional ability to drive
- whether the driver is compliant with any prescribed treatment regime
- whether the driver is compliant with any existing conditions,
- the driver's driving record, and
- any other information relevant to driving privileges.

Rationale

Each driver is unique, and drivers may have multiple medical conditions or medical conditions which are not addressed in the driver fitness standards, authorities also review and consider other available and relevant information when making driver fitness determinations.

6.3 Considering persistent impairments

Model

6.3.1 An authority will make a driver fitness determination for an individual with a persistent impairment based on observable and measurable evidence of functional impairment.

6.3.2 In general, if a review of the information collected during assessment for an individual with a persistent impairment indicates no functional impairment, or a level of functional impairment that does not impact the individual's ability to drive safely, the individual may be licensed.

Rationale

Because drivers with persistent impairments are continuously impaired, authorities can make determinations for drivers with persistent impairments based on observable and measurable evidence of functional impairment.

6.4 Considering episodic impairments

Model

6.4.1 A driver fitness authority will make a driver fitness determination for an individual with an episodic impairment based on the probability and consequences of an event of functional impairment occurring.

Rationale

Because drivers with episodic impairments are not continuously impaired, authorities cannot make determinations for individuals with episodic impairments based on observable and measurable evidence of functional impairment. Instead, they must rely on a risk analysis that takes into account the probability and consequence of impairment when making a driver fitness determination for an individual with an episodic impairment. To assist authorities in performing this analysis, the driver fitness standards for medical conditions that result in episodic impairments incorporate expert opinion regarding at what level of disease severity the medical condition may result in a functional impairment.

6.5 Considering cognitive impairment

Model

6.5.1 If a driver's cognitive assessment is within the range established for 'fit to drive', then the driver is cognitively fit to drive. This assessment may identify some cognitive function decline and necessitate more frequent cognitive assessment intervals to be determined by the driver fitness administrator.

6.5.2 If a driver's cognitive assessment is within the range established as 'not fit to drive', then the driver fitness administrator must consider all factors to determine if the driver is cognitively fit to drive.

6.5.3 If an individual fails a cognitive assessment, the individual's cognitive function may not be sufficient to drive safely and the individual may not eligible for a licence.

Rationale

See Part 2, Chapter 5, 'Assessing the cognitive functions needed for driving'

6.6 Considering motor impairment

Model

6.6.1 When making a driver fitness determination for a driver whose motor function may be impaired an authority will review and consider the information listed in standard 6.2.1.

6.6.2 Generally, the results of an on-road assessment will be determinative when making a driver fitness determination.

Rationale

Unlike cognitive impairment, there are no assessment tools available that are specifically designed to assess the motor functions needed for driving. This means that authorities must review information from all relevant sources of information and exercise discretion and judgment when determining driver fitness for individuals with motor impairments.

6.7 Considering sensory impairment – vision

Model

6.7.1 When making a driver fitness determination for a driver whose vision may be impaired, an authority will follow the vision standards in Chapter 22 of Part 2 and the information listed in standard 6.2.1.

6.7.2 Generally, the results of an on-road assessment will be determinative when making a driver fitness determination.

Rationale

Results from studies investigating the relationship between visual abilities and driving performance are, for the most part, equivocal. It may be, as suggested for motor abilities, that a significant level of visual impairment is needed before driving performance is affected.

There are many different kinds of visual impairment, for example, individuals with impaired visual acuity may lack the ability to perceive necessary details while driving while visual field impairments may interfere with driving by limiting the area that an individual can see. And, drivers with reduced contrast sensitivity may have difficulty seeing traffic lights or cars at night. Limitations in research and testing preclude standards for impairments in contrast sensitivity, dark adaptation, or glare recovery, although some individuals with these impairments may not be fit to drive.

The loss of certain visual functions can be compensated for adequately, particularly in the case of long-standing or congenital impairments. When a person becomes visually impaired, the capacity to drive safely varies with their ability to compensate. As a result, there are people with visual deficits who do not meet the vision standards for driving but who are able to drive safely.

Although there are tools that measure, for example, visual acuity and visual field, the vision standards for driving are based on consensus opinion of subject matter experts. This is because there is no research that has identified what level of vision impairment makes a person unable to drive safely.

6.8 Considering sensory impairment – hearing

Model

6.8.1 When making a driver fitness determination for a driver whose hearing may be impaired, an authority will follow the hearing standards in Chapter 9 of Part 2 and the information listed in standard 6.2.1.

Rationale

The ability to hear or communicate is of paramount importance for the operation of certain commercial vehicles including a passenger bus, ambulance or other emergency vehicles

6.9 Considering imposing conditions

Model

6.9.1 If a driver fitness authority determines that an individual must:

(a) stop driving in specific circumstances
(b) take prescribed medications
(c) comply with a specific treatment regime
(d) report a change in their medical condition
(e) attend medical follow-up
(f) only operate vehicles during daylight hours
(g) only operate certain types of vehicles
(h) only operate vehicles in certain geographic areas
(i) only operate vehicles under a certain speed
(j) only carry certain types of cargo
(k) wear specific devices, and/or
(l) use specific vehicle modifications or adaptations

in order to be licensed, the authority will impose those conditions on the individual or the individual's licence.

6.9.2 Without information to the contrary, authorities will assume that a driver will comply with a condition. However, if the information obtained from assessments indicates that the driver is

not likely to be compliant with any conditions that are required in order to be licensed, the authority may not licence the individual.

Rationale

Generally, authorities will refer to the driver fitness standards to determine the conditions that are required. However, because the driver fitness standards may not always apply in individual circumstances, authorities may impose conditions that are not contemplated by the standards. If the risk associated with a medical condition at a certain severity level is high, and the risk cannot be reduced through the use of conditions, the standards indicate that an individual is not eligible for licensing.

6.10 Considering specific requirements for commercial drivers

Model

6.10.1 When determining whether an individual can be licensed as a commercial driver, a driver fitness authority will consider:

(a) the number of hours an individual with that type of licence typically spends driving

(b) any physical requirements (e.g. load securement) associated with the operation of motor vehicles allowed under that type of licence, and

(c) any information provided by the driver or the driver's employer regarding:

- the types of vehicles they will be operating, and
- how many passengers they will carry and for what purpose.

6.10.2 If a driver is not fit to be licensed as a commercial driver, the authority will consider whether the driver is fit as a non-commercial driver.

Rationale

The class of licence held or applied for is a key consideration when making a driver fitness determination. Commercial drivers who operate passenger carrying vehicles, trucks and emergency vehicles spend many more hours at the wheel than non-commercial drivers. Commercial drivers may also be called upon to undertake heavy physical work such as

loading or unloading their vehicles, realigning shifted loads and putting on and removing chains. Because the physical and endurance requirements for commercial drivers are generally more onerous than for non-commercial drivers, the driver fitness standards often specify different standards for commercial and non-commercial drivers.

6.11 Considering whether the driver can compensate

Model

6.11.1 Driver fitness authorities will consider whether a driver can compensate for their functional impairment when making a driver fitness determination.

6.11.2 A driver cannot compensate for an episodic impairment.

6.11.3 Whether an individual can compensate for a persistent impairment depends upon the functional ability that is impaired. Individuals with impairments in motor function, vision or hearing may be able to compensate for those impairments. Individuals with progressive or irreversible declines in cognitive function cannot compensate for a cognitive impairment.

6.11.4 In general, an individual who can compensate for their functional impairment is fit to drive if their cognitive, sensory and motor functions are acceptable.

Rationale

In some situations, drivers who would otherwise not be fit to drive have learned strategies, or utilize devices, that reduce or eliminate their functional impairment. For example:

- a driver with limited peripheral vision may use the strategy of turning their neck to the left and right to ensure they have a full field of view, or
- a driver who is unable to use their lower limbs may have their vehicle modified for hand controls.

In keeping with the decision in *Grismer*, and CCMTA principles, driver fitness authorities will make driver fitness determinations on an individual basis, based on the results of individual assessments. In general, if a

review of assessment results and the individual's driving record indicates that a driver is able to compensate for their functional impairment, the driver is fit to drive.

6.12 Considering insight

Model

6.12.1 If a driver fitness authority decides that conditions are required in order for an individual to be fit to drive, it will review:

(a) medical assessments on file for information that indicates that the driver has, or does not have, insight into their medical condition or its impact on the functions necessary for driving

(b) medical assessments on file for information that indicates that the driver is non-compliant with their prescribed treatment regime or medications

(c) the driver's driving record for any information that indicates the individual has been non-compliant with conditions in the past, and

(d) any credible reports for information that indicates that the driver has been non-compliant with conditions in the past.

6.12.2 Without information to the contrary, an authority will assume that an individual has insight into their medical condition and its impact on their driving. However, if the information obtained indicates that the driver lacks insight, the individual may not be fit to drive.

Rationale

One key factor for determining whether a driver is fit to drive is the driver's level of insight. This is because drivers with good insight are more likely to be diligent about their treatment regime, to seek medical attention when needed, and to avoid driving when their condition is likely to impair their functional ability to drive.

An individual's level of insight is a critical consideration when assessing the risk of an episodic impairment of functional ability due to a psychiatric disorder. Because of this, there is a specific guideline regarding insight in the Psychiatric Disorders chapter.

6.13 Considering compliance with existing treatment regime

Model

6.13.1 If a driver is currently being treated for a medical condition, the authority will review any medical assessments or other information that indicates that the driver is non-compliant with their prescribed treatment regime or medications. If the information obtained indicates that the driver is not compliant with any existing treatment regime that is required in order to be fit to drive, the driver is not fit to drive.

6.13.2 Without information to the contrary, a driver fitness authority will assume that a driver is in compliance with their existing treatment regime.

Rationale

Individuals who are diligent about their treatment regime are more likely to have good insight into their medical condition, to seek medical attention when needed, and to avoid driving when their condition is likely to impair their functional ability to drive.

6.14 Considering compliance with existing conditions of licence

Model

6.14.1 If a driver currently has licence conditions, the authority will review any information that indicates that the driver is non-compliant with the conditions. If the information obtained indicates that the driver is not compliant with any condition that is required in order to be fit to drive, the driver is not fit to drive.

6.14.2 Without information to the contrary, a driver fitness authority will assume that a driver is in compliance with their existing licence conditions.

Rationale

A key consideration when determining whether or not a driver is fit to drive is whether an individual is in compliance with current licence conditions. Because conditions are only imposed if required for driver fitness, if a driver is not in compliance with existing conditions they should not be licensed.

6.15 Considering the driving record

Model

6.15.1 Where driving records are available, authorities will review a driver's driving record for any information that indicates whether the identified medical conditions impair the functions necessary for driving. In particular, authorities will review:

(a) whether there has been a deterioration, improvement or no change in driving safety (i.e. crashes, penalty points and infractions) that can be linked to:

- the date of onset
- the date of diagnosis, and/or
- the date the driver began a new treatment regime, prescribed medication or compensation strategy, and

(b) any evidence on file (e.g. police reports) that indicates that incidents were related to the individual's medical conditions.

Rationale

An individual's driving record may indicate that a medical condition is affecting their functional ability to drive. A lengthy, clean driving record for a driver with a long-standing medical condition may be evidence of:

- a low level of impairment
- an ability to compensate, or
- a condition that is well controlled.

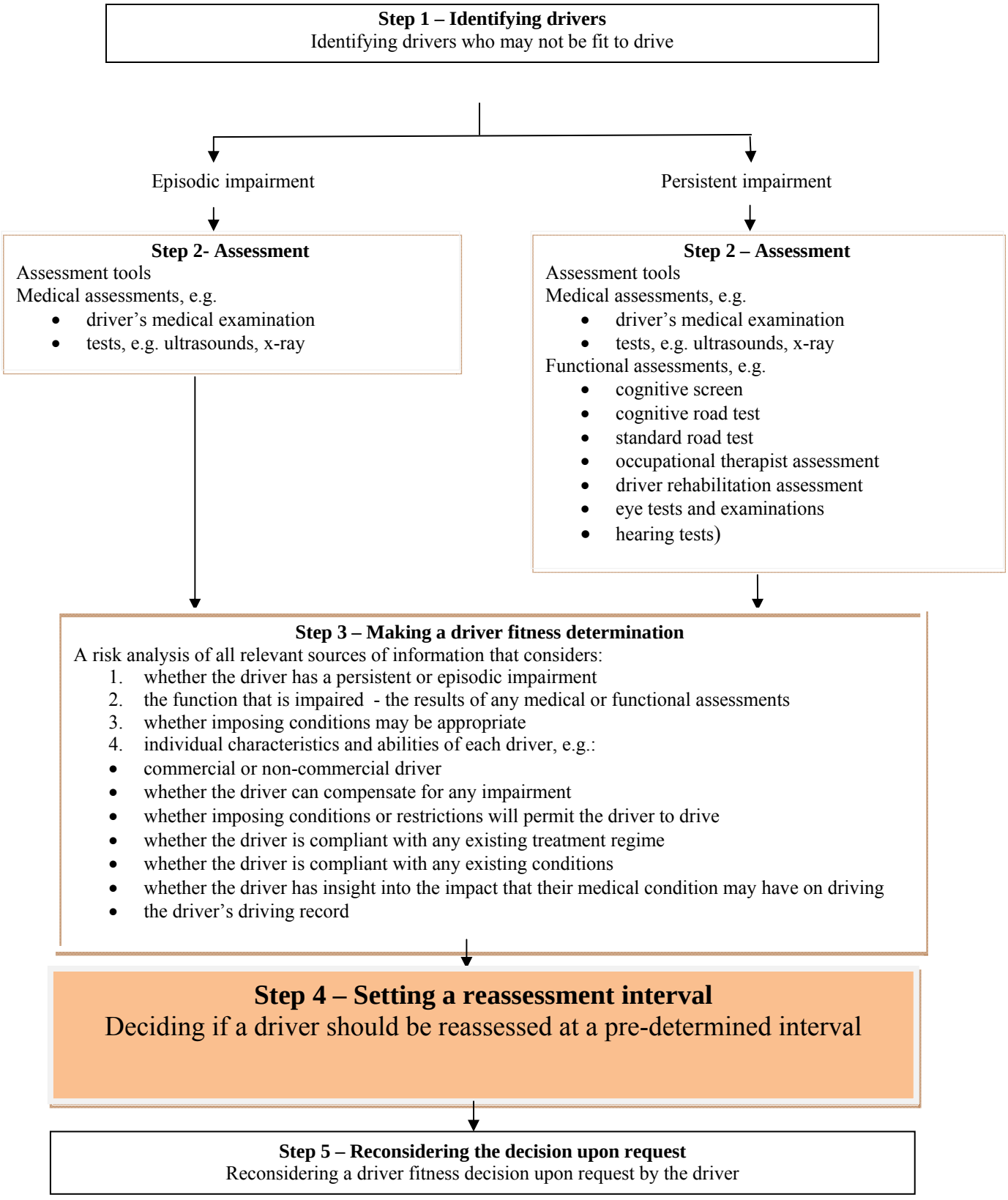
A driving record with multiple crashes may indicate functional impairment.

Chapter 7: Reassessment

Reassessment is the process of re-assessing and making a new determination of fitness for a driver with a previously reported medical condition. Reassessment is initiated by driver fitness authorities when a request for a reassessment is sent to a driver at the expiration of a scheduled reassessment interval or at any other time in the discretion of the authority.

For some medical conditions, a reassessment interval is provided in the standards. In those circumstances where a reassessment interval is not provided, or where individual circumstances may require a different interval, e.g. when the individual has multiple medical conditions, the authority will review the relevant information to determine whether the driver's level or risk of impairment may increase and the time period over which this increase may take place.

Where a reassessment interval is provided in the standards, it is a minimum. This means that no more than the stated number of years can pass before the driver is reassessed. However, if, in the opinion of the treating physician, other medical professional or the driver fitness authority, the driver should be reassessed more frequently, then an earlier reassessment interval should be set.


Step 1 – Identifying drivers
Identifying drivers who may not be fit to drive
Episodic impairment
Persistent impairment
Step 2- Assessment
Assessment tools
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Step 2 – Assessment
Assessment tools
Medical assessments, e.g.
driver's medical examination
tests, e.g. ultrasounds, x-ray
Functional assessments, e.g.
cognitive screen
cognitive road test
standard road test
occupational therapist assessment
driver rehabilitation assessment
eye tests and examinations
hearing tests)
Step 3 – Making a driver fitness determination
A risk analysis of all relevant sources of information that considers:
1. whether the driver has a persistent or episodic impairment
2. the function that is impaired - the results of any medical or functional assessments
3. whether imposing conditions may be appropriate
4. individual characteristics and abilities of each driver, e.g.:
commercial or non-commercial driver
whether the driver can compensate for any impairment
whether imposing conditions or restrictions will permit the driver to drive
whether the driver is compliant with any existing treatment regime
whether the driver is compliant with any existing conditions
whether the driver has insight into the impact that their medical condition may have on driving
the driver's driving record
Step 4 – Setting a reassessment interval
Deciding if a driver should be reassessed at a pre-determined interval
Step 5 – Reconsidering the decision upon request
Reconsidering a driver fitness decision upon request by the driver

7.1 Routine reassessment intervals – commercial drivers

Model

7.1.1 Unless a different reassessment interval is set because of a medical condition, authorities will routinely identify commercial drivers for a review of driver fitness at the time of licence application and then at the following intervals:

(a) up to age 45, every 5 years

(b) from age 45 to age 65, every 3 years, and

(c) from age 65, annually.

Rationale

See Part 2, Chapter 4, section 4.2 ‘Commercial Drivers’.

7.2 Routine reassessment intervals – non-commercial drivers

Model

7.2.1 Unless a different reassessment interval is set because of a medical condition, authorities will routinely identify non-commercial drivers for a review of driver fitness, for example:

(a) at age 75

(b) at age 80, and

(c) every 2 years over age 80.

Rationale

See Part 1, Chapter 4, section 4.3 ‘Non-commercial drivers’

7.3 Determining whether reassessment is required (other than routine)

Routine reassessment intervals are a minimum standard for reassessment. There may be instances, however, when drivers should be reassessed more frequently.

Model

7.3.1 To determine whether reassessment is required, the authority will consider:

(a) the driver fitness standard(s) for the relevant medical condition(s)

(b) the date of onset, diagnosis and/or treatment of the medical condition, if known

(c) the severity of the medical condition

(d) whether the condition is stable and, if so, the period of stability

(e) whether the condition is progressive and, if so, the rate of progression

(f) whether the condition is controlled

(g) where appropriate, the date of the next routine reassessment (i.e. age-related or commercial driver routine)

(h) whether the individual has been compliant with any prescribed treatment regime, conditions or restrictions

(i) the results of any functional assessments

(j) the individual's driving record, and/or

(k) the recommendation of a physician.

7.3.2 Generally, reassessment will be required if:

(a) the driver has a medical condition that is progressive

(b) the driver fitness determination is based upon the effectiveness of a prescribed treatment regime and it is unknown whether the treatment regime is likely to continue to be effective

(c) the driver fitness determination is based upon the effectiveness of a prescribed treatment regime and it is unknown whether the individual is likely to comply with the treatment regime

(d) the medical condition results in episodic impairment, the driver fitness determination is based upon an individual having a period of stability without an episodic event, and it is unknown whether the medical condition is likely to continue to be stable

(e) the medical condition results in an episodic impairment, the driver fitness determination is based upon a pattern of episodes, e.g. nocturnal seizures or auras, and it is unknown whether the pattern of episodes is likely to continue

(f) it is recommended by a physician, and/or

(g) the driver fitness standard for that medical condition indicates that reassessment is required.

Rationale

A driver fitness authority schedules a reassessment when the authority decides an individual can be licensed but may require follow-up assessment in the future to ensure the driver's level or risk of impairment has not increased.

7.4 Setting the reassessment interval

Model

7.4.1 If an authority determines that an individual can be licensed, the authority will also decide whether reassessment is required and, if so, what the reassessment interval should be.

7.4.2 A driver fitness authority will not schedule a reassessment for a commercial driver if the driver's next scheduled routine re-assessment will provide the authority with the necessary opportunity for reassessment.

7.4.3 A driver fitness authority can set any reassessment interval that is appropriate for a particular driver. Generally, an authority will set a reassessment interval at either:

(a) 1 year

(b) 2 years

(c) 3 years, or

(d) 5 years.

7.4.4 Generally, a driver fitness authority will schedule a reassessment in 1 year if:

(a) a driver's cognitive function is impaired and the level of cognitive impairment is likely to increase over time

(b) the driver fitness determination is based upon the effectiveness of a prescribed treatment regime and it is

unknown whether the treatment regime is likely to continue to be effective

(c) the driver fitness determination is based upon the effectiveness of a prescribed treatment regime and it is unknown whether the individual is likely to comply with the treatment regime

(d) the medical condition results in episodic impairment, the driver fitness determination is based upon an individual having a period of stability without an episodic event, and it is unknown whether the medical condition is likely to continue to be stable

(e) the medical condition results in an episodic impairment, the driver fitness determination is based upon a pattern of episodes, e.g. nocturnal seizures or auras, and it is unknown whether the pattern of episodes is likely to continue.

7.4.5 In most other circumstances where reassessment is required, an authority will schedule a 2, 3 or 5 year reassessment interval, depending upon the likely rate of progression of the medical condition(s).

Rationale

Reassessment intervals of less than 1 year are generally not scheduled, because the majority of medical conditions do not substantially progress in such a short period of time. However, because of the rapid decline in cognitive function associated with many conditions, one year intervals are usually scheduled for individuals with cognitive impairments. One year intervals are also scheduled for individuals with episodic impairments where it is unknown if the stability of the condition, the pattern of episodes or the effectiveness of treatment is likely to change. This is because a period of one year is usually sufficient to determine whether such a change is likely to occur in future.

PART 2:

CCMTA
MEDICAL STANDARDS
FOR DRIVERS

Summary of Chapters and Medical Conditions

Chapter Number	Chapter Title	Conditions/Contents
1	Introduction	
2	Medical conditions at-a-glance	
3	Cardiovascular disease and disorders	Cardiovascular diseases
4	Cerebrovascular disease	Cerebrovascular diseases
5	Chronic renal disease	Renal diseases
6	Cognitive impairment including dementia	Cognitive impairment Dementia
7	Diabetes - Hypoglycemia	Diabetes, Hypoglycemia
8	General debility and lack of stamina	Chronic fatigue syndrome, malabsorption syndromes, AIDS, maignecies, chronic pain
9	Hearing loss	
10	Intracranial tumours	Intracranial tumours
11	Musculoskeletal conditions	Musculoskeletal
12	Neurological disorders	MS, Cerebral Palsy, Parkinson's
13	Peripheral vascular diseases	Abdominal Aortic Aneurysm Aortic dissection DVT – Pulmonary embolism Peripheral arterial disease - severe claudication
14	Psychiatric disorders	Mood disorders, ADHD, Schizophrenia, Personality disorders
15	Drugs ad Driving	Opioids, Antidepressants, Antiepilectics, Antihistamines, Antipsychotics, Sedatives, Stimulants, Alcohol dependence
16	Respiratory diseases	Chronic obstructive pulmonary disease
17	Seizures and epilepsy	Seizures, epilepsy, alcohol induced seizures
18	Sleep disorders	Narcolepsy Sleep Apnea (OSA)
19	Syncope	
20	Traumatic brain injury	Traumatic brain injuries
21	Vestibular disorders	Vertigo, dizziness
22	Vision impairment	Vision impairment
23	Medical Review for Drivers	Frequency of medical review

Chapter 1: Introduction

1.1 Purpose of this part

The medical conditions chapters in this part of the document:

- identify what medical conditions may have an impact on an individual's fitness to drive
- highlight the risk of impairment and crash associated with certain medical conditions
- identify compensation strategies, devices and/or training that may be used to compensate for the effects of a medical condition on driving, and
- include driver fitness standards to assist authorities in determining whether an individual with a medical condition should be licensed and, if so, the appropriate reassessment interval.

1.2 Source of the medical condition chapters

The medical standards in this part used as a starting point documentation originally developed by British Columbia for medical conditions and fitness to drive which in turn was based on an integrated review by Dr. B. Dobbs.

The medical standards were subsequently further developed by medical advisors and administrators from Canadian provincial driver licensing bodies using sources such as the Canadian Medical Association (CMA) publication *Determining Medical Fitness to Operate Motor Vehicles, 7th edition* and the Canadian Cardiovascular Society (CCS) publication on *Assessment of the cardiac patient for fitness to drive and fly.*

The driver licence classes in these standards are based on the CCMTA Classified Driver Licensing System, provided in Appendix 1. In general, Classes 1-4 are refer to commercial drivers and classes 5-7 as non-commercial drivers.

1.3 Medical Condition chapter template

Below is the template used for the medical condition standards chapters. It is annotated to explain what type of information is found in each section of the template.

NAME OF MEDICAL CONDITION

1.1 About medical condition

Information about the medical condition to assist driver fitness authorities in understanding and applying the guidelines for assessment.

1.2 Prevalence

Information about the prevalence of the medical condition, which is relevant to the frequency that it may appear as an issue for licensing.

1.3 Medical condition and adverse driving outcomes

Conclusions on the general findings of research on the link between the medical condition and adverse driving outcomes.

1.4 Effect on functional ability to drive

Information on the specific effects of the medical condition on the functional abilities needed for driving. This section includes the following table:

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
The medical condition and any distinct presentations or variations of the condition	Whether the functional impairment is persistent or episodic, and whether a medical assessment and/or functional assessment is required	The primary functional abilities affected by the medical condition: cognitive, motor, or sensory	The assessment tool to be used, e.g. cognitive road test.

1.5 Compensation

Information about whether or not a driver can compensate through the use of strategies or devices for the functional impairment caused by a medical condition. Treatment for a condition, e.g. medication, is not a type of compensation.

1.6 Guidelines for assessment

This section names the medical condition and any distinct presentations or variations that require an individual standard. A standard may be for <u>all</u> licence classes (non-commercial classes 5-7 and commercial classes 1-4), for non-commercial drivers only, or for commercial drivers only.

Additional background information about the medical condition may be included here to help provide context for the standard and other information in the table, below.

Standard	The requirements that must be met in order to be licensed
Conditions for maintaining licence	Description of any conditions for maintaining a licence. Conditions are ongoing requirements that the driver must meet in order to maintain the licence. For example, ‘wear corrective lenses’ or ‘do not drive if your dialysis regime is delayed’.
Reassessment	Description of a suggested period on how often an individual will be reassessed after being found eligible for a licence.

	Where a reassessment period is mandatory it is also reflected in the standard. Where there is no particular reassessment period for the medical condition, then reassessment is "routine."
Information from health care providers	Description of any information about the medical condition or functional ability that an authority usually requests when applying the standard. This information will come from medical and functional assessments and is supplied by from physicians, driver rehabilitation specialists or other health care providers. Specific information that may be requested includes a professional's opinion regarding: • whether the individual has insight into the impact their medical condition may have on driving • whether the individual is compliant with their current treatment regime • if known or applicable, whether the individual is compliant with any current conditions for maintaining a licence
Rationale	A brief description of the rationale for the guide.

Chapter 2: Medical conditions at-a-glance

For each major medical condition identified in the medical condition chapters, the following table identifies:

- whether the resulting impairment is persistent or episodic
- the chapter where the specific information is available

Condition	Chapter Reference	Type of Impairment	
		Persistent	**Episodic**
Abdominal Aortic Aneurysm	13		X
Aortic dissection	13		X
Cardiovascular diseases	3	X	X
Cerebrovascular diseases	4	X	X
Cognitive impairment including dementia	6	X	
Diabetes – Hypoglycemia	7		X
DVT – Pulmonary embolism	13		X
Hearing loss	9	X	
Intracranial tumours	10	X	X
MS, Cerebral Palsy, Parkinson's	12	X	X
Musculoskeletal	11	X	
Narcolepsy	18	X	X
Peripheral arterial disease-severe claudication	13	X	
Psychiatric disorders	14	X	X
Renal diseases	5	X	
Respiratory diseases	16	X	
Seizures and epilepsy	17		X
Sleep apnea	18	X	X
Syncope	19		X
Traumatic brain injuries	20	X	X
Vestibular disorders	21	X	X
Vision impairment	22	X	

Chapter 3: Cardiovascular disease and disorders

3.1 About cardiovascular disease

Overview

Cardiovascular disease is an umbrella term used to describe a variety of disorders relating to the heart and blood vessels.

Coronary artery disease

Coronary artery disease, which is also called coronary, ischemic or atherosclerotic heart disease, is characterized by the presence of atherosclerosis in the arteries of the heart. Atherosclerosis is the progressive build up of fatty deposits called plaque, which narrows the coronary arteries and reduces blood flow to the heart. Complications of coronary artery disease include:

- angina (pain or discomfort due to lack of oxygen to the heart muscle)
- myocardial infarction (heart attack), and
- ischemic cardiomyopathy (permanent damage to the heart muscle).

Disturbances of cardiac rhythm

Disturbances of cardiac rhythm, or arrhythmias, include:

- tachycardia (rapid heart rate)
- bradycardia (slow heart rate)
- fibrillation or flutter (abnormal twitching of the heart muscle), and
- heart block.

These arrhythmias may arise from the heart muscle itself or the conduction system and are often secondary to underlying heart disease.

Valvular heart disease

Disease affecting the heart valves may result in stenosis and regurgitation, and is associated with an increased risk of thromboembolism.

In valvular stenosis, the valve opening is smaller than normal due to hardening or fusing of the valve's leaflets. This may cause the heart to have to work harder to pump blood through the valves. In valvular regurgitation or "leaky valve", the valve does not close tightly enough, allowing some blood to leak backwards across the valve. As the leak worsens, the heart has to work harder to make up for the leaky valve, and less blood may flow to the rest of the body. Stenosis and regurgitation may coexist.

Individuals who have undergone valve replacement surgery are subject to a certain irreducible incidence of late complications such as thromboembolism, dehiscence, infection and mechanical malfunction.

Congestive heart failure

Congestive heart failure usually is a chronic, progressive condition in which the heart is unable to pump the quantity of blood required to meet the body's needs. It is generally the result of heart disease but may be secondary to non-cardiac conditions such as fluid overload and anemia.

The severity of congestive heart failure can be assessed by measuring the fraction of blood being pumped out of the left ventricle with each beat. This is expressed as a ratio called the left ventricle ejection fraction (LVEF). Healthy individuals generally have an LVEF greater than 55%.

The New York Heart Association (NYHA) functional classification system provides a simple, clinical measure for assessing the degree of heart failure. This system describes the effect of cardiovascular disease on an individual's general physical activity, according to the categories shown in the following table.

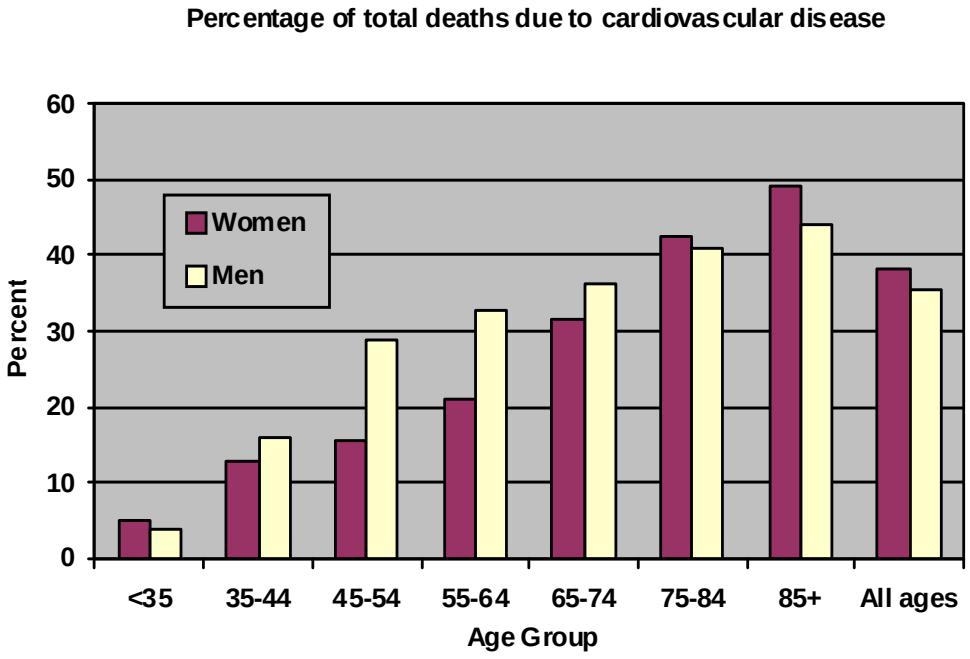
Category	Description
I	No symptoms and no limitation in ordinary physical activity. Comfortable at rest.
II	Mild symptoms and slight limitation during ordinary activity. Comfortable at rest.
III	Marked limitation in activity due to symptoms, even during less-than-ordinary activity. Comfortable only at rest.
IV	Severe limitations. Experiences symptoms even while at rest.

Cardiomyopathy

Cardiomyopathy refers to a change in the size, strength or flexibility in the heart muscle. These changes can reduce the amount of blood being pumped out of the heart, and may lead to congestive heart failure. Cardiomyopathy is associated with an increased risk of arrhythmias.

3.2 Prevalence

Cardiovascular disease is a major cause of death, disability and health care costs in Canada. Although cardiovascular disease death rates have been declining since the mid-1960s, statistics from 1997 indicate that cardiovascular disease was still the leading cause of death in Canada, accounting for 36% of all deaths in men and 38% in women. As shown in the graph below, the proportion of deaths caused by cardiovascular disease increases dramatically with age.



3.3 Cardiovascular disease and adverse driving outcomes

Research indicates that drivers with cardiovascular disease as a whole have a higher risk for adverse driving outcomes than those without cardiovascular disease. However, there is relatively little research on the effects of specific cardiovascular disorders and driving outcomes.

3.4 Effect of cardiovascular disease on functional ability to drive

Condition	Type of driving impairment and assessment approach[4]	Primary functional ability affected	Assessment tools
Coronary artery disease Arrhythmias Valvular heart disease Cardiomyopathy	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments
Congestive heart failure	Persistent Impairment: Functional assessment	Can affect Motor Sensory and Cognitive function May also result in general debility or lack of stamina	Medical assessments Functional Assessment
	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments Specialist's report
Post cardiac arrest Post-operative cognitive decline (POCD)	Persistent Impairment: Functional assessment	Can affect Motor Sensory and Cognitive function May also result in general debility	Medical assessments Functional Assessment

[4] See Part 1 for a discussion of the use of functional assessments for driver licensing decisions.

The effect of cardiovascular disease on an individual's functional ability to drive may be episodic or persistent.

Episodic impairment

The potential episodic impairment is a partial or complete loss of consciousness that incapacitates the driver. This may be caused by a variety of cardiovascular events such as:

- bradyarrhythmias
- tachyarrhythmias
- myocardial disease (massive myocardial infarction)
- left ventricular myocardial restriction or constriction
- pericardial constriction or tamponade
- aortic outflow tract obstruction
- aortic valvular stenosis, or
- hypertrophic obstructive cardiomyopathy.

Persistent impairment

Individuals with congestive heart failure may develop persistent cognitive impairment, loss of stamina or general debility as a result of a reduction of oxygen to the brain, organs and tissues. Cardiac arrest also may cause persistent cognitive impairment where a loss of blood to the brain causes brain damage.

Neurocognitive deficits can occur in individuals undergoing intracardiac procedures (e.g. valve surgery) or extracardiac procedures (e.g. coronary artery bypass graft (CABG) surgery). However, the majority of studies investigating cognitive decline have focused on individuals undergoing CABG surgery. The results of those studies indicate that a significant number of individuals experience post-operative cognitive decline (POCD) for several months after surgery, with documented declines in memory, attention, speed of processing, and executive functioning. Studies indicate that between 20% and 79% of individuals experience POCD between 6 weeks and 6 months of CABG surgery, with a majority of the studies showing a rate of 45% or higher. In those studies that have followed individuals for more than 6 months post-surgery, the results indicate that up to 35% of individuals will show POCD one year after surgery. The current understanding is that POCD is the result of a number of factors associated with cardiac treatment, rather than a single factor such as the use of cardiopulmonary bypass.

3.5 Compensation

Individuals with cardiovascular disease are not able to compensate for their functional impairment.

3.6 Guidelines for assessment

These guidelines are based primarily on recommendations contained in the final report of the 2003 Canadian Cardiovascular Society (CCS) Consensus Conference Assessment of the Cardiac Patient for Fitness to Drive and Fly. The CCS recommendations focus exclusively on the potential episodic impairment associated with cardiovascular diseases.

Additional guidelines have been added to address potential persistent cognitive impairment caused by congestive heart failure, and the potential for co-morbid cognitive impairment in relation to cardiac arrest, and post-operative cognitive decline (POCD) following coronary artery bypass graft (CABG) surgery. Where the standards differ from the CCS recommendations, the rationale is included in the table.

For CCS recommendations for transient conditions (waiting periods) see Section 3.6.50 which form part of the standards.

3.6.1 Congenital heart defects

STANDARD	**All drivers eligible for a licence if** • **they meet any standards related to a specific cardiovascular condition or event**
Conditions for maintaining licence	None
Reassessment	• Where the defect has been repaired and the treating physician does not indicate any concerns, as per routine • Where the defect has not been repaired, every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether or not the defect has been repaired • Presence of any specific cardiovascular condition or event or risk of condition or event that may impair functional ability to drive
Rationale	Congenital heart defects are not specifically addressed in the CCS recommendations. This standard is included here to assist where a congenital heart defect is reported to an authority. The nature of congenital heart defects and their treatment is variable; therefore there are no driver fitness standards specifically for them.

3.6.2 Acute Coronary Syndromes – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they have an angiographic demonstration of less than a 70% reduction in the diameter of the left main coronary artery, or** • **where they have a 70% or greater reduction in the diameter of the left main coronary artery, it has been successfully treated with revascularization** • **the waiting periods have been met (Section 3.6.50)**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Extent of reduction in the left main coronary artery • Where applicable, result of treatment with revascularization
Rationale	CCS recommendation

3.6.3 Acute Coronary Syndromes – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they have an angiographic demonstration of less than a 50% reduction in the diameter of the left main coronary artery, or** • **where they have a 50% or greater reduction in the diameter of the left main coronary artery, it has been successfully treated with revascularization** • **providing the applicable waiting periods are met (3.6. 50)**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Extent of reduction in the left main coronary artery • Where applicable, result of treatment with revascularization
Rationale	CCS recommendation

3.6.4 Asymptomatic coronary artery disease or stable angina

STANDARD	**All drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Confirmation that coronary artery disease is asymptomatic or angina is stable
Rationale	CCS recommendation

3.6.5 CABG surgery – Non-commercial drivers

Guidelines	**Non-commercial drivers eligible for a licence if** • **it has been 1 month or more since CABG surgery**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Date of CABG surgery
Rationale	CSS recommendations

3.6.6 CABG surgery – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 3 months or more since CABG surgery**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Date of CABG surgery
Rationale	CSS recommendations

3.6.7 Premature atrial or ventricular contractions

STANDARD	**All drivers eligible for a licence if** • **they have no associated impaired level of consciousness caused by cerebral ischemia**
Conditions for maintaining licence	None
Reassessment	• Where there is no underlying cardiovascular disease, as per routine • More frequently at the discretion of the authority
Information from health care providers	• Confirmation that there is no impaired level of consciousness caused by cerebral ischemia
Rationale	CCS recommendation

3.6.8 Ventricular fibrillation with no reversible cause – Non-commercial drivers

This standard applies to non-commercial drivers who have ventricular fibrillation (VF) with no reversible cause. It does not apply to drivers who have VF due to any of the following reversible causes:

- VF within 24 hours of myocardial infarction
- VF during coronary angiography
- VF with electrocution, or
- VF secondary to drug toxicity.

If VF has a reversible cause, it is considered a transient condition, see 3.6.11.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 6 months or more since their last episode of ventricular fibrillation**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Date of last episode of ventricular fibrillation
Rationale	CCS recommendation

3.6.9 Ventricular fibrillation with no reversible cause – Commercial drivers

This standard applies to commercial drivers who have ventricular fibrillation (VF) with no reversible cause. It does not apply to drivers who have VF due to any of the following reversible causes:

- VF within 24 hours of myocardial infarction
- VF during coronary angiography
- VF with electrocution, or
- VF secondary to drug toxicity.

If VF has a reversible cause, it is considered a transient condition. The CCS recommendation for VF with a reversible cause is included in 3.6.xx.

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation

3.6.10 Hemodynamically unstable VT – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **It has been 6 months since the last episode, and** • **the underlying condition has been successfully treated**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the underlying condition causing VT has been successfully treated
Rationale	CCS recommendation

3.6.11 Hemodynamically unstable VT – Commercial drivers

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation

3.6.12 Sustained VT and an LVEF of < 35% – Non-commercial drivers

This standard applies to non-commercial drivers who have sustained ventricular tachycardia (VT) with:

- a left ventricular ejection fraction (LVEF) of < 35%, and
- no associated impaired level of consciousness.

Sustained VT means VT having a cycle length of 500 msec or less, and lasting 30 seconds or more or causing hemodynamic collapse.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 3 months or more since their last episode of sustained VT**
Conditions for maintaining licence	None
Reassessment	• Where the driver's condition is controlled and stable, every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Date of last episode of sustained VT
Rationale	CSS recommendations

3.6.13 Sustained VT and an LVEF of <35% – Commercial drivers

This standard applies to commercial drivers who have sustained ventricular tachycardia (VT) with:

- a left ventricular ejection fraction (LVEF) of <35%, and
- no associated impaired level of consciousness.

Sustained VT means VT having a cycle length of 500 msec or less, and lasting 30 seconds or more or causing hemodynamic collapse.

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from	N/A

health care providers	
Rationale	CCS recommendation

3.6.14 Sustained VT and an LVEF of ≥35% – Non-commercial drivers

This standard applies to non-commercial drivers who have sustained ventricular tachycardia (VT):

- with a left ventricular ejection fraction (LVEF) of ≥ 35%
- with no associated impaired level of consciousness, and
- for whom an implantable cardioverter defibrillator (ICD) has not been recommended.

Sustained VT means VT having a cycle length of 500 msec or less, and lasting 30 seconds or more or causing hemodynamic collapse.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 4 weeks or more since their last episode of sustained VT, and** • **they have been successfully treated with radiofrequency ablation plus a 1 week waiting period or successful pharmacological treatment**
Conditions for maintaining licence	None
Reassessment	• Annually or more frequently at the discretion of the authority
Information from health care providers	• Date of last episode of sustained VT • Whether the driver has been successfully treated
Rationale	CCS recommendation

3.6.15 Sustained VT and an LVEF of ≥35% – Commercial drivers

This standard applies to commercial drivers who have sustained ventricular tachycardia (VT):

- with a left ventricular ejection fraction (LVEF) of ≥ 35%
- with no associated impaired level of consciousness, and
- for whom an implantable cardioverter defibrillator (ICD) has not been recommended.

Sustained VT means VT having a cycle length of 500 msec or less, and lasting 30 seconds or more or causing hemodynamic collapse.

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 3 months or more since their last episode of sustained VT, and** • **they have been successfully treated with radiofrequency ablation plus a 1 week waiting period or successful pharmacological treatment**
Conditions for maintaining licence	None
Reassessment	• Annually or more frequently at the discretion of the authority
Information from health care providers	• Date of last episode of sustained VT • Whether the driver has been successfully treated
Rationale	CCS recommendation

3.6.16 Nonsustained VT

This standard applies to all drivers who have nonsustained ventricular tachycardia (VT).

Nonsustained VT means VT having a cycle length of 500 msec or less, and lasting less than 30 seconds without hemodynamic collapse.

STANDARD	**All drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	None
Rationale	CCS recommendation

3.6.17 Paroxysmal SVT, AF or AFL with no impaired consciousness

This standard applies to all drivers who have had paroxysmal:

- supraventricular tachycardia (SVT)
- artial fibrillation (AF), or
- atrial flutter (AFL)

with no associated impaired level of consciousness.

STANDARD	**All drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Initial reassessment at 5 years or as per routine, whichever is more frequent. If no further recurrences after 5 years, then as per routine • More frequently at the discretion of the authority
Information from health care providers	None
Rationale	CCS recommendation

3.6.18 Paroxysmal SVT, AF or AFL with impaired consciousness

This standard applies to all drivers who have had paroxysmal:

- supraventricular tachycardia (SVT)
- artial fibrillation (AF), or
- atrial flutter (AFL)

with an associated impaired level of consciousness.

STANDARD	**All drivers eligible for a licence if** • **they have been on medical therapy for a minimum of 3 months with no recurrence of paroxysmal SVT, AF, or AFL with impaired level of consciousness** • **for drivers with paroxysmal SVT, it has been successfully treated with radiofrequency ablation** • **for drivers with paroxysmal AF, they have had AV node ablation and pacemaker implantation and meet the standard for pacemaker treatment, and** • **for drivers with paroxysmal AFL, they have had a successful isthmus ablation with proven establishment of bidirectional isthmus block**
Conditions for maintaining licence	None
Reassessment	• Initial reassessment at 5 years or as per routine, whichever is more frequent. If no further recurrences after 5 years, then routine • More frequently at the discretion of the authority
Information from health care providers	• Date of last occurrence of paroxysmal SVT, AF, or AFL with impaired level of consciousness • For drivers with paroxysmal SVT, whether it has been successfully treated with radiofrequency ablation • For drivers with paroxysmal AF, whether they have had AV node ablation and pacemaker implantation • For drivers with paroxysmal AFL, whether they have had a successful isthmus ablation with proven establishment of bidirectional isthmus block
Rationale	CCS recommendation

3.6.19 Persistent or permanent paroxysmal SVT, AF or AFL

This standard applies to all drivers who have persistent or permanent paroxysmal:

- supraventricular tachycardia (SVT)
- artial fibrillation (AF), or atrial flutter (AFL).

STANDARD	**All drivers eligible for a licence if** • **they have adequate ventricular rate control, and** • **they do not experience an impaired level of consciousness**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver has adequate ventricular rate control • Whether the driver experiences an impaired level of consciousness
Rationale	CCS recommendation

3.6.20 Sinus node dysfunction

STANDARD	**All drivers eligible for a licence if** • **they have no associated symptoms, or** • **where they have associated symptoms, the sinus node dysfunction has been successfully treated with a pacemaker and they meet the standard for pacemaker treatment**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver has associated symptoms • Where the driver has associated symptoms, whether they have been successfully treated with a pacemaker
Rationale	CCS recommendation

3.6.21 Atrioventricular (AV) or intraventricular block – Non-commercial drivers

If a permanent pacemaker is implanted, the recommendations in 3.6.23 prevail.

STANDARD	**(a) Non-commercial drivers with** **(i) isolated first degree AV block** **(ii) isolated right bundle branch block (RBBB), or** **(iii) isolated left anterior or posterior fascicular block** **are eligible for a licence** **(b) Non-commercial drivers with** **(i) left bundle branch block (LBBB)** **(ii) bifascicular block** **(iii) second degree AV block/Mobitz I** **(iv) first degree AV block + bifascicular block, or** **(v) congenital third degree AV block** **are eligible for a licence if** • **they have had no associated impaired level of consciousness** **(c) Non-commercial drivers with** **(i) second degree AV block; Mobitz II (distal AV block)** **(ii) alternating LBBB and RBBB, or** **(iii) acquired third degree AV block** **are not eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• The specific nature of the atrioventricular or intraventricular block • Where the driver has • left bundle branch block (LBBB) • bifascicular block • second degree AV block/Mobitz I • first degree AV block + bifascicular block, or • congenital third degree AV block whether the driver has had any associated impaired level of consciousness
Rationale	CCS recommendation

3.6.22 Atrioventricular (AV) or intraventricular block – Commercial drivers

If a permanent pacemaker is implanted, the recommendations in 3.6.24 prevail.

STANDARD	**(a) Commercial drivers with** **(i) isolated first degree AV block** **(ii) isolated right bundle branch block (RBBB), or** **(iii) isolated left anterior or posterior fascicular block** **are eligible for a licence** **(b) Commercial drivers with** **(i) left bundle branch block (LBBB)** **(ii) bifascicular block** **(iii) second degree AV block/Mobitz I, or** **(iv) first degree AV block + bifascicular block** **eligible for a licence if** • **they have had no associated impaired level of consciousness, and** • **the conditions for maintaining a licence are met** **(c) Commercial drivers with a congenital third degree AV block are eligible for a licence if** • **they have had no associated impaired level of consciousness** • **they have a QRS duration $\leq$ 110 msec, and** • **they have a Holter showing no documented pauses $\geq$ 3 seconds** • **the conditions for maintaining a licence are met** **(d) Commercial drivers with** **(i) second degree AV block; Mobitz II (distal AV block)** **(ii) alternating LBBB and RBBB, or** **(iii) acquired third degree AV block** **are not eligible for a licence**

Conditions for maintaining licence	• Drivers with
	  • left bundle branch block (LBBB)
	  • bifascicular block
	  • second degree AV block/Mobitz I, or
	  • first degree AV block + bifascicular block
	  have an annual Holter that shows there is no higher grade AV block
	• Drivers with a congenital third degree AV block have an annual Holter that shows no documented pauses > 3 seconds

Reassessment	• Routine or more frequently at the discretion of the authority

Information from health care providers	• The specific nature of the atrioventricular or intraventricular block
	• Where the driver has
	  • left bundle branch block (LBBB)
	  • bifascicular block
	  • second degree AV block/Mobitz I
	  • first degree AV block + bifascicular block, or
	  • congenital third degree AV block
	  whether the driver has had any associated impaired level of consciousness and the results of Holter confirming no higher grade AV block
	• Where the driver has congenital third degree AV block, whether they have a QRS duration $\leq$ 110 msec and the results of a Holter showing no documented pauses $\geq$ 3 seconds

Rationale	CCS recommendation

3.6.23 Permanent pacemakers – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 1 week or more since pacemaker implant** • **they have not experienced any episodes of impaired level of consciousness since the implant** • **they show normal sensing and capture on a post-implant ECG, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regularly check pacemaker at a pacemaker clinic and do not drive if there is a pacemaker malfunction
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver has experienced any episodes of impaired level of consciousness since the implant • Whether the results of a post-implant ECG show normal sensing and capture
Rationale	CCS recommendation

3.6.24 Permanent pacemakers – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 1 month or more since pacemaker implant** • **they have not experienced any episodes of impaired level of consciousness since the implant** • **they show normal sensing and capture on a post-implant ECG, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regularly check pacemaker at a pacemaker clinic and do not drive if there is a pacemaker malfunction
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Date of pacemaker implant • Whether the driver has experienced any episodes of impaired level of consciousness since the implant • Whether the results of a post-implant ECG show normal sensing and capture
Rationale	CCS recommendation

3.6.25 Declined an ICD or have an ICD implanted as primary prophylaxis – Non-commercial drivers

This standard applies to non-commercial drivers who:

- have had an implantable cardioverter defibrillator (ICD) implanted as a primary prophylaxis, or
- have declined an ICD recommended as primary prophylaxis

When implanted as a primary prophylaxis, the ICD is implanted to prevent sudden cardiac death in individuals considered to be at high risk but who have not had an episode of ventricular arrhythmia.

Individuals whose ICD also regulates pacing for bradycardia must also meet the standard for permanent pacemakers in 3.6.23.

STANDARD	**Non-commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I, II, or III** • **it has been 4 weeks or more since ICD implant (if applicable), and** • **the conditions for maintaining a licence are met (if applicable)**
Conditions for maintaining licence	• Regularly check ICD at a device clinic and do not drive if there is an ICD malfunction • Report to the authority if you experience an impaired level of consciousness or disability as a result of ICD therapy
Reassessment	• Where the driver's condition is controlled and stable, every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• NYHA classification • Date of ICD implant (if applicable)
Rationale	CCS recommendation

3.6.26 Declined an ICD or have an ICD implanted as primary prophylaxis – Commercial drivers

This standard applies to commercial drivers who:

- have had an implantable cardioverter defibrillator (ICD) implanted as a primary prophylaxis, or
- have declined an ICD recommended as primary prophylaxis

When implanted as a primary prophylaxis, the ICD is implanted to prevent sudden cardiac death in individuals considered to be at high risk but who have not had an episode of ventricular arrhythmia.

Individuals whose ICD also regulates pacing for bradycardia must also meet the standard for permanent pacemakers in 3.6.24.

STANDARD	**Commercial drivers generally not eligible for a licence. May be eligible if** • **cardiologist assessment indicates that the annual risk of sudden incapacitation is 1% or less, and** • **the driver meets the standard for ICD implanted as a primary prophylaxis in non-commercial drivers 3.6.25**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation – an ICD may sometimes be implanted in low risk patients. Individual cases may be made for allowing a commercial driver to continue driving with an ICD provided the annual risk of sudden incapacitation is felt to be 1% or less.

3.6.27 ICD implanted as secondary prophylaxis for sustained VT – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I, II, or III** • **it has been 1 week or more since ICD implant** • **it has been 3 months or more since their last episode of sustained VT, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regularly check ICD at a device clinic and do not drive if there is an ICD malfunction • Report to the authority if you experience an impaired level of consciousness or disability as a result of ICD therapy
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA classification • Date of ICD implant • Date of last episode of sustained VT • Has driver experienced an impaired level of consciousness since ICD implant
Rationale	CCS recommendation

3.6.28 ICD implanted as secondary prophylaxis for sustained VT – Commercial drivers

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation

3.6.29 ICD therapy (shock or ATP) has been delivered – Non-Commercial drivers

This standard applies to non-commercial drivers where ICD therapy (shock or ATP) has been delivered and there is an associated impaired level of consciousness, or the therapy delivered by the device was disabling.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 6 months or more since the event, and** • **the standard for the underlying cardiovascular condition are met**
Conditions for maintaining licence	• As per the standard for the underlying cardiovascular condition
Reassessment	• As per the standard for the underlying cardiovascular condition
Information from health care providers	• Date of the event
Rationale	CCS recommendation

3.6.30 ICD therapy (shock or ATP) has been delivered – Commercial drivers

STANDARD	**Commercial drivers are ineligible for a licence**
Conditions for maintaining licence	• n/a
Reassessment	• n/a
Information from health care providers	• n/a
Rationale	CCS recommendation

3.6.31 ICD implanted as secondary prophylaxis for VF or VT – Non-commercial drivers

This standard applies to non-commercial drivers who have had an implantable cardioverter defibrillator (ICD) implanted as a secondary prophylaxis for VF or VT with an impaired level of consciousness.

When implanted as a secondary prophylaxis, the ICD is implanted to prevent sudden cardiac death in individuals who have suffered a cardiac arrest or who suffer from malignant arrhythmias that do not respond readily to medical treatment.

Individuals whose ICD also regulates pacing for bradycardia must also meet the standard for permanent pacemakers in 3.6.23.

STANDARD	**Non-commercial drivers eligible for a licence if** • **assessed as NYHA class I, II, III** • **it has been 6 months or more since their last episode of sustained symptomatic VT or syncope judged to be likely due to VT or cardiac arrest, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regularly check ICD at a device clinic and do not drive if there is an ICD malfunction • Report to the authority if you experience an impaired level of consciousness or disability as a result of ICD therapy
Reassessment	• Where the driver's condition is controlled and stable, every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Date of last episode of sustained symptomatic VT or syncope judged to be likely due to VT or cardiac arrest
Rationale	CCS recommendation

3.6.32 ICD implanted as secondary prophylaxis for VF or VT – Commercial drivers

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation

3.6.33 Inherited heart disease – Non-commercial drivers

This standard applies to non-commercial drivers with the following inherited heart diseases:

- Brugada's Syndrome
- Long QT Syndrome, and
- arrhythmogenic right ventricular cardiomyopathy.

STANDARD	**<u>Non-commercial drivers</u> eligible for a licence if** • **their condition has been investigated and treated by a cardiologist, and** • **it has been 6 months or more since they have experienced any event causing an impaired level of consciousness**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Confirmation that the condition has been investigated and treated by a cardiologist • Date of last event causing an impaired level of consciousness (if applicable)
Rationale	CCS recommendation

3.6.34 Inherited heart disease – Commercial drivers

This standard applies to commercial drivers with the following inherited heart diseases:

- Brugada's Syndrome
- Long QT Syndrome, and
- arrhythmogenic right ventricular cardiomyopathy.

STANDARD	**<u>Commercial drivers</u> generally not eligible for a licence. May be eligible if** • **an assessment by a cardiologist indicates that the annual risk of sudden incapacitation is 1% or less, and** • **the driver meets the standard for inherited heart disease in non-commercial drivers**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	CCS recommendation – Inherited heart diseases may sometimes be identified to pose a very low risk to patients. Individual cases can sometimes be made to allow a commercial driver to continue to drive despite the diagnosis of one of these diseases, provided the annual risk of sudden incapacitation is believed to be less than one percent.

3.6.35 Medically treated valvular heart disease – Non-commercial drivers

This standard applies to non-commercial drivers with medically treated:

- aortic stenosis
- aortic regurgitation
- mitral stenosis, or
- mitral regurgitation.

STANDARD	**Non-commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I or II, and** • **they have had no episodes of impaired level of consciousness**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• NYHA classification • Whether the driver has had an episode of impaired level of consciousness
Rationale	CCS recommendation

3.6.36 Medically treated aortic stenosis or aortic sclerosis – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I** • **their condition is asymptomatic** • **they have an aortic valve area (AVA)**) $\geq$ **1.0 cm^2** • **they have a left ventricle ejection fraction (LVEF**) $\geq$ **35%** • **they have had a detailed assessment by a cardiologist, including an assessment for risk of syncope, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Have an annual medical follow-up
Reassessment	• Annually or more frequently at the discretion of the authority
Information from health care providers	• NYHA classification • Whether condition is asymptomatic • Aortic Valve Area (AVA) • Left ventricle ejection fraction (LVEF) • Confirmation of cardiologist assessment including risk of syncope
Rationale	CCS recommendation

3.6.37 Medically treated aortic or mitral regurgitation or mitral stenosis – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I** • **they have a left ventricle ejection fraction (LVEF) $\geq$ 35%** • **they have had no episodes of impaired level of consciousness**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA classification • Left ventricle ejection fraction (LVEF) • Whether the driver has had an episode of impaired level of consciousness
Rationale	CCS recommendation

3.6.38 Surgically treated valvular heart disease – Non-commercial drivers

This standard applies to non-commercial drivers with:

- mechanical prostheses
- mitral bioprostheses with non-sinus rhythm
- mitral valve repair with non-sinus rhythm
- aortic bioprostheses
- mitral bioprostheses with sinus rhythm, or
- mitral valve repair with sinus rhythm.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 6 weeks or more since their discharge following treatment** • **they have no thromboembolic complications, and** • **for drivers with mechanical prostheses, mitral bioprostheses with non-sinus rhythm or mitral valve repair with non-sinus rhythm, they are on anti-coagulant therapy**
Conditions for maintaining licence	None
Reassessment	• Every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Type of surgical treatment • Date of their discharge following treatment • Whether there are thromboembolic complications • Where applicable, whether the driver is on anti-coagulant therapy
Rationale	CCS recommendation

3.6.39 Surgically treated valvular heart disease – Commercial drivers

This standard applies to commercial drivers with:

- mechanical prostheses
- mitral bioprostheses with non-sinus rhythm
- mitral valve repair with non-sinus rhythm
- aortic bioprostheses
- mitral bioprostheses with sinus rhythm, or
- mitral valve repair with sinus rhythm.

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 3 months or more since their discharge following treatment** • **they have no thromboembolic complications** • **they are assessed as NYHA Class I** • **they have an LVEF ≥ 35%, and** • **for drivers with mechanical prostheses, mitral bioprostheses with non-sinus rhythm or mitral valve repair with non-sinus rhythm, they are on anti-coagulant therapy**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Type of surgical treatment • Date of their discharge following treatment • Whether there are thromboembolic complications • NYHA classification • Left ventricle ejection fraction (LVEF) • Where applicable, whether the driver is on anti-coagulant therapy
Rationale	CCS recommendation

3.6.40 Mitral valve prolapse – All drivers

STANDARD	**All drivers eligible for a licence if** • **they are asymptomatic, or** • **where they are symptomatic they have been assessed for arrhythmia and they meet any applicable standard for arrhythmia**
Conditions for maintaining licence	None
Reassessment	• Where the condition is longstanding and asymptomatic, then routine; otherwise every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver is asymptomatic
Rationale	CCS recommendation

3.6.41 Congestive heart failure – Non-commercial drivers

If using left ventricular assist device (LVAD), see 3.6.43

STANDARD	**Non-commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I, II, or III** • **they are not receiving intermittent inotropes**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA Classification • Whether the driver is receiving intermittent inotropes or using a left ventricle assist device • Results of cognitive screening
Rationale	CCS recommendations

3.6.42 Congestive heart failure – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I or II** • **they have an LVEF of ≥ 35%** • **they are not receiving intermittent inotropes**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA Classification • LVEF • Whether the driver is receiving intermittent inotropes or using a left ventricle assist device
Rationale	CSS recommendations

3.6.43 Left ventricular dysfunction or cardiomyopathy – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I, II, or III** • **they are not receiving intermittent inotropes, and** • if has left ventricular assist device (LVAD) and cardiologist report indicates is stable for 2 months post implantation
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA Classification • Whether the driver is receiving intermittent inotropes or using an LVAD • Date of LVAD implant
Rationale	CCS recommendation

3.6.44 Left ventricular dysfunction or cardiomyopathy – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they are assessed as NYHA Class I or II** • **they have an LVEF of ≥ 35%** • **they are not receiving intermittent inotropes, and** • **they are not using a left ventricle assist device**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• NYHA Classification • Left ventricle ejection fraction (LVEF) • Whether the driver is receiving intermittent inotropes or using a left ventricle assist device
Rationale	CCS recommendation

3.6.45 Heart transplant – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 6 weeks or more since their discharge following transplant** • **they are assessed as NYHA Class I or II** • **they are on stable immunotherapy, and** • **they meet the conditions for maintaining a licence**
Conditions for maintaining licence	• Have an annual medical follow-up
Reassessment	• Where the driver's condition is controlled, stable and asymptomatic, then every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Date of the driver's discharge following transplant • NYHA Classification

	• Whether the driver is on stable immunotherapy
Rationale	CCS recommendation

3.6.46 Heart transplant – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 6 months or more since their discharge following transplant** • **they are assessed as NYHA Class I** • **they have an LVEF of ≥ 35%** • **they are on stable immunotherapy** • **they have no active ischemia, and** • **they meet the conditions for maintaining a licence**
Conditions for maintaining licence	• Have an annual medical follow-up, including a non-invasive test of ischemic burden
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Date of the driver's discharge following transplant • NYHA Classification • Left ventricle ejection fraction (LVEF) • Whether the driver is on stable immunotherapy • Whether the driver has active ischemia
Rationale	CCS recommendation

3.6.47 Hypertrophic cardiomyopathy – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they have had no episodes of impaired level of consciousness**
Conditions for maintaining licence	None
Reassessment	• Where the driver's condition is controlled, stable and asymptomatic, then every 5 years or as per routine, whichever is more frequent • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver has had an episode of impaired level of consciousness
Rationale	CCS recommendation

3.6.48 Hypertrophic cardiomyopathy – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **they have had no episodes of impaired level of consciousness** • **they have no family history of sudden death at a young age** • **they have left ventricle wall thickness of < 30 mm** • **they show no increase in blood pressure with exercise, and** • **they have no nonsustained VT, and** • **they meet the conditions for maintaining a licence**
Conditions for maintaining licence	• Have an annual Holter to test for nonsustained VT
Reassessment	• Annually until the condition is controlled and stable, then routine • More frequently at the discretion of the authority
Information from health care providers	• Whether the driver has had an episode of impaired level of consciousness • Whether the driver has a family history of sudden death at a young age • Whether the driver's left ventricle wall thickness is < 30 mm • Whether the driver shows an increase in blood pressure with

	exercise • Whether the driver has any nonsustained VT on a Holter
Rationale	CCS recommendation

3.6.49 Syncope

The standards for syncope are included in Chapter 19.

3.6.50 CCS recommendations regarding transient conditions (Waiting Periods)

The **waiting periods in these recommendations form part of the standard** and refer to the time interval following onset of the referenced cardiac condition or event during which it is recommended that an individual does not drive. These standards are intended to mitigate the risk of an episodic impairment of functional ability to drive.

- Recurrence of the referenced cardiac condition or event during a waiting period resets the waiting period.
- If more than one waiting period applies (because of multiple conditions/events) the longer waiting period should be applied, unless otherwise stated.

A. Coronary artery disease

Acute coronary syndromes – waiting periods

Condition	Classes 5-7 (Non commercial	Classes 1-4 Commercial
ST elevation MI	• **1 month after discharge**	• **3 months after discharge**
Non-ST elevation MI with significant LV damage		
Non-ST elevation MI with minor LV damage		
If PCI performed during initial hospital stay	• **48 hours after PCI**	• **7 days after PCI**
If PCI not performed during initial hospital stay	• **7 days after discharge**	• **30 days after discharge**
Acute coronary syndrome without MI (unstable angina)		
If PCI performed during initial hospital stay	• **48 hours after PCI**	• **7 days after PCI**
If PCI not performed during initial hospital stay	• **7 days after discharge**	• **30 days after discharge**

Notes:

ST elevation: refers to the appearance of the ST segment of an electrocardiogram (ECG or EKG)

MI: Myocardial infarction (heart attack)

LV: left ventricle

Significant LV damage: any MI which is not classified as minor

Minor LV damage: an MI defined only by elevated troponin ± ECG changes and in the absence of a new wall motion abnormality.

Stable coronary syndromes – waiting periods

	Non-commercial	Commercial
Stable angina Asymptomatic coronary artery disease	• No restrictions	
PCI	• **48 hours after PCI**	• **7 days after PCI**
Notes: PCI: Percutaneous coronary intervention (angioplasty)		

Cardiac surgery for coronary artery disease – waiting periods

	Non-commercial	Commercial
Coronary artery bypass graft	• **1 month after discharge**	• **3 months after discharge**

B. Disturbances of cardiac rhythm, arrhythmia devices and procedures

Catheter ablation and EPS

	Non-commercial	Commercial
Catheter ablation procedure EPS with no inducible sustained ventricular arrhythmias	• **48 hours after discharge**	• **1 week after discharge**
Notes: EPS: electrophysiology		

C. Disturbances of cardiac rhythm and arrhythmia devices

Ventricular arrhythmias

	Non-commercial	Commercial
VF with a reversible cause	**No driving until/unless successful treatment of underlying condition**	
Notes: VF: ventricular fibrillation Examples of reversible causes of VF: • VF within 24 hours of myocardial infarction • VF during coronary angiography • VF with electrocution • VF secondary to drug toxicity		

Chapter 4: Cerebrovascular disease

4.1 About cerebrovascular disease

Cerebrovascular disease is disease involving the blood vessels supplying the brain.

Transient ischemic attack (TIA)

A transient ischemic attack (TIA) is a brief episode of neurological dysfunction caused by a temporary state of reduced blood flow to the brain. The symptoms of a TIA are similar to a CVA (described below) but are temporary, typically lasting less than one hour and no more than 24 hours. The most common cause of a TIA is a blood clot. A TIA is considered to be a warning sign that a CVA may be imminent. The risk of having a CVA is 10% in the first 90 days following a TIA, with a cumulative 3 year risk of 25%.

Cerebrovascular accident (CVA)

A cerebrovascular accident (CVA) or stroke is defined as rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than of vascular origin. A CVA can be classified as either ischemic or hemorrhagic. Ischemic CVA refers to a CVA caused by thrombosis or embolism, and accounts for 85% of all CVAs. Hemorrhagic CVAs are caused by an intracerebral hemorrhage (bleeding within the brain) or subarachnoid hemorrhage (bleeding between the inner and outer layers of the tissue covering the brain).

The symptoms of a CVA vary depending on what part of the brain is affected. The most common symptom is weakness or paralysis of one side of the body with partial or complete loss of voluntary movement or sensation in a leg or arm. There can be speech problems and weak face muscles. Numbness or tingling is very common. A CVA can affect:

- balance
- vision
- swallowing
- breathing, and
- level of consciousness.

Visual or spatial neglect is a common consequence of a CVA. With neglect, damage to the brain causes an individual to ignore one side of their visual field or their body, even if they retain sensation and function. Neglect is usually a result of a stroke affecting the right hemisphere of the brain, therefore causing neglect of the left side. Visual neglect occurs in 33% to 85% of all strokes affecting the right hemisphere.

The prognosis for recovery following a CVA is related to the severity of the CVA and how much of the brain has been damaged. Most functional recovery occurs within the first two months following a CVA.

The risk of a subsequent CVA is approximately 4% per year, with a 10 year cumulative risk of 43%. In the first six months following a CVA, the risk of a subsequent CVA is approximately 9%.

Cerebral aneurysm

A cerebral aneurysm is the localized dilation or ballooning of a cerebral artery or vein resulting from weakness in the wall of the affected vessel. Most cerebral aneurysms have no associated symptoms until they become large or rupture. The majority (50% to 80%) remain small and do not rupture.

Symptoms associated with larger aneurysms include:

- sudden severe headache
- nausea and vomiting
- visual impairment, and
- loss of consciousness.

The risk of rupture increases with the size of the aneurysm. A rupture results in subarachnoid or intracerebral hemorrhage, leading to alterations in consciousness including:

- syncope
- seizures
- visual impairment, and
- respiratory or cardiovascular instability.

Treatment of unruptured cerebral aneurysms is controversial. Treatment options include observation and surgical procedures to prevent blood from flowing into the aneurysm. Risks of surgery include possible damage to other blood vessels, potential for aneurysm recurrence and rebleeding, and post-operative CVA. Successful surgery reduces the risk of rupture.

4.2 Prevalence

Transient ischemic attack

The results of a survey published in 2000 by the National Stroke Association found that half a million adults (18 years of age and older) in Canada had been diagnosed with a TIA. A population-based study in Alberta found the age-adjusted incidence of TIA to be between .04% and .07% (44 and 68 per 100,000) annually.

The risk factors for a TIA are similar to those for a CVA (see below).

Cerebrovascular accident

CVAs are the 4th leading cause of death in Canada and account for 7% of all deaths in Canada. Of the 40,000 to 50,000 Canadians who have a CVA each year, 14,000 will die.

The risk factors for a CVA include:

- high blood pressure
- cigarette smoking
- heart disease
- carotid artery disease
- diabetes, and
- heavy use of alcohol.

The risk for males is three times greater than for females. Risk also increases with age, with those in their 70s and 80s at the greatest risk.

Cerebral aneurysm

Prevalence rates for cerebral aneurysm are unclear because they are often asymptomatic. Autopsy studies indicate a prevalence rate in the adult population between 1% and 5%, with 5% being a widely cited figure.

Under age 40, cerebral aneurysms affect equal numbers of males and females, but are rarely seen in infants and children. Over age 40, more women than men are affected. The peak age for clinical manifestation of cerebral aneurysm is between 55 and 60.

4.3 Cerebrovascular disease and adverse driving outcomes

Transient ischemic attack

There has been little research on the relationship between TIAs and adverse driving outcomes.

Cerebrovascular accident

There has been little research on episodic impairment (sudden incapacitation) of driving ability due to a CVA.

In studies that considered the effects of persistent impairments from CVAs as measured by fitness to drive assessments, 50% or more of the subjects who had a CVA were assessed as unfit to drive. Surveys of drivers who had a CVA indicate that more than half did not resume driving after their CVA.

Cerebral aneurysm

No studies were found that considered the relationship between cerebral aneurysm and adverse driving outcomes.

4.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Transient ischemic attack (TIA)	Episodic impairment (risk for stroke): Medical assessment – likelihood of impairment	Variable – sudden cognitive, motor or sensory impairment	Medical assessments
Cerebrovascular accident (CVA)	Persistent impairment: Functional assessment	Variable – cognitive, motor or sensory	Medical assessments Functional assessment
Cerebral aneurysm	Episodic impairment (risk of rupture): Medical assessment – likelihood of impairment	All – sudden impairment	Medical assessments
	Persistent impairment (where symptomatic): Functional assessment	Variable – cognitive, motor or sensory	Medical assessments Functional assessment

Transient ischemic attack

The primary concern for licensing is the potential for a subsequent CVA. The greatest risk is within the 3 months following the TIA.

Cerebrovascular accident

The primary concern for licensing is the potential for a persistent impairment of functional ability following a CVA. Depending on what part of the brain is affected, cognitive, motor or sensory functions may be impaired.

Cerebral aneurysm

The primary concern for licensing is the risk of an episodic impairment caused by rupture of the aneurysm. Generally, this risk is not considered significant for licensing purposes unless the aneurysm is symptomatic or has been identified as requiring surgical intervention.

A large or leaking cerebral aneurysm could result in a persistent impairment of cognitive, motor or sensory functions depending on its size and location.

4.5 Compensation

Drivers who have experienced a persistent impairment of motor or sensory function may be able to compensate. An occupational therapist, driver rehabilitation specialist, driver examiner or other medical professional may recommend specific compensatory vehicle modifications or restrictions based on an individual functional assessment. The effectiveness of individual vehicle modifications may be determined through a road test.

Some examples of compensatory mechanisms are shown in the following table.

Motor impairment	**Sensory (vision) impairment**
• Steering wheel spinner knob • Left-foot accelerator pedal • Restriction to automatic transmission or power-assisted brakes • Downgrade from commercial to non-commercial driving	• Scanning horizon more frequently • Turning head 90◦ to maximize area scanned • Large left and right side mirrors

4.6 Guidelines for assessment

4.6.1 Transient ischemic attack (TIA)

STANDARD	**All drivers eligible for a license if:** • **complete medical assessment shows no residual effects** • **any underlying cause has been addressed with appropriate treatment** • **conditions for maintaining a license are met.**
Conditions for maintaining licence	• Remain under regular medical supervision and follow any prescribed diagnostic or treatment regime • Report any further TIAs to the authority
Reassessment	• Reassess in one year if the TIA occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Date of the TIA • Whether the driver remains under regular medical supervision • Opinion of treating physician whether the driver follows any prescribed diagnostic or treatment regime
Rationale	The primary driver concern with a TIA is the risk for a CVA after a TIA. By definition, there are no persistent impairments associated with a TIA. The risk for a CVA is greatest immediately after the TIA and decreases significantly over time. Subject matter experts recommended a minimum no-driving period of two weeks, with appropriate follow-up and treatment.

4.6.2 Cerebrovascular accident (CVA)

STANDARD	**All drivers eligible for a licence if** • **Complete medical assessment shows no residual effects** • **any underlying cause has been addressed with appropriate treatment** • **a post CVA seizure has not occurred** • **the functional abilities necessary for driving are not impaired, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Remain under regular medical supervision and follow your physician's advice regarding treatment • Report any further CVAs to the authority (Note that additional conditions may be required, depending upon the nature of any functional impairment and the ability of the driver to compensate)
Reassessment	• Reassess in one year if the CVA occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Date of the CVA • Opinion of treating physician whether any underlying cause has been addressed with appropriate treatment • Whether the driver has experienced a post CVA seizure • Opinion of treating physician whether there may be significant residual loss of the functional abilities necessary for driving, and if yes, the results of any functional assessments the physician carried out, e.g. cognitive screen • Whether the driver remains under regular medical supervision • Opinion of treating physician whether the driver is compliant with the physician's advice regarding treatment
Rationale	The primary driver fitness concern with a CVA is the potential for a persistent impairment. Subject matter experts recommended a minimum no-driving period of one month, with appropriate follow-up and treatment.

4.6.3 Cerebral aneurysm that requires surgical repair

STANDARD	**All drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	The primary concern with a cerebral aneurysm is the risk of rupture. Where the risk of rupture is such that surgery is recommended to repair the rupture, a driver is not eligible for a licence.

4.6.4 Surgery to repair a cerebral aneurysm – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been at least 3 months since the surgery, and** • **the driver has no symptoms of the aneurysm, or** • **if the driver continues to have symptoms, the symptoms do not impair the functional abilities necessary for driving**
Conditions for maintaining licence	None
Reassessment	• If the driver has no symptoms of the aneurysm, routine • Otherwise, to be determined on an individual basis
Information from health care providers	• Date of the surgery • Whether the driver experiences any symptoms of the aneurysm, and if yes, a description of the symptoms • Opinion of treating physician if any symptoms impair the functional abilities necessary for driving, and if yes, the results of any functional assessments the physician carried out
Rationale	Successful surgical treatment for a cerebral aneurysm significantly reduces the risk of rupture. A waiting period of 3 months after surgery is imposed to allow for an assessment of the effectiveness of the surgery or any complications of surgery. The impact of any symptoms caused by the aneurysm or by complications from surgery should be assessed.

4.6.5 Surgery to repair a cerebral aneurysm – Commercial drivers

STANDARD	**Commercial driver eligible for a licence if** • **it has been at least 6 months since the surgery, and** • **the driver has no symptoms of the aneurysm, or** • **if the driver continues to have symptoms, the symptoms do not impair the functional abilities necessary for driving**
Conditions for maintaining licence	None
Reassessment	• If the driver has no symptoms of the aneurysm, routine • Otherwise, to be determined on an individual basis
Information from health care providers	• Date of the surgery • Whether the driver experiences any symptoms of the aneurysm, and if yes, a description of the symptoms • Opinion of treating physician whether any symptoms may impair the functional abilities necessary for driving, and if yes, the results of any functional assessments the physician carried out, e.g. cognitive screen
Rationale	The waiting period for commercial drivers is longer than that for non-commercial drivers in order to provide more certainty about the success of surgery prior to a return to driving.

Chapter 5: Chronic renal disease

5.1 About chronic renal disease

Overview

Chronic renal (kidney) disease is a progressive disease involving deterioration and destruction of renal nephrons, with a progressive and usually permanent loss of renal function. Diabetes, hypertension and glomeruonephritis are leading causes of chronic renal disease. It is divided into five stages of increasing severity, as shown in the table below. The stages are based on a measurement of kidney function called the glomerular filtration rate (GFR).

Stages of Chronic Renal Disease

Stage	Description	GFR mL/min/1.73m^2
1	Slight kidney damage – normal or elevated GFR	More than 90
2	Kidney damage – mild decrease in GFR	60 to 89
3	Kidney damage – moderate decrease in GFR	30 to 59
4	Kidney damage – severe decrease in GFR	15 to 29
5	Kidney failure – dialysis or transplant required	Less than 15

5.2 Prevalence

The prevalence of chronic renal disease in the adult population in the United States is estimated to be 11% and it is assumed that the prevalence in Canada would be approximately the same. It is more prevalent in the elderly population.

Stage 5 of chronic renal disease (kidney failure) is also referred to as end–stage renal disease (ESRD), and is characterized by a total or near–total loss of kidney function where an individual requires dialysis or transplantation to stay alive. The prevalence rates for ESRD have increased substantially since 1997, most likely because of improved survival rates among high-risk populations, e.g. people with diabetes and hypertension, as well as improvements in management of ESRD, and the aging of the population.

5.3 Chronic renal disease and adverse driving outcomes

The evidence linking chronic renal disease with adverse driving outcomes is weak because there has been limited research in this area and the research that is available is either dated or has methodological limitations.

5.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach[5]	Primary functional ability affected	Assessment tools
Chronic renal disease (Stage 3 and 4) End-stage renal disease	Persistent impairment: Functional assessment	Variable - Cognitive and Motor May also result in general debility	Medical assessments Functional Assessment
Renal transplant	Persistent impairment: Functional assessment	Variable - Cognitive and Motor	Medical assessments Functional Assessment

Cognitive impairment

Evidence suggests that cognitive impairment is associated with chronic renal disease and that with increasing disease severity there is also a corresponding decrease in cognitive functioning, which may impair functional ability to drive.

The highest risk of cognitive impairment is for those with ESRD (stage 5). There is a small body of literature indicating that ESRD is associated with diminished perceptual motor-coordination, impairments in intellectual functioning including decreased attention and concentration, and memory impairments. Some studies indicate that individuals with ESRD have a 2 to 7 times higher prevalence of cognitive impairment and dementia compared to the general population.

There is also evidence of a significant risk of cognitive impairment for those in Stage 3 and 4 of chronic renal disease. There is no evidence to suggest that risk of cognitive impairment in the early stages (stage 1 and 2) is significant enough to impair driving.

Research indicates that cognitive impairment ranging from mild to severe is common and often undiagnosed in dialysis patients. In particular, between 30% and 47% of older patients undergoing treatment by hemodialysis or peritoneal dialysis were classified as cognitively impaired. In the general population, 8% of Canadians 65 and over have dementia and another 17% have some form of cognitive impairment. One study also indicated that physicians had a tendency to underestimate cognitive impairment in patients undergoing dialysis.

[5] See Part 1 for a discussion of the use of functional assessments for driver licensing decisions.

Improvement in cognitive performance has been reported in individuals who have undergone a kidney transplant.

General debility

Drivers with chronic renal disease, particularly end-stage renal disease, may develop general debility resulting in a loss of stamina required to support the functions necessary for driving.

5.5 Compensation

Drivers with chronic renal disease are not able to compensate for their functional impairment.

5.6 Guidelines for Assessment

5.6.1 Stage 1 to 4 renal disease (Commercial and Non-Commercial)

STANDARD	**All drivers are eligible for a licence if:** • **medical assessment shows no residual effects** • **the functional abilities necessary for driving are not impaired.**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Stage of renal disease • Functional limitiations if any Whether the driver is compliant with their current treatment regime
Rationale	Stage 1 or 2 renal disease is unlikely to cause impairment of the functions needed for driving. Drivers with stage 3 or 4 chronic renal disease are at significant risk for cognitive impairment that could impair their functional ability to drive.

5.6.2 Stage 5 – End-stage renal disease – All Drivers (Commercial and Non-Commercial)

STANDARD	**All eligible for a licence if** • **Complete medical assessment by treating physician shows no residual effects** • **The functional abilities necessary for driving are not impaired, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow prescribed dialysis regimen • Do not drive if dialysis treatment is delayed or circumstances do not allow for maintaining dialysis schedule • Remain under regular medical supervision by a treating physician to ensure that any progression of the disease or development of co-morbid conditions is monitored.
Reassessment	Reassess annually
Information from health care providers	• Stage of renal disease • Functional Limitations, if any • History of compliance with prescribed dialysis regimen • Opinion of treating physician on compatibility of work schedule with dialysis regimen • Whether the driver has insight into the impact their medical condition may have on driving • If known or applicable, whether the driver is compliant with any current conditions of licence
Rationale	Drivers with end-stage renal disease are at significant risk for cognitive impairment and general debility that could impair functional ability to drive. Regular dialysis is required to maintain overall functional ability.

5.6.3 Renal transplant

STANDARD	**All drivers eligible for a licence if** • **Complete medical assessment by treating physician shows no residual effects**
Conditions for maintaining licence	• None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Functional limitations, if any
Rationale	Even after a successful renal transplant, there may be persistent cognitive impairment that could impair functional ability to drive.

Chapter 6: Cognitive impairment including dementia

6.1 About cognitive impairment and dementia

Cognitive impairment, also called cognitive dysfunction or neuropsychological impairment, refers to any impairment of a cognitive function such as:

- memory
- attention
- language
- problem solving, or
- judgment.

Cognitive impairment may have any number of causes including:

- brain trauma
- anoxia (lack of oxygen to the brain)
- infection
- toxicities, or
- degenerative, metabolic or nutritional diseases.[6]

The presentation of cognitive impairment is variable depending on the cognitive functions affected and the degree of impairment. Cognitive impairment may progress to dementia, it may remain stable, or there may be a recovery of normal cognitive function.

Dementia

Dementia refers to a disorder characterized by memory impairment in conjunction with one or more other cognitive deficits. In North America, the most commonly used criteria for the diagnosis of a dementia are those articulated by the American Psychiatric Association. The defining features of dementia are:

A. The development of multiple cognitive deficits that include both

   (1) memory impairment (impaired ability to learn new information or to recall previously learned information), and

   (2) one or more of the following cognitive disturbances:

      i. aphasia (language disturbance)

[6] Persistent cognitive impairment in association with other medical conditions is referenced in the following chapters: Cardiovascular Diseases and Disorders, Cerebrovascular Disease, Intracranial Tumours, Psychotropic Drugs, Neurological Disorders, Psychiatric Disorders, Chronic Renal Disease, Respiratory Diseases, Sleep Disorders, Traumatic Brain Injury and Vestibular Disorders.

ii. apraxia (impaired ability to carry out motor activities despite intact motor function)

iii. agnosia (failure to recognize or identify objects despite intact sensory function), and

iv. disturbance in executive functioning (e.g. planning, organizing, sequencing, abstracting).

B. The cognitive deficits in criteria A (1) and (2) each cause significant impairment in social or occupational functioning and represent a significant decline from a previous level of functioning.

C. The deficits do not occur exclusively during the course of a delirium.

D. The deficits are not better accounted for by another Axis I disorder[7] (e.g. Major Depressive Episode, Schizophrenia).

Dementia has many causes and more than 100 types of dementia have been documented. The five most common types of dementia are:

- Alzheimer's disease
- vascular dementia (multi-infarct dementia)
- mixed Alzheimer's and vascular dementia
- dementia with Lewy bodies (Lewy body dementia), and
- frontotemporal dementia (Pick's disease or Pick's complex). Frontotemporal dementia may not meet all of the criteria noted for dementia, especially in the early stages, but may still result in significant functional impairment.

These types of dementia are all progressive and irreversible, and are characterized by impairments in multiple cognitive functions.

In Alzheimer's disease, the most common form of dementia, the earliest cognitive symptoms include difficulties in:

- recent memory
- word finding
- confrontation naming
- orientation, and
- concentration.

Characteristics of later stages include:

- slowed rates of information processing

[7] This refers to the classification of psychiatric disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). See Chapter 14, Psychiatric Disorders, for more information on this classification system.

- attentional deficits
- disturbances in executive functions, and
- impairments in language, perception and praxis.

Less commonly, dementias can result from:

- head injury and trauma
- brain tumours
- depression
- hydrocephalus (excessive accumulation of cerebrospinal fluid (CFS) in the brain)
- bacterial and viral infections
- toxic, endocrine and metabolic causes, or
- anoxia.

Some of these dementias may be reversible. Specific examples of reversible causes of dementia include:

- thyroid deficiency or excess
- vitamin B12 deficiency
- chronic alcoholism
- abnormal calcium levels
- dementia associated with celiac disease, and
- intracranial space-occupying lesions.

Treatment for dementia has become available over the last decade with cognition enhancing drugs such as donepezil (Aricept™), galantamine (Reminyl™) and rivastigmine (Exelon™). These drugs seem to improve symptoms of the disease in some stages of dementia but their therapeutic effect is variable. It is generally considered not likely that treatment with medication would improve cognition to a degree that would enable driving in those whose driving skills had declined to an unsafe level or those who had previously failed a driving assessment due to cognitive impairment.

Mild cognitive impairment

Mild cognitive impairment (MCI) is a term that usually refers to the transitional state between the cognitive changes associated with normal aging and the fully developed clinical features of dementia. The diagnostic criteria for MCI are evolving but in general it describes a cognitive decline that presents no significant functional impairment.

A simple summary of factors in determining degree of Dementia and Mild Cognitive Impairment include:

Mild cognitive Impairment (MCI) *(Some memory impairment but dementia not definitively diagnosed)*	**Mild Dementia**	**Moderate Dementia**	**Severe Dementia**
Forgets name, location of objects May have trouble finding words May have difficulty traveling to new locations May have difficulty with problems at work	Has difficulty with complex tasks or instrumental activities of daily living (eg finances, shopping, planning dinner, cooking, taking medication, telephoning etc.)	Has difficulty with basics activities of daily living (eg eating, dressing hygiene) Needs help choosing and putting on clothing Requires prompting and assistance when bathing	Decreased ability to use toilet and is incontinent Vocabulary limited Loses ability to walk and sit Unable to smile

Delirium

Delirium is a condition characterized by a disturbance of consciousness and a change in cognition that occurs over a relatively short period of time, usually hours to days. Common causes of delirium include:

- vascular disorders (e.g. stroke, myocardial infarct)
- infections (e.g. urinary tract, chest)
- drugs (e.g. analgesics, sedatives, alcohol, illicit drugs), and
- metabolic disorders (e.g. renal failure, hepatic failure, endocrine disorders).

Although the symptoms of delirium may be similar to dementia, delirium is temporary and therefore considered a transient impairment for licensing purposes.

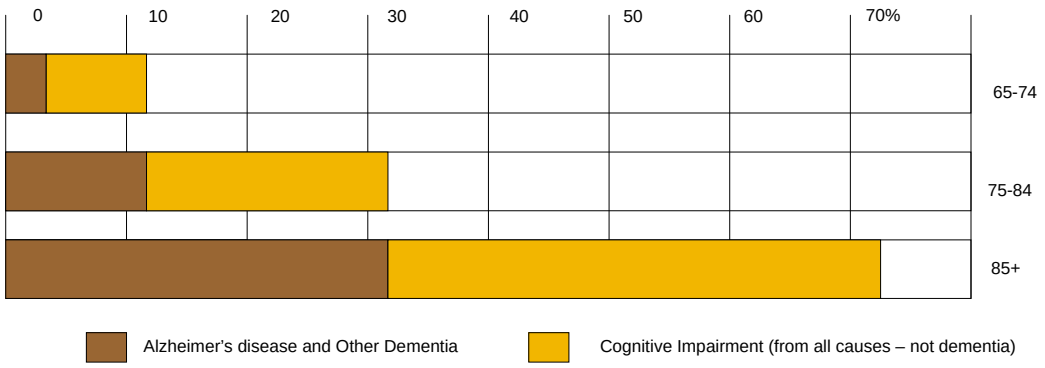
6.2 Prevalence

Estimates from the Canadian Study on Health and Aging (1991) suggest that 8% of all Canadians aged 65 and older meet the criteria for dementia, increasing to 34.5% for those 85 and older. A 2004 study projected that, in 2007, there would be 65,780 individuals with dementia in British Columbia, 44,130 of whom would have Alzheimer's disease.

In relation to cognitive impairment from any cause that has not been diagnosed as dementia, research indicates that the prevalence is 8% in individuals aged 65 to 74, increasing to 42% for those 85 and older.

The prevalence of both cognitive impairment (all causes – not dementia) and dementia increases with age. As shown in the table below, when combined, the prevalence of cognitive impairment and dementia is 12% in those 65 to 74 and more than 72% in those 85 and older.

Prevalence of Dementia and Cognitive Impairment[8]



6.3 Cognitive impairment, dementia and adverse driving outcomes

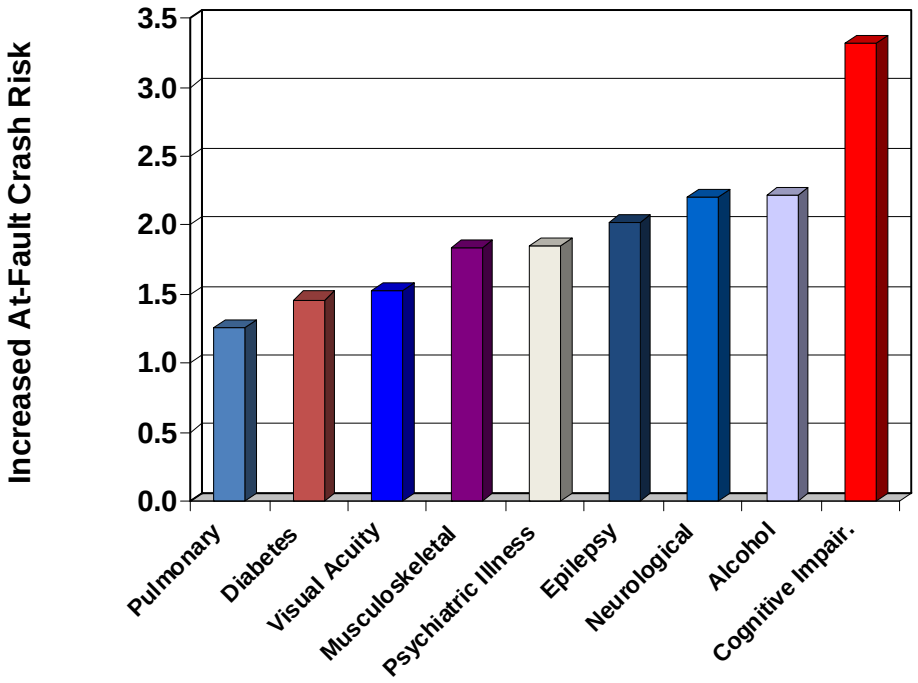
Research clearly indicates that, as a group, those with dementia are at higher risk for adverse driving outcomes. In particular, individuals with dementia who experience behavioural disturbances and who are treated with psychotropic medications (e.g. antipsychotics, antidepressants) may be at increased risk. It is important to note that studies also indicate that many individuals with dementia show no evidence of deterioration of driving skills in the early stages of their illness.

The significance of cognitive impairment and dementia in relation to other medical conditions was highlighted in a 1999 study done in Utah. This study compared citations, crashes and at-fault crashes for individuals with medical conditions to those for healthy controls matched for age, gender and county of residence. As shown in the graph below, the results indicated that individuals with cognitive impairment (including dementia) had at-fault crash rates that were more than 3 times higher than controls. In comparison, the

[8] Source: Canadian Study of Health and Aging, 1991

at-fault crash rate for those who had a history of alcohol or other drug abuse was 2 times higher than controls.

Risk of at-fault crash: selected medical conditions[9]



6.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Cognitive impairment Dementia	Persistent impairment: Functional assessment	Cognitive	Medical assessments Functional Assessment

Cognitive impairment or dementia may affect one or more of the cognitive functions required for driving.

[9] Source: Diller, E, Cook, L, Leonard, D, Reading, J, Dean, JM, Vernon, D. Evaluating drivers licensed with medical conditions in Utah, 1992-1996. DOT HS 809 023. Washington, DC: National Highway Traffic Safety Administration.

6.5 Compensation

Drivers with cognitive impairment or dementia are not able to compensate for their functional impairment.

6.6 Guidelines for assessment

6.6.1 Cognitive impairment or dementia

STANDARD	**Eligible for any class licence if** • **Complete medical assessment indicates cognitive functions necessary for driving are not impaired, or** • **where required, functional driving assessment shows condition does not affect ability to drive** • **Conditions for maintaining a licence are met**
Conditions for maintaining licence	Reassessment annually or as required
Reassessment	• Reassess annually if a driver has dementia or a cognitive impairment that is progressive • Otherwise, routine
Information from health care providers	• Nature or cause of the cognitive impairment • Opinion of treating physician whether the cognitive impairment is progressive • Various tools such as OT driving assessments, cognitive screens and road tests may be helpful in assessing whether an individual with cognitive impairment is eligible to hold licence.
Rationale	Functional assessment is required to determine if individual can drive safely.

6.6.2 Severe Dementia

STANDARD	**Ineligible for any class of licence**

Chapter 7: Diabetes - Hypoglycemia

7.1 About diabetes and hypoglycemia

Diabetes

Diabetes is a chronic and progressive disease characterized by hyperglycemia (high blood glucose). It appears in two principal forms[10]:

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

Type 1 and type 2 also differ in the underlying defect, and type of therapeutic control.

Type 1 diabetes

Type 1 diabetes can occur at any age, but it primarily appears before age 30. It 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

Type 2 diabetes usually occurs in individuals over the age of 40. It 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 combination with oral antihyperglycemic agents[11], but people with type 2 diabetes whose blood glucose cannot be controlled in this way require treatment with insulin.

Hypoglycemia

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.

---

[10] Other types of diabetes include gestational diabetes, other specific types (those due to genetic defects in β-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.

[11] Oral antihyperglycemics also may be referred to as oral hypoglycemics.

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.

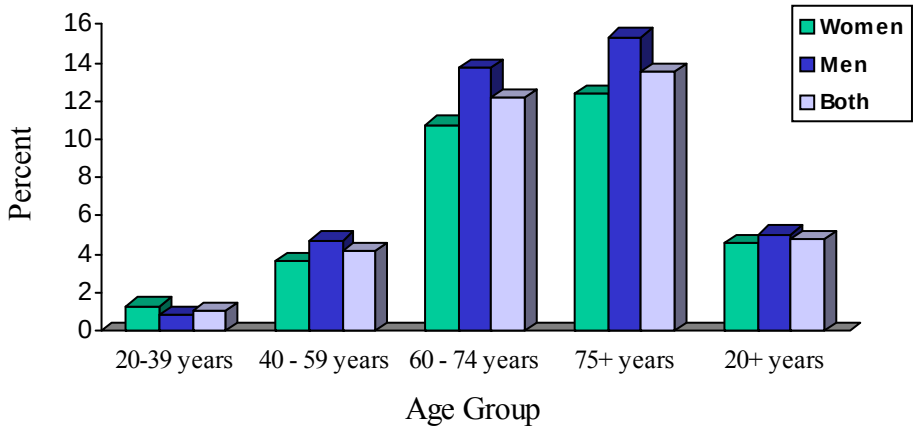
7.2 Prevalence

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 the figure 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



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.

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.

7.3 Diabetes and adverse driving outcomes

Over the last twenty years the scientific evidence on the relationship between diabetes and crash risk has evolved, in part as a reflection of better management and control. Although there is some variability in results of research on drivers with diabetes, there is clear evidence to show that both non-commercial 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
- incidence of hypoglycemia unawareness, and
- presence of chronic complications of diabetes.

7.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Severe hypoglycemia	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments

For individuals with diabetes, both acute and chronic complications of the disease may affect fitness to drive.

Hyperglycemia may cause blurred vision, confusion, and eventually diabetic coma. For the purposes of this standard, these are considered transient impairments.

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.

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. Over time, people with diabetes often develop co-morbidities caused by their prolonged exposure to hyperglycemia. These complications of diabetes include retinopathy, neuropathy, nephropathy, cardiovascular disease and peripheral vascular disease. Therefore, the effect of chronic complications always must be considered when assessing fitness to drive for people with diabetes.

7.5 Compensation

As severe hypoglycemia is an episodic impairment, a driver cannot compensate.

7.6 Guidelines for assessment

7.6.1 Type 2 diabetes – All drivers

- **treated with diet and exercise alone or**
- **oral medication - non insulin secretagogues medication, i.e. metformin or,**
- **oral medication - insulin secretagogues i.e. glyburide, diamicron**, etc

STANDARD	**<u>All drivers</u> eligible for any licence class if:** • **has good understanding if their condition** • **routinely follows their physicians instructions about diet, medication, glucose, glucose monitoring and hypoglycaemia prevention** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• remains under regular medical supervision to ensure that any progression in condition or development of chronic complications does not go unattended

	• stops driving and treat themselves immediately if hypoglycemia is identified or suspected • does not drive until at least 45 minutes after effective treatment if glucose level is between 2.5 and 4.0 mmol/L • report to the authority if begins insulin therapy
Reassessment	• Routine or more frequently at the discretion of the Authority
Information from health care providers	• Description of treatment
Rationale	Drivers with diabetes who are not treated with insulin or insulin secretagogues are at little or no risk for hypoglycemia. Because diabetes is a progressive condition, these drivers must remain under medical supervision and undergo a reassessment at the discretion of the authority. Drivers who begin insulin therapy are required to report because of the significant increase in risk for hypoglycemia associated with insulin therapy. The requirement to report is intended to ensure that drivers on insulin therapy meet the more stringent driver fitness standards and conditions for driving. Although there is some increased risk of hypoglycemia from the use of insulin secretagogues, the risk remains less than the risk from insulin therapy.

7.6.2 Type 1 or type 2 diabetes treated with insulin – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they understand their diabetic condition and the close interrelationship between insulin and diet and exercise, and** • **Routinely follow their physician's instructions about diet, medication, glucose monitoring, and hypoglycemia prevention and management** • **conditions for maintaining a licence are met**

Conditions for maintaining licence	• Remains under regular medical supervision to ensure that any progression in their condition or development of chronic complications does not go unattended • Stops driving immediately if hypoglycemia is identified or suspected • Does not drive when glucose level is below 4.0 mmol/L • Does not begin to drive when blood glucose level is between 4.0 and 5.0 mmol/L unless you first take prophylactic carbohydrate treatment • Does not drive until at least 45 minutes after effective treatment if glucose level is between 2.5 and 4.0 mmol/L • When on long drives, tests blood glucose immediately before driving and approximately every 4 hours while driving, and have an available source of rapidly absorbable glucose
Reassessment	• If blood glucose levels and treatment are not stable, reassess more frequently at the discretion of the Authority
Information from health care providers	• Description of treatment • Opinion of treating physician whether the driver understands their diabetic condition and the close interrelationship between insulin and diet and exercise
Rationale	Drivers with diabetes who are treated with insulin therapy are at risk for hypoglycemia. In addition to the conditions regarding how to avoid severe hypoglycemia while driving that apply to drivers treated with insulin secretagogues, there are additional conditions for checking and monitoring blood glucose. These conditions are based on guidelines published by the Canadian Diabetes Association.

7.6.3 Type 1 or type 2 diabetes treated with insulin – Commercial drivers

STANDARD	**Commercial driver eligible for a licence if** • **they obtain and retain an initial certificate of competency in blood glucose measurement from a specialist in diabetic care (when required) or a treating physician** • **Blood tests do not indicate uncontrolled diabetes, which are: hba1c > 12% or, > 10% of bg levels < 4.0 mmol/l** • **There is no significant change in insulin therapy (i.e. insulin was introduced , change in insulin type or number of injections) or, if there has been a significant change in therapy, monitoring and assessment indicate stable and effective blood glucose control** • **No evidence of inadequate blood glucose self-monitoring (unreliable or no home blood glucose measurement) or inadequate knowledge regarding causes, symptoms and treatment of hypoglycemia and,** • **Annual medical review** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• their work schedule is approved by their treating physician as compatible with their insulin regimen • carries a blood glucose self-monitoring equipment and an available source of rapidly absorbable glucose • tests blood glucose concentration 1 hour or less before driving and approximately every 4 hours while driving • doesn't begin or continue to drive if glucose level falls below 6 mmol/L (108 mg/dl), and doesn't resume driving until glucose level rises above 6.0 mmol/L after food ingested
Reassessment	• Annually
Information from health care providers	• Description of treatment

	• Whether the driver has an initial certificate of competency in blood glucose measurement **from a specialist in diabetic care (when required) or a treating physician** • Opinion of treating physician whether the driver's work schedule is compatible with their insulin regimen • Whether blood tests indicate uncontrolled diabetes • Whether there has been a significant change in insulin therapy. If there has been a significant change in insulin therapy, whether monitoring and assessment indicate a stable and effective blood glucose control. • Whether there is evidence of inadequate self-monitoring of blood glucose or inadequate knowledge of the causes, symptoms and treatment of hypoglycemic reactions
Rationale	Commercial drivers who are treated with insulin are at increased risk of experiencing hypoglycemia while driving. This is due to both their high level of driving exposure and to the nature of the driving task, which may make it more difficult for them to manage their blood glucose. The standard is focused on ensuring that these drivers have stable blood glucose levels and that they understand their condition and are able to effectively monitor and manage their blood glucose.

7.6.4 Episode of severe hypoglycemia – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **Treating physician indicates stable glycemic control re-established and authority determines are fit to drive. Time required to re-establish glycemic control varies individually** • **No further hypoglycemic episodes within past 6 months** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• must test blood glucose immediately before driving and approximately every hour while driving • doesn't begin or continue to drive if blood glucose falls below 6.0 mmol/L and doesn't resume driving until blood glucose rises above 6.0 mmol/L after food ingested
Reassessment	• Reassess based on opinion of the treating physician or at the discretion of the Authority
Information from health care providers	• Date of the hypoglycemic episode • Opinion of treating physician whether stable glycemic control has been re-established
Rationale	Severe hypoglycemia indicates a lack of glycemic control and the potential for further hypoglycemic episodes. Once control is re-established and driving resumes, more stringent glucose monitoring conditions are required temporarily to mitigate the increased risk of hypoglycemia.

7.6.5 Episode of hypoglycemia unawareness within past year – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **has been 3 months since the episode** • **treating physician indicates glycemic awareness regained and have stable glycemic control** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• must test blood glucose immediately before driving and approximately every hour while driving • doesn't begin or continue to drive if blood glucose falls below 6.0 mmol/L and doesn't resume driving until blood glucose rises above 6.0 mmol/L after food ingested
Reassessment	• Reassess based on opinion of the treating physician or at the discretion of the Authority
Information from health care providers	• Date of the episode • Opinion of treating physician whether glycemic awareness has been regained • Opinion of treating physician whether the driver has stable glycemic control
Rationale	Hypoglycemia unawareness greatly increases the risk for hypoglycemia while driving. This standard requires that glycemic awareness be re-established before driving resumes. Once awareness and glucose stability are re-established, more stringent glucose monitoring guidelines are required temporarily to mitigate the increased risk of hypoglycemia.

7.6.6 Persistent hypoglycemia unawareness – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **has been 3 months since the last episode of hypoglycemia** • **treating physician indicated stable glycemic control and takes steps to ensure they do not become hypoglycemic while driving** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• retains blood glucose log and reviews with treating physician at intervals physician feels necessary to monitor continued glycemic control • tests blood glucose levels immediately before driving and approximately every hour while driving • doesn't begin or continue to drive if blood glucose level falls below 6.0 mmol/L and doesn't resume driving until blood glucose rises above 6.0 mmol/L after food ingested
Reassessment	• Reassess based on opinion of the treating physician or at the discretion of the Authority
Information from health care providers	• Date of the last episode • Opinion of treating physician whether stable glycemic control has been re-established • Opinion of treating physician whether driver is willing and able to take steps to ensure they do not become hypoglycemic while driving
Rationale	Persistent hypoglycemia unawareness presents the greatest risk for hypoglycemia while driving. The standard permits non-commercial drivers to continue to drive provided they are able to maintain stable blood glucose levels and follow more stringent glucose monitoring requirements.

7.6.7 Episode of severe hypoglycemia – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **Treating physician indicates stable glycemic control re-established and authority determines are fit to drive. Time required to re-establish glycemic controls varies individually** • **No further hypoglycemic episodes within past 6 months** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• driver provides treating physician with blood glucose log of at least 4 readings per day for 30 days, where less than 5% of readings are below 4.0 mmol/L • must test blood glucose immediately before driving and approximately every hour while driving • doesn't begin or continue to drive if blood glucose falls below 6.0 mmol/L and doesn't resume driving until blood glucose rises above 6.0 mmol/L after food ingested
Reassessment	• Reassess based on opinion of the treating physician or at the discretion of the Authority
Information from health care providers	• Date of the hypoglycemic episode • Opinion of treating physician whether stable glycemic control has been re-established • Statement from treating physician that driver has provided 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
Rationale	Severe hypoglycemia indicates a lack of glycemic control and the potential for further hypoglycemic episodes. Once control is re-established and driving resumes, more stringent glucose monitoring conditions are required temporarily to mitigate the increased risk of hypoglycemia.

7.6.8 Episode of hypoglycemia unawareness in the last year– Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **has been 3 months since the episode** • **treating physician indicates glycemic awareness regained, has stable glycemic control and authority determines are fit to drive** • **conditions for maintaining a licence are met**
Conditions for maintaining licence	• driver provides treating physician with blood glucose log of at least 4 readings per day for 30 days, where less than 5% of readings are below 4.0 mmol/L • must test blood glucose immediately before driving and approximately every hour while driving • doesn't begin or continue to drive if blood glucose falls below 6.0 mmol/L and doesn't resume driving until blood glucose rises above 6.0 mmol/L after food ingested
Reassessment	• Reassess based on opinion of the treating physician or at the discretion of the Authority
Information from health care providers	• Date of the episode • Statement from treating physician that driver has provided 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 • Opinion of treating physician whether glycemic awareness has been regained • Opinion of treating physician whether the driver has stable glycemic control
Rationale	Hypoglycemia unawareness greatly increases the risk for hypoglycemia while driving. This standard requires that glycemic awareness be re-established before driving resumes. Once awareness and glucose stability are re-established, more stringent glucose monitoring guidelines are required temporarily to mitigate the increased risk of hypoglycemia.

7.6.9 Persistent hypoglycemia unawareness – Commercial drivers

STANDARD	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	Persistent hypoglycemia unawareness presents the greatest risk for hypoglycemia while driving. Given the increased driving exposure associated with commercial driving, individuals who have persistent hypoglycemia unawareness are not fit to drive.

7.6.10 Summary Table of Diabetes Conditions and Driver Medical Standards

Type II	Standard
Non-Commercial	Eligible for licence
Commercial	Eligible for licence
Type I or Type II Insulin-Treated	
Non-Commercial	Eligible for licence
Commercial	Eligible for licence • Annual Medical • Treating physician confirms diabetes controlled
Severe Hypoglycemia Episode	
Non-Commercial	Eligible for licence • no episodes within past 6 months, • Treating physician confirms stable glycemic control
Commercial	Eligible for licence • no episodes within past 6 months, • Treating physician confirms stable glycemic control
Episode of Hypoglycemic Unawareness	
Non-Commercial	Eligible for licence • No episode in past 3 months, • Treating physician confirms glycemic awareness regained
Commercial	Eligible for licence • No episode in past 3 months, • Treating physician confirms glycemic awareness regained
Persistent Hypoglycemic Unawareness	
Non-Commercial	Eligible for licence • No episode of hypoglycemia within past 3 months, • Treating physician confirms stable glycemic control
Commercial	**Ineligible to Drive**

Chapter 8: General debility and lack of stamina

8.1 About general debility and lack of stamina

General debility

General debility is a state of general weakness or feebleness that may be a result or an outcome of one or more medical conditions that produce symptoms such as pain, fatigue, cachexia and physical disability, or deficits in attention, concentration, memory, development and/or learning.

Some of the medical conditions included in this part may be commonly associated with general debility (e.g. end stage renal disease), and in these cases this is noted in the medical condition chapter. However, general debility is more usually associated with multiple medical conditions or extreme old age. Medications used to treat various medical conditions may also produce effects that contribute to general debility.

Common medical conditions not included in this document that may result in general debility are:

- anorexia nervosa or other related eating disorders
- chronic fatigue syndrome
- malabsorption syndromes (e.g. cystic fibrosis, Crohn's disease) and malnutrition
- AIDS
- chronic infections (e.g. TB, HIV)
- malignancies, and
- conditions resulting in chronic pain.
- Metabolic diseases such as: Thyroid Diseases, Pituitary Diseases and Adrenal Diseases.

Lack of stamina

Stamina is the physical or mental strength to resist fatigue and tiredness and maintain functional ability over time. Lack of stamina is not the same as general debility. While drivers with general debility do not have sufficient stamina to drive, drivers suffering from a lack of stamina may not be suffering from general debility.

Generally, concerns about stamina only arise in extreme old age or when a driver has a condition that results in a persistent impairment. For drivers with co-morbidities, stamina may be a particular concern.

Some of the medical conditions in this part may be commonly associated with a lack of stamina (e.g. congestive heart failure), and in these cases this is noted in the medical condition chapter.

8.2 Prevalence

No data are available on the prevalence of general debility or lack of stamina in Canada.

8.3 General debility, lack of stamina and adverse driving outcomes

No research is available on the relationship between general debility or a lack of stamina and driving outcomes.

8.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
General debility Lack of stamina	Persistent impairment: Functional assessment	Cognitive and Motor	Medical assessments Functional assessments

Both a lack of stamina and general debility may impair a driver's motor and/or cognitive functions necessary for driving.

A driver suffering from a lack of stamina may experience:

- fatigue
- physical disability, and/or
- cognitive impairment such as loss of attention, concentration and memory.

A driver suffering from general debility may experience:

- pain
- fatigue/poor stamina
- cachexia - a condition marked by loss of appetite, weight loss, muscular wasting, and general mental and physical debilitation
- physical disability, and/or
- cognitive impairment such as loss of attention, concentration and memory.

8.5 Compensation

A driver can not compensate for general debility or a lack of stamina that impairs the functions necessary for driving.

8.6 Guidelines for assessment

8.6.1 Frailty, weakness or general debility

STANDARD	**All drivers eligible for a licence if** • **the results of a functional assessment indicate that the functions necessary for driving are not impaired**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the Authority
Information from health care providers	• Description of any cognitive and/or motor impairments • Results of Functional Assessment
Rationale	Frailty, weakness or general debility may include one or more cognitive or motor impairments. Licensing decisions should be based on individual functional assessments.

Chapter 9: Hearing loss

9.1 About hearing loss

Hearing loss is categorized as either conductive or sensorineural. Conductive hearing loss involves abnormalities in the external or middle ear, including the ear canal, eardrum or ossicles. A blockage or other structural problem interferes with how sound gets conducted through the ear, making sound levels seem lower. In many cases, conductive hearing loss can be corrected with medication or surgery.

Sensorineural hearing loss typically results from permanent damage to the inner ear (cochlea) or the auditory nerve. Typically, it is gradual, bilateral, and characterized by the loss of high-frequency hearing. Sensorineural hearing loss is permanent and often is helped with hearing aids. Profound deafness can be treated with cochlear implants.

Sensorineural hearing loss accounts for 90% of all hearing loss.

9.2 Prevalence

The 2003 Canadian Community Health Survey (CCHS) indicated that 3% of Canadians 12 years of age and older have some type of hearing difficulty. The prevalence of hearing loss increases with age. In the CCHS, 5% of 65 to 69 year-olds reported hearing problems, with the percentage increasing to 23% of those 80 and older. Hearing loss is more common in men than in women across every age group.

9.3 Hearing loss and adverse driving outcomes

The effects of hearing loss on the ability to safely operate a motor vehicle are not well established. Although the overall body of literature examining the relationship between hearing loss and driving is small, since the 1990's there has been an increasing amount of research in this area. The results are equivocal. Some studies report an association between impairments in hearing and adverse driving outcomes while others have not found an association.

Although variability in methodology makes it difficult to draw conclusions across studies, results from studies indicate that, for the majority (70%) of study measures, no significant relationship was found between hearing loss and adverse driving outcomes (e.g. crashes, violations, convictions).

9.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Hearing loss	Persistent impairment: Functional assessment	Sensory - Hearing	Audiometric assessment

The effect of hearing loss on functional ability to drive has not been established.

9.5 Compensation

Drivers with hearing loss may compensate for this impairment using auditory aids.

9.6 Guidelines for Assessment

9.6.1 Hearing loss – Non-commercial drivers

STANDARD	**All drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	None
Rationale	There is insufficient evidence to support a minimum hearing requirement for non-commercial drivers.

9.6.2 Hearing loss – Commercial drivers

STANDARD	**Eligible for class 2 and 4 driver licence, and classes 1, 3 and 5 when transporting dangerous goods, if either:** • **Perceives a forced whispered voice at not less than 5 (1.5 metres) feet with or without the use of a hearing aid or,** • **Hearing loss no greater than 40dB averaged at 500, 1000, and 2000 Hz in their better ear**
Conditions for maintaining licence	• Wear hearing aid, if the driver must wear a hearing aid in order to meet the hearing standard
Reassessment	• Routine
Information from health care providers	• Results of a recent auditory testing
Rationale	For Classes 5 and 6, hearing loss should not constitute a barrier to driving ability. While the ability to hear or communicate is of paramount importance for the operator of a passenger bus, ambulance or other emergency vehicles (ie Classes 2 and 4), there are a number of factors which suggest it is inappropriate to apply the same requirement to the operator of a Class 1 or 3 motor vehicle. Consequently, it is suggested that the holder of a Class 2 or 4 driver licence and the operators of emergency vehicles be required to meet a hearing standard. It is also recommended individuals who hold a Class 1, 3 or 5 licence and are engaged in the transportation of dangerous goods meet the medical requirements corresponding to Classes 2 and 4 as stated above. While it is agreed that a degree of hearing would be beneficial for all motor vehicle operators, in the absence of empirical data, the totally deaf individual who is able to successfully complete the driving tests should be permitted to obtain or hold a Class 1, 3, 5 or 6 licence. The US FMCSA whisper test is described as: - For the whispered voice test, the individual should be stationed at least 5 feet from the examiner with the ear being tested turned toward the examiner. - The other ear is covered. - Using the breath which remains after a normal expiration, the examiner whispers words or random numbers such as 66, 18, 23, etc. - The examiner should not use only sibilants (s-sounding test materials). - The opposite ear should be tested in the same manner.

.

Chapter 10: Intracranial tumours

10.1 About intracranial tumours

Intracranial tumours are tumours that develop inside the cranium, the upper portion of the skull that protects the brain. Primary tumours are those which originate from within the cranium and metastatic tumours are those which result from cancers which spread (metastasize) from other parts of the body. Metastatic tumours are by far the more common type of intracranial tumour in adults, 10 times more common than primary tumours.

Primary tumours may be classified as either benign (non-cancerous) or malignant (cancerous). Malignant tumours are graded on a scale of 1 to 4, with grade 4 being the most severe, based on how abnormal they are compared to normal tissue and how quickly they are likely to grow and metastasize.

Typically, the treatment options for intracranial tumours are surgery, radiation and chemotherapy, alone or in combination, regardless of whether the tumour is primary or metastatic, benign or malignant. For primary tumours, the probability of successful treatment depends on a number of factors, including the type of tumour, size and location.

Treatment will rarely cure a metastatic tumour, and the goal of treatment is generally to reduce symptoms, increase length of survival and improve quality of life.

Impairments associated with intracranial tumours vary depending on the tumour type, location and rate of growth, and can affect cognitive, motor or sensory functions. Examples of possible impairments include:

- cognitive impairment
- epilepsy
- personality changes
- focal weakness, and
- sensory disturbances.

The presentation of impairments may be progressive or variable.

10.2 Prevalence

The overall incidence of intracranial tumours in the United States is between 5 and 14 per 100,000 people (all ages), with the peak incidence in those between 65 and 79 years of age. Canadian data are lacking.

10.3 Intracranial tumours and adverse driving outcomes

No studies on the effects of intracranial tumours on driving were found.

10.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Intracranial tumour	Persistent impairment: Functional assessment	Variable – cognitive, motor or sensory	Medical assessments Functional assessment
	Episodic impairment: Medical assessment – likelihood of impairment	Variable – sudden impairment (epilepsy)	Medical assessments

An intracranial tumour may result in a persistent cognitive, motor or sensory impairment, or an episodic impairment (epilepsy), or both.

10.5 Compensation

Drivers who have experienced a persistent impairment of motor or sensory function may be able to compensate. An occupational therapist, driver rehabilitation specialist, driver examiner or other medical professional may recommend specific compensatory vehicle modifications or restrictions based on an individual functional assessment.

Some examples of compensatory mechanisms are shown in the following table.

Motor impairment	Sensory (vision) impairment
• Steering wheel spinner knob • Restriction to automatic transmission or power-assisted brakes	• Scanning horizon more frequently • Turning head 90◦ to maximize area scanned • Large left and right side mirrors

10.6 Guidelines for assessment

10.6.1 Intracranial tumour

If a driver has epilepsy as a result of an intracranial tumour, also see the standards in Chapter 17.

STANDARD	**All drivers eligible for a licence if** • **movement and strength are sufficient to perform the functions necessary for driving** • **cognitive and visual functions necessary for driving are not impaired** • **any pain associated with the condition, and any treatment for the condition, do not impair the functional abilities necessary for driving** • **where required, a road test or other functional assessment indicates that the driver is able to compensate for any loss of functional ability necessary for driving, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive vehicles that have the permitted modifications and devices required to compensate for functional impairment
Reassessment	• Routine
Information from health care providers	• Whether the driver suffers from epilepsy as a result of the tumour. See the standards under Chapter 17 if epilepsy is present. • Opinion of treating physician on whether the driver has a loss of movement or strength that may affect functional ability to drive • Opinion of treating physician on whether pain or treatment may adversely affect functional ability to drive • Opinion of treating physician on whether the driver suffers from diplopia and/or a visual field deficit that may affect functional ability to drive. See the standards under Chapter 22 if the treating physician indicates that either of these conditions may be present. • Results of cognitive assessment • Where required, the results of a functional assessment
Rationale	The potential functional impairments associated with an intracranial tumour are variable.

Chapter 11: Musculoskeletal conditions

11.1 About musculoskeletal conditions

This chapter is concerned with diseases or injuries that have a persistent impact on the musculoskeletal system. Musculoskeletal refers to the system of muscles, tendons, ligaments, bones, joints, cartilage and other connective tissues. The musculoskeletal system is responsible for body movement and stability. Examples of chronic musculoskeletal conditions that may have a persistent impact on driving are:

- diseases of the joints, e.g. rheumatoid arthritis and osteoarthritis
- disabilities of the spine, e.g. degenerative disc disease or permanent injuries
- deformity, e.g. scoliosis, and
- loss of limb.

Some musculoskeletal conditions, or procedures to treat the conditions, may result in temporary impairment of the functions necessary for driving, including fractures, temporary braces and casts, hip and knee replacements, and various orthopedic surgeries. These are considered transient impairments and authorities do not assess drivers with transient impairments.

11.2 Prevalence

Statistics on the prevalence and incidence of musculoskeletal conditions in general are difficult to obtain because of the broadness of the category and the diversity of conditions within the category. Research suggests that musculoskeletal conditions are a leading cause of pain and physical disability. In Canada, the Ontario Health Survey (1994) found that musculoskeletal conditions are responsible for 54% of all long-term disability, 40% of all chronic conditions, and 24% of all restricted activity days. A study in the United States found that the leading causes of disability included back or spine problems, stiffness or deformity of limbs and arthritis.

Arthritis is an umbrella term referring to a group of more than 100 medical conditions. Two of the most common forms of arthritis are osteoarthritis (OA) and rheumatoid arthritis (RA). It is estimated that 9.6% of males and 18.0% of females 60 years of age and older worldwide have symptomatic OA.

RA also has a worldwide distribution with an estimated prevalence of 1 to 2%. Both the incidence and prevalence of RA increase with age and both are two to three times greater in women than in men.

11.3 Musculoskeletal conditions and adverse driving outcomes

Few studies have specifically examined the relationship between musculoskeletal conditions and impaired driving performance. As well, it is difficult to draw specific conclusions from this research because of differences in study design, outcome measures and the conditions studied, as well as limited measurement of the degree of impairment of the subjects.

Nonetheless, one broad conclusion that can be drawn is that many musculoskeletal conditions do appear to affect driving performance, often to a significant degree. In those studies that examined crash outcomes, the majority report elevated risk for crashes for those with musculoskeletal impairments. Two studies in particular (one a meta-analysis) identified that drivers with a musculoskeletal condition had crash rates that were 70% higher than those without musculoskeletal conditions.

Another important consideration for drivers with musculoskeletal conditions who are treated with non-steroidal anti-inflammatory drugs (NSAIDS) and/or narcotics is the effect of these drugs on driving performance. The effect of the use of NSAIDS and narcotics is discussed in Chapter 15, Psychotropic Drugs.

11.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach[12]	Primary functional ability affected	Assessment tools
Loss of limb Diseases of the joints Disabilities of the spine Deformity	Persistent impairment: Functional assessment	Motor	Medical assessments Functional assessment

Drivers operating motor vehicles of any class must be able to carry out many complex muscular movements swiftly, accurately and repeatedly in order to control a vehicle properly. Truck and bus drivers must also have good muscular strength and functional range of motion in both their arms and legs in order to handle these heavier vehicles.

Musculoskeletal conditions may cause a persistent impairment of motor functions necessary for driving. The specific impact on functional ability varies by condition and type of impairment. Functional abilities that may be affected include:

- muscular strength
- range of motion
- flexion and extension of upper and lower extremities
- joint mobility, and
- trunk and neck mobility.

[12] See Part 1 for a discussion of the use of functional assessments for driver licensing decisions.

Osteoarthritis has a considerable effect on functional ability, with the extent of the disability associated with the location and severity of the disease. For example, the risk for disability (defined as needing help walking or climbing stairs) attributable to OA of the knee is as great as that attributable to cardiovascular disease, and is greater than that due to any other medical condition in the aged population.

Functional disability is the major consequence of rheumatoid arthritis. Drivers with RA often experience a substantial loss of mobility due to pain and joint destruction. In the few studies that have examined the relationship between RA and driving performance, 25% - 50% of individuals with RA reported difficulties with aspects of the driving task such as steering, cornering, reversing, head turns and shoulder checks.

11.5 Compensation

Drivers with musculoskeletal conditions may be able to compensate for functional impairment through strategies and/or vehicle modifications.

Strategies

For loss of limb, a driver may compensate through the use of a prosthetic device when driving. Other strategies that do not require vehicle modifications may also be used to compensate, for example, rotating the upper body in order to check side view mirrors if the driver's neck lacks sufficient mobility. The effectiveness of individual strategies may be determined through a road test.

Vehicle modifications

Drivers with musculoskeletal conditions may be able to compensate for a functional impairment by driving a vehicle that has been modified to address their impairment. Compensatory vehicle modifications can include modifications to driving controls (e.g. hand controlled throttle and brake) or the use of additional mirrors.

An occupational therapist, driver rehabilitation specialist, driver examiner or medical professional may recommend specific compensatory vehicle modifications based on an individual functional assessment. They are familiar with the full range of possible vehicle modifications and what is appropriate for the type of musculoskeletal condition. Listed below are examples of some possible vehicle modifications.

Musculoskeletal condition	**Possible vehicle modifications**
Some degree of loss of movement of the head and neck	Left and right outside mirrors Rear view cameras
Missing lower limb	Hand controls Left foot accelerator
Amputation or deformity of either arm	Power assisted steering Mechanical devices to permit all hand controls to be operated by the normal hand

There is little empirical research that considers the relationship between vehicle modifications and adverse driving outcomes. The effectiveness of individual vehicle modifications may be determined through a road test.

11.6 Guidelines for assessment

11.6.1 Loss of upper or lower extremities

STANDARD	**All drivers eligible for a licence if** • **a road test indicates ability to compensate for any loss of functional ability required for driving, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive vehicles that have the permitted modifications and devices required to compensate for functional impairment
Reassessment	• If the loss of limb is due to a progressive medical condition, reassess as per the standards for that condition • Otherwise, routine
Information from health care providers	• Results of a road test in a vehicle with the permitted modifications or devices required • Health professional's opinion as to whether the driver has insight into the impact their loss of limb may have on driving
Rationale	The impact of a loss of limb on fitness to drive is variable and must be determined by an individual functional assessment.

11.6.2 Chronic musculoskeletal condition

Chronic musculoskeletal conditions include diseases of the joints, disabilities of the spine and deformity.

STANDARD	**All drivers eligible for a licence if** • **the driver retains sufficient movement and strength to perform the functions necessary for driving** • **pain associated with the condition, or the drugs used to treat the condition, do not adversely affect ability to drive safely** • **where required, a road test or other functional assessment indicates ability to compensate for any loss of functional ability required for driving, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive vehicles that have the permitted modifications and devices required to compensate for any functional impairment
Reassessment	• Routine
Information from health care providers	• Opinion of treating physician on whether the driver has a loss of range of motion or strength that may affect functional ability to drive • Opinion of treating physician on whether pain or drugs may adversely affect functional ability to drive • Where required, the results of a functional assessment • Opinion of treating physicians as to whether the driver has insight into the impact their condition may have on driving • History of compliance with prescribed treatment regime • If known or applicable, whether the driver is compliant with any current conditions of licence related to their condition
Rationale	The impact of a chronic musculoskeletal condition on fitness to drive is variable and must be determined by an individual functional assessment.

Chapter 12: Neurological disorders

12.1 About neurological disorders

Neurological disorders can affect the brain, spinal cord, nerves and muscles. They can affect an individual's ability to think, see, communicate, move, and sense and coordinate movements. While any number of conditions fall within the category of neurological disorders, this chapter focuses on three common disorders: multiple sclerosis, Parkinson's disease and cerebral palsy.

Multiple sclerosis

Multiple sclerosis (MS) is believed to be an autoimmune disorder in which the immune system attacks specific structures of the central nervous system (brain and spinal cord), resulting in inflammation, demyelination and axonal damage. Myelin is an essential insulation sheath of the nerve processes (axons). If it is damaged, signal transmission is slowed. Demyelination can ultimately result in permanent axonal damage in the form of scars and is called gliosis.

MS has an unpredictable and chronic course, leading to numerous physical and cognitive impairments. The cause is unknown. There are four clinical types of MS:

- Relapsing – Remitting (RRMS)
- Secondary Progressive (SPMS)
- Primary Progressive (PPMS), and
- Progressive Relapsing (PRMS).

Relapsing – Remitting (RRMS)

It is estimated that 55% of individuals with MS have RRMS. It is characterized by unpredictable attacks (relapses) followed by periods of months to years with no new clinical signs of disease activity (remissions). Impairments suffered during relapses may either resolve or become permanent. Approximately 10% of those with RRMS have "benign MS," where impairments usually completely resolve between relapses and no disability is present after 10 years of disease onset. The longer a person has MS, the greater the probability that the relapses will not completely resolve and they will experience increasing disability.

RRMS accounts for over 90% of initial diagnoses of MS, but in many cases a different type emerges as the disease progresses. Approximately 50% of individuals with RRMS will eventually progress to Secondary Progressive MS within 10 years of disease onset.

Secondary Progressive (SPMS)

It is estimated that 30% of individuals with MS have SPMS. It is characterized by an initial presentation as RRMS, transitioning to a gradual progression of disability with or

without superimposed relapses and minor remissions. Relapses may include new neurologic symptoms or worsening of existing symptoms. Of all the types of MS, SPMS causes the greatest amount of disability.

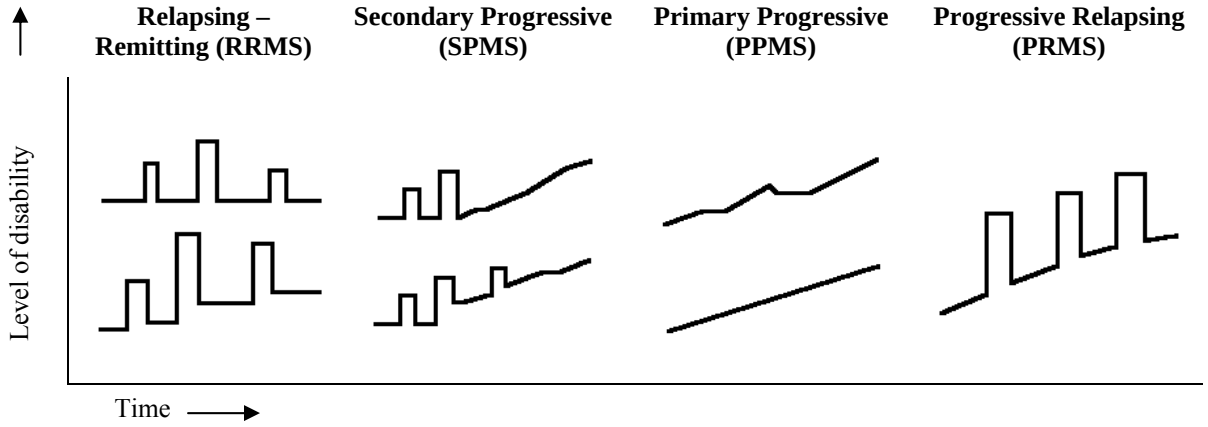
Primary Progressive (PPMS)

It is estimated that 10% of individuals with MS have PPMS. It is characterized by a gradual progression of disability with no relapses and minor remissions from onset. The spinal cord is the area of the central nervous system primarily affected; therefore, cognitive impairments are unusual.

Progressive Relapsing (PRMS)

It is estimated that 3% to 5% of individuals with MS have PRMS. PRMS is characterized by a steady progression of disability with superimposed relapses and remissions. There may be significant recovery immediately following a relapse, but between relapses there is a gradual worsening of symptoms.

The following illustration compares the course of disability over time for each of the four types of MS.[13]



Parkinson's disease

Parkinson's disease (PD) belongs to a group of conditions called motor system or movement disorders, which result from the slowly progressive loss of dopamine-producing brain cells. The lack of dopamine, a neurotransmitter, interferes with the transmission of messages from the brain to nerve cells that control muscle movement and coordination. It can result in motor impairment (tremor or rigidity), and in later stages, in cognitive or autonomic dysfunction. PD is chronic and progressive, and while the

[13] Source: The Multiple Sclerosis Information Trust, http://www.mult-sclerosis.org.

specific cause is unknown, it is believed that both genetic and environmental factors contribute to the development of the disease.

Cerebral palsy

Cerebral palsy refers to any one of a number of neurological disorders that appear in infancy or early childhood and are the result of damage to, or impaired development of, the motor centres of the brain. It is a non-progressive disorder that permanently affects body movement and muscle coordination.

12.2 Prevalence

Multiple sclerosis

The prevalence of MS in Canada is among the highest in the world, with studies reporting prevalence rates from 55 to 240 per 100,000. A recent study using data from the 2001 Canadian Community Health Survey reported an overall weighted estimate of 240 per 100,000 adults (0.24%).[14]

MS is twice as likely to affect women as men, with the highest incidence occurring in individuals in their late 30s, and the highest prevalence among those in their 40s and 50s.

Parkinson's disease

Estimated prevalence rates for Parkinson's disease vary widely depending on the population sampled and the methodology used. Age-adjusted prevalence rates in Canada have been reported as 125 per 100,000 (1.25%).

Cerebral palsy

The prevalence of cerebral palsy (CP) in Canadian infants is approximately 2 in 1000, with over 50,000 Canadians currently living with the disorder. The number of individuals with CP has risen slightly over the past 30 years due to higher survival rates of affected newborns as care and treatment have improved.

12.3 Neurological disorders and adverse driving outcomes

Multiple sclerosis

The research on MS and driving is limited. The results of this research indicate that driving performance may be impaired by functional deficits, including cognitive impairment, caused by MS.

[14] Weighted estimate means that the results from the data are adjusted (weighted) from the sampling design using national population data.

Parkinson's disease

There is a small but consistent body of research indicating that functional deficits associated with Parkinson's disease or its treatment may impair driving performance.

Cerebral palsy

There has been no research on the effects of cerebral palsy and driving outcomes.

12.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Multiple sclerosis Parkinson's disease Cerebral palsy	Persistent impairment: Functional assessment	Variable – cognitive, motor or sensory	Medical assessments Functional assessment

Multiple sclerosis

MS can affect motor, visual and cognitive functioning. The major symptoms associated with MS that may affect driving are:

- ataxia (wobbliness, incoordination and unsteadiness)
- impaired proprioception (ability to perceive the body's position in space)
- spasticity (involuntary muscle spasms)
- muscle weakness
- fatigue
- chronic pain
- vision problems, and
- cognitive impairment.

Vision problems are common, affecting up to 80% of individuals with MS at some point. Visual symptoms associated with MS include:

- nystagmus (rapid, involuntary eye movement)
- diplopia (double vision)
- blurred vision
- scotoma (abnormal blind spot), and

- diminished contrast sensitivity.

Cognitive impairment, particularly associated with information processing speed, is also common, affecting between 45% and 65% of those with the disease.

Medications used to treat MS that may affect driving include:

- corticosteroids
- NSAIDS
- antiepileptics
- antidepressants
- antispasticity drugs, and
- opioids.

See Chapter 15, Psychotropic Drugs, for more information on these medications.

Parkinson's disease

PD can affect motor, visual and cognitive functioning. Common motor symptoms include:

- tremor
- rigidity
- bradykinesia/akinesia (slowness or absence of movement/rapid repetitive movements), and
- postural instability.

Visual impairments such as contrast sensitivity, diplopia (double vision) and impaired eye movement are sometimes seen in PD and related movement disorders. Cognitive symptoms may include:

- psychiatric conditions such as depression, impulse control disorders and psychosis
- sleep disturbances
- psychomotor slowing (slow response and reaction time)
- cognitive impairment, and
- dementia.

In addition to the symptoms noted above, fatigue and sleep disturbances are common in those with PD.

The symptoms of PD are often treated with medications including levodopa, dopamine agonists and MAO-B inhibitors. These medications can cause side effects including sleepiness, sleep attacks (sudden, overwhelming sleepiness with little or no warning signs) and visual hallucinations, which may affect driving.

A further consideration for driving is the fluctuation in the effects of medication. Individuals with advanced PD may experience periods of reduced symptom control (wearing off) near the time of their next dose of medication.

Cerebral palsy

CP can affect motor, visual, and cognitive functioning. The primary effects of CP are:

- ataxia (wobbliness, incoordination and unsteadiness)
- weakness and spasticity (involuntary muscle spasms), and
- altered muscle tone that is either too stiff or too floppy.

CP can also cause a loss of visual acuity or slowed visual tracking, as well as cognitive impairments such as impaired judgment and slow processing or reaction times.

12.5 Compensation

Drivers who have experienced a persistent impairment of motor or sensory function may be able to compensate. An occupational therapist, driver rehabilitation specialist, driver examiner or other medical professional may recommend specific compensatory vehicle modifications or restrictions based on an individual functional assessment.

Some examples of compensatory mechanisms are shown in the following table.

Motor impairment	**Sensory (vision) impairment**
• Steering wheel spinner knob • Restriction to automatic transmission or power-assisted brakes	• Scanning horizon more frequently • Turning head 90◦ to maximize area scanned • Large left and right side mirrors

12.6 Guidelines for assessment

12.6.1 Neurological disorder

STANDARD	**All drivers eligible for a licence if** • **range of motion, strength and coordination are sufficient to perform the functions necessary for driving** • **cognitive functions necessary for driving are not impaired** • **any pain associated with the condition, and any drugs used to treat the condition, do not impair the functional abilities necessary for driving** • **where required, a road test or other functional assessment indicates that the driver is able to compensate for any loss of functional ability necessary for driving, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive vehicles that have the permitted modifications and devices required to compensate for functional impairment
Reassessment	• Reassess a minimum of every 5 years if the disorder is progressive (e.g. MS or PD) • Routine if the disorder is not progressive (e.g. CP)
Information from health care providers	• Opinion of treating physician on whether the driver has a loss of range of motion, strength or coordination that may affect functional ability to drive • Opinion of treating physician on whether pain or drugs may adversely affect functional ability to drive • Where required, the results of cognitive assessment • Where required, the results of a functional assessment
Rationale	The potential functional impairments associated with neurological disorders are variable.

Chapter 13: Peripheral vascular diseases

13.1 About peripheral vascular diseases

Overview

The term peripheral vascular diseases (PVDs) refers to circulatory disorders involving any of the blood vessels outside the heart, e.g. arteries, veins and lymphatics of the peripheral vasculature. The four subcategories of PVDs that have the greatest relevance for driving are:

- peripheral arterial disease
- aneurysms
- dissections, and
- deep vein thrombosis.

Peripheral arterial disease

Peripheral arterial disease (PAD) is characterized by partial or complete failure of the arterial system to deliver oxygenated blood to peripheral tissue. Atherosclerosis is the primary underlying cause of PAD. Other causes include thrombembolic, inflammatory or aneurismal disease. Although PAD can affect both upper and lower extremities, lower extremity involvement is more common. A large majority (70% to 80%) of individuals with PAD are asymptomatic. For those individuals who are symptomatic, symptoms can progress from intermittent claudication (pain while walking) to rest/nocturnal pain, to necrosis/gangrene. Only 1% to 2%, however, progress to limb amputation within 5 years of the original diagnosis.

Aneurysms

An aneurysm is defined as a localized abnormal dilation of an artery by 50% above the normal size. Although an aneurysm can form on any blood vessel, abdominal aortic aneurysms (AAA) are most common, with 90% occurring below the renal arteries. Others include those occurring in the thoracic aorta (ascending 5%; aortic arch 5%; descending 13%), those in the combined thoracic and abdominal aorta (14%) and iliac aneurysms (isolated 1%; combined abdominal and iliac 13%).

Aortic dissection

Aortic dissection is a different disease to aortic aneurysm. Most dissections are in apparently normal aortas, are sudden and often present with collapse. Apart from some congenital conditions which predispose to dissections, e.g. Marfan's, there is no way to predict an aortic dissection.

Deep vein thrombosis

Deep vein thrombosis (DVT) occurs when a thrombus (blood clot) forms within a deep vein, most commonly in the calf. Three main factors (known as Virchow's triad) can contribute to deep vein thrombosis: injury to the vein's lining, an increased tendency for blood to clot, and slowing of blood flow.

13.2 Prevalence

Peripheral arterial disease

Estimates of the prevalence of PAD depend on populations studied and study methodology. The general prevalence rate is reported to be 10%. However, because most individuals remain asymptomatic, the true overall prevalence rate is likely to be considerably higher. The prevalence of PAD increases with age and with prolonged exposure to smoking, hypertension and diabetes.

Recent studies indicate that PAD affects approximately 20% of adults 55 years of age and older and an estimated 27 million persons in North America and Europe. Intermittent claudication is the most common symptom associated with PAD. The prevalence of intermittent claudication increases dramatically with age. The incidence in the general population is less than 1% of those under the age of 55, and increases to 5% for those 55 to 74 years of age. At younger ages, the prevalence rate is almost twice as high for males as for females but, at the older ages, the difference between males and females is reduced. Risk factors for lower extremity PAD are:

- age less than 50 years, with diabetes and one other atherosclerosis risk factor (smoking, dyslipidemia, hypertension or hyperhomocysteinemia)
- age 50 to 69 years and history of smoking or diabetes
- age 70 years and older
- leg symptoms with exertion (suggestive of claudication) or ischemic rest pain
- abnormal lower extremity pulse examination, and
- known atherosclerotic coronary, carotid or renal artery disease.

Abdominal aortic aneurysms

Based on results from a population-based study completed in 2001, the prevalence of abdominal aortic aneurysms is approximately 9% for males and 2.2% for females. Prevalence increases with age and is higher in close family relatives of those affected. Prevalence also is higher in individuals with cardiovascular risk factors such as cigarette smoking, hypertension and hypercholesterolemia.

Deep vein thrombosis

The prevalence of DVT is estimated to be < 0.005% in individuals less than 15 years of age, and increases to approximately 0.5% for individuals 80 years of age and older. Approximately one-third of patients with symptomatic DVT will develop a pulmonary

embolism, which is the obstruction of the pulmonary artery, or a branch of it leading to the lungs, by a blood clot.

13.3 Peripheral vascular diseases and adverse driving outcomes

There are no studies that consider a relationship between peripheral vascular diseases and risk of crash.

13.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Peripheral arterial disease – severe claudication	Persistent impairment: Functional assessment	Sensorimotor Motor	Medical assessments Functional assessment
Abdominal aortic aneurysm	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments
Aortic dissection	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments
DVT - may result in pulmonary embolism	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments

Peripheral arterial disease

For drivers with peripheral arterial disease, the chronic outcomes of the disease will rarely affect driving ability. The symptoms of lower extremity PAD such as coldness or numbness in the foot or toes and, in the later stages, pain while the extremity is at rest, may affect the sensory and motor functions required for driving.

In general, the degree of impact will be determined by disease severity. For example, drivers who are asymptomatic or have mild to moderate claudication are unlikely to have symptoms that would affect driving. Drivers whose disease has progressed to the severe claudication stage or higher may have functional impairment sufficient to interfere with the lower extremity demands of operating a motor vehicle (e.g. awareness of foot placement, pedal pressure, motor strength, etc.).

Abdominal aortic aneurysm and aortic dissection

For drivers with an abdominal aortic aneurysm, acute complications may affect driving ability. The primary concern with an abdominal aortic aneurysm is the risk of rupture.

The majority of aneurysms are asymptomatic and research suggests that there are few or no symptoms prior to rupture. There is limited data on the immediate functional outcomes of rupture (e.g. loss of consciousness). In the absence of firm data, it is assumed that most drivers experiencing a rupture lose consciousness almost immediately. As with AAA, the primary concern for a driver with an aortic dissection is the risk of rupture.

Size and rate of expansion of abdominal aortic aneurysms and aortic dissections are determined by sequential CT or Ultrasound imaging. Only the anterior-posterior or transverse diameter is predictive of rupture; the length of the aneurysm has no relation to rupture.

Deep vein thrombosis

For drivers with deep vein thrombosis (DVT), acute complications may affect driving ability. The primary concern with DVT is the risk of sudden incapacitation due to a pulmonary embolism.

13.5 Compensation

Drivers are not able to compensate for the effects of an AAA, aortic dissection or DVT.

Drivers with an amputation resulting from PAD may be able to compensate for functional impairment through strategies and/or vehicle modifications. For example:

- for loss of limb, a driver may compensate through the use of a prosthetic device when driving
- drivers with PAD may be able to compensate for a functional impairment by driving a vehicle that has been modified to address their impairment. Compensatory vehicle modifications can include modifications to driving controls (e.g. hand controlled throttle and brake).

An occupational therapist, driver rehabilitation specialist, driver examiner or other medical professional may recommend specific compensatory vehicle modifications based on an individual functional assessment.

13.6 Guidelines for assessment

13.6.1 Peripheral arterial disease

If a driver has lost a limb due to peripheral arterial disease, also see standard 11.6.1.

STANDARD	**All drivers eligible for a licence if** • **the peripheral arterial disease is successfully treated**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the authority
Information from health care providers	• Opinion of treating physician on whether there is severe claudication or foot and leg symptoms that may impair functional ability to drive • Where required, the results of a functional assessment • Opinion of the treating physician regarding whether the driver has insight into the impact their medical condition may have on driving • Whether the driver is compliant with their current treatment regime
Rationale	Where peripheral arterial disease results in a functional impairment, the impact of the impairment on driving should be determined by an individual functional assessment.

13.6.2 Abdominal aortic aneurysm or medically treated aortic dissection – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **the aneurysm or dissection is not at the stage of imminent rupture as determined by size, location or recent change, and** • **for <u>men</u>, the diameter of the aneurysm or dissection is < 6.5 cm and the conditions for maintaining a licence are met, or** • **for <u>women</u>, the diameter of the aneurysm or dissection is < 6 cm and the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regular review by a physician
Reassessment	Reassessment periods depend on the size of the AAA. Suggested frequencies are: • If the diameter is over 5 cm, reassess annually • If the diameter is between 4 and 5 cm, reassess every 2 years • If the diameter is under 4 cm, reassess every 5 years
Information from health care providers	• Size of aneurysm or dissection • Whether condition is regularly reviewed
Rationale	The primary concern with AAA and aortic dissection is the risk of rupture. The risk of rupture increases with the size of the aneurysm. The size threshold for non-commercial drivers has been set at just over the point at which surgery to repair the aneurysm or dissection is generally considered advisable given the risk of rupture. Aneurysms less than 5 cm in diameter have an annual incidence of rupture of 4.1%, which increases to 6.6% in aneurysms between 5 and 5.7 cm. Aneurysms larger than 7 cm in diameter have 19 percent per year incidence of rupture. This means that most patients (75%) with this size of aneurysm will have a rupture within 5 years.

13.6.3 Abdominal aortic aneurysm or medically treated aortic dissection – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **the aneurysm or dissection is not at the stage of imminent rupture as determined by size, location or recent change, and** • **for <u>men</u>, the diameter of the aneurysm or dissection is < 6 cm and the conditions for maintaining a licence are met, or** • **for <u>women</u>, the diameter of the aneurysm or dissection is < 5.5 cm, and the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Regular review by a physician
Reassessment	Reassessment periods depend on the size of the AAA. Suggested frequencies are: • If the diameter is over 4 cm, reassess annually • If the diameter is between 3 and 4 cm, reassess every 2 years • If the diameter is under 3 cm, reassess every 3 years
Information from health care providers	• Size of aneurysm or dissection • Whether condition is regularly reviewed
Rationale	The primary concern with AAA and aortic dissection is the risk of rupture. The risk of rupture increases with the size of the aneurysm. The size threshold for commercial drivers has been set at the point at which surgery to repair the aneurysm or dissection is generally considered advisable given the risk of rupture. This threshold is lower than the threshold for non-commercial drivers to reflect the additional risk presented by the increased driving exposure for commercial drivers. Aneurysms less than 5 cm in diameter have an annual incidence of rupture of 4.1%, which increases to 6.6% in aneurysms between 5 and 5.7 cm. Aneurysms larger than 7 cm in diameter have 19 percent per year incidence of rupture. This means that most patients (75%) with this size of aneurysm will have a rupture within 5 years.

13.6.4 Surgically repaired abdominal aortic aneurysm or surgically treated aortic dissection

STANDARD	**All drivers eligible for a licence if** • **the abdominal aortic aneurysm has been surgically repaired, or the aortic dissection has been surgically treated, and** • **the treating physician supports a return to driving**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Opinion of the treating physician whether the surgery was successful in repairing the aneurysm or treating the dissection
Rationale	The primary concern with AAA and aortic dissection is the risk of rupture. Successful surgery to repair an aneurysm or dissection will significantly reduce the risk of rupture. Surgical repair is considered where an aneurysm is greater than 5.5 cm. A recent study suggests that women's aneurysms rupture at smaller sizes, leading to the conclusion that the 5.5 cm threshold for surgical repair is likely too large for women and 5 cm has been suggested as the appropriate level.

13.6.5 Deep vein thrombosis

STANDARD	**All drivers eligible for a licence if** • **treated with an anticoagulant, and** • **treating physician states that the treatment is effective**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Whether the driver is being treated with an anticoagulant • Treating physician's opinion that the DVT has been successfully treated • Whether the driver has insight into the impact their medical condition may have on driving • Whether the driver is compliant with their current treatment regime
Rationale	The primary concern with DVT is the risk of sudden incapacitation due to a pulmonary embolism

Chapter 14: Psychiatric disorders

14.1 About psychiatric disorders

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)[15], published by the American Psychiatric Association, contains a standard classification system of psychiatric disorders for health care professionals in the United States and Canada. It classified psychiatric disorders by diagnostic category, based on five axes. The five axes, a summary of the diagnostic category for each, and some common disorders falling within each axis are provided in the table below.

Psychiatric Disorders: Axes, Diagnostic Categories and Common Disorders
(DSM-IV-TR, American Psychiatric Association, 2000)

Axis	Diagnostic Category	Examples
Axis I	Clinical disorders, including major mental disorders, as well as developmental and learning disorders	• Delirium, dementia and other cognitive disorders • Substance related disorders • Mood disorders (Major Depressive Disorder, Bipolar Disorders, Dysthymia) • Anxiety disorders • Attention-Deficit/Hyperactivity Disorder • Schizophrenia
Axis II	Personality disorders, as well as mental retardation	• Borderline Personality Disorder • Schizotypal Personality Disorder • Anti-social Personality Disorder • Narcissistic Personality Disorder
Axis III	Acute medical conditions and physical disorders	• Diseases of the nervous, circulatory, musculoskeletal, etc. systems
Axis IV	Psychosocial and environmental factors contributing to the disorder	• Relationship, social, educational, occupational, housing or financial problems may precipitate or aggravate a mental disorder
Axis V	Global assessment of Functioning	• A rating scale, from 0 to 100, used to report on impairment due to psychiatric disorder

This chapter is concerned with Axis I and Axis II disorders. Axis III focuses on general medical conditions. Those conditions with relevance to driving safety are addressed in other chapters of this document. Axis IV addresses external factors that may impact a driver's physical or psychological health and are not addressed in this document. Axis V, the Global Assessment of Functioning, is a 0 to 100 scale used for reporting a clinician's

[15] DSM-IV-TR was published in 2000. Publication of the DSM-V is expected in 2013.

judgment of an individual's level of psychological, social and occupational functioning in light of any impairment due to psychiatric disorders. A low score is a red flag for potential impairment of functions necessary for driving.

Delirium, dementia, and other cognitive disorders (Axis I)

The effects of delirium, dementia and other cognitive disorders on driving are covered in Chapter 6, Cognitive Impairment including Dementia.

Substance-use disorders (Axis I)

Substance-use disorders refer to the taking of a drug of abuse (including alcohol). Substances include alcohol, amphetamines, cannabis, cocaine, hallucinogens, sedatives, hypnotics and anxiolytics. Alcohol and illicit drug use disorders are not considered in this document. The effects of drugs commonly prescribed for medical conditions are addressed in Chapter 15, Psychotropic Drugs.

Mood disorders - Major Depressive Disorder, Bipolar Disorder, Dysthymia (Axis I)

Major Depressive Disorder (single episode or recurrent), Bipolar Disorders (Manic, Depressed or Mixed types) and Dysthymic Disorder are collectively referred to as mood disorders.

Major Depressive Disorder is characterized by one or more episodes of depressed mood or loss of interest in usual activities, as well as four additional symptoms of depression, with the episodes lasting for two or more weeks. Additional symptoms of depression include:

- change in appetite
- sleep disturbances
- decreased energy or fatigue
- sense of worthlessness or guilt, and
- poor concentration or difficulty making decisions.

Bipolar Disorder is characterized by one or more manic or mixed (manic and depression) episodes, with or without a history of major depression.

Dysthymic Disorder is defined as a chronically depressed mood over a period of at least two years.

Anxiety disorders (Axis I)

There are a number of anxiety disorders classified in the DSM-IV-TR, including:

- Generalized Anxiety Disorder
- specific phobias
- Posttraumatic Stress Disorder
- Social Phobia
- Obsessive Compulsive Disorder, and

- Panic Disorder.

Symptoms include intense and prolonged feelings of fear or distress that occur out of proportion to the actual threat or danger. The feelings of distress also must be sufficient to interfere with normal daily functioning.

Attention-Deficit/Hyperactivity Disorder (Axis I)

Attention-Deficit/Hyperactivity Disorder (ADHD) is characterized by inappropriate degrees of inattention, impulsivity and overactivity that begin in childhood. ADHD is one of the most common neurobehavioral disorders of childhood and can persist through adolescence and into adulthood.

Although many individuals with ADHD show symptoms of both inattention and hyperactivity-impulsivity, there may be a predominance of either inattention or hyperactivity-impulsivity. This variability of presentation is reflected in the three major classifications of the disorder:

- Combined Type (exhibiting both inattention and hyperactivity-impulsivity)
- Predominately Inattentive Type, and
- Predominately Hyperactivity-Impulsivity Type.

The symptoms of hyperactivity and impulsivity tend to diminish over time so that many adults will present with primary symptoms of inattention only.

Schizophrenia (Axis I)

The effects of Schizophrenia on the individual can be profound. Common symptoms include delusions and hallucinations, thought disorders, lack of motivation and social withdrawal. The symptoms of Schizophrenia are generally divided into three broad categories[16]:

- Positive or "psychotic" symptoms are characterized by abnormal thoughts or behaviours. For example, hallucinations are disturbances of perception where individuals hear or see things that are not there.
- Disorganised symptoms are characterized by poorly organized, illogical or bizarre thought processes. These disturbances in logical thought processes frequently produce observable patterns of behaviour that are also disorganized and bizarre.
- Negative symptoms are characterized by the absence of thoughts and behaviours that would otherwise be expected. This may be manifested as limited ability to think abstractly, express emotion, initiate activities or become motivated.

The onset of Schizophrenia can occur at any age, but most typically appears in early adulthood.

[16] Monash Report 213, April 2004, pg. 272-73

Many individuals with Schizophrenia have recurring acute psychotic attacks (consisting of positive and/or disorganized symptoms) throughout their life, which are typically separated by intervening periods in which they usually experience residual or negative symptoms. It is now recognized that early intervention (promptly at the time of the first psychotic break) is very important in preventing major cognitive impairment resulting from this condition.

Personality disorders (Axis II)

There are a number of personality disorders identified in the DSM-IV-TR, including:

- Borderline Personality Disorder
- Schizotypal Personality Disorder
- Anti-social Personality Disorder, and
- Narcissistic Personality Disorder.

Onset typically occurs during adolescence or in early adulthood. The disorder affects thought, emotion, interpersonal relationships and impulse control. Symptoms include difficulty getting along with people and the presence of consistent behaviours that deviate markedly from societal expectations. The prognosis depends on whether the person has an awareness and acceptance of the disorder and its manifestations, and is willing to engage in treatment.

Mental retardation (Axis II)

The DSM-IV-TR defines mental retardation as significantly subaverage intellectual functioning (an IQ of 70 or below), with onset before the age of 18 years, and concurrent deficits or impairments in adaptive functioning. Mental retardation is not considered in this document.

Suicidal ideation

Suicidal ideation is defined as having thoughts of suicide or taking action to end one's own life, irrespective of whether the thoughts include a plan to commit suicide. Studies indicate that more than 90% of all suicides are associated with psychiatric disorders.

Insight

For individuals with psychiatric disorders, insight is an important factor in their ability to adhere to treatment and respond appropriately to their condition. In general, drivers with sufficient insight are those who are aware of any cognitive limitations caused by their disorder and who have the judgment and willingness to adapt their driving to these limitations.

Affect

Emotional control – the ability to manage frustration, agitation, impulsivity – is an important functional component of safe driving performance. Affect includes:

- emotional intelligence
- impulse control/emotional control
- frustration threshold
- agitation, and
- impulsivity and/or mood control/management.

In this document, affect will be considered as one of the functional abilities needed for driving for drivers with psychiatric disorders.

Psychomotor

Psychomotor functions affect the coordination of cognitive processes and motor activity. In this document, psychomotor function will be considered as one of the functional abilities needed for driving for drivers with psychiatric disorders.

14.2 Prevalence

Mood disorders - Major Depressive Disorder, Bipolar Disorder, Dysthymic Disorder (Axis I)

In Canada, approximately 8% of adults will experience major depression at some time in their lives, with approximately 1% experiencing Bipolar Disorder. Depression is more common among women, with a female to male ratio of 2 to1. Women also are 2 to 3 times more likely to develop Dysthymic Disorder. For Bipolar Disorder, the ratio between males and females is approximately equal.

Anxiety disorders (Axis I)

Anxiety disorders affect 12% of the Canadian population, and result in mild to severe impairment. The prevalence in the Canadian population is higher for Specific Phobia (6.2%-8.0%) and Social Phobia (6.7%) compared to Obsessive Compulsive Disorder (1.8%), Generalized Anxiety Disorder (1.1%) and Panic Disorder (0.7%). The prevalence of Posttraumatic Stress Disorder in the United States is estimated to be 8% to 9%.

Attention-Deficit/Hyperactivity Disorder (Axis I)

Prevalence rates of ADHD vary, depending on the diagnostic criteria used, the setting (e.g. general population vs. clinic sample) and the reporter (e.g. parent, teacher, self). Estimates suggest that ADHD affects 3% to 10% of school age children and is 2 to 3 times more common in boys. It is estimated that 33% to 67% of those with ADHD continue to manifest symptoms into adulthood, and that 5% to 7% of the adult population has ADHD.

Schizophrenia (Axis I)

Schizophrenia affects 1% of the population, with onset typically in early adulthood (late teens to mid-30s). Males and females are affected equally.

Personality disorders (Axis II)

In the United States, the prevalence of personality disorders is estimated to be between 6% and 9%.

Suicidal ideation

In the general population of Canada, the estimated prevalence of suicidal ideation is from 5% to 18%. The incidence of suicide attempts in the general population is from 1% to 5%.

14.3 Psychiatric disorders and adverse driving outcomes

Despite the prevalence of psychiatric disorders in the general population, there have been few investigations into the relationship between these disorders and adverse driving outcomes. Surprisingly, the majority of research was done, on average, more than 30 years ago.

There are a number of methodological issues that impact the ability to draw conclusions from the existing research, in particular, the impact of improved treatment of psychiatric disorders and changes in the complexity of the driving environment on the results of older studies. Nonetheless, the consistency of findings supports a general conclusion that drivers with psychiatric conditions are at increased risk of adverse driving outcomes.

Mood disorders - Major Depressive Disorder, Bipolar Disorder, Dysthymic Disorder

A few studies have identified depression as one of a number of factors that may influence driving performance. However, the results of these studies are equivocal, and methodological limitations significantly limit any conclusions that may be drawn.

Pharmacological treatment of mood disorders is an important consideration. When treatment is effective, the alertness, cognitive ability and judgment of a person with a mood disorder may be improved. At the same time, the significant side effects of anti-depressant medications may include impairments in psychomotor functioning, sedation and impairments in cognitive functioning. The impact of the side effects of drug treatment on driving is considered in Chapter 15, Psychotropic Drugs.

Anxiety disorders

There are no studies that have investigated the relationship between anxiety disorders and driving. Pharmacological treatment with sedatives or hypnotics may include side effects that impair functional ability to drive. See Chapter 15, Psychotropic Drugs, for more information.

Attention-Deficit/Hyperactivity Disorder

There is a small body of research that suggests that drivers with ADHD are at a higher risk for crashes, have higher rates of traffic citations and licence revocations or suspensions, and are more likely to drive without a licence.

There is some indication that pharmacological treatment of ADHD with stimulants may have a positive effect on driving performance. However, research in this area has primarily relied on driving simulators to measure outcomes. A few studies have investigated the relationship between pharmacological treatment of ADHD and on-road performance. However, methodological limitations, including small sample size (< 20 in all cases), limit the findings. The effects of pharmacological treatment of ADHD are discussed further in Chapter 15, Psychotropic Drugs.

Schizophrenia

The results of the few studies on the relationship between Schizophrenia and adverse driving outcomes are equivocal. Given the functional impairments often associated with this disorder, the results are surprising. An important factor which may contribute to the equivocal results is driver licensing rates. A recent study found that only 52% of individuals with Schizophrenia were licensed to drive compared to 96% in the control group. Failure to control for the reduced driving exposure of individuals with Schizophrenia is an important consideration in that crash rates are likely an underestimation of impairments in driving performance in this population.

Personality disorders

Two studies, both more than 30 years old, considered the relationship between personality disorders and adverse driving outcomes. Both studies found an increased crash risk for drivers with personality disorders.

Suicidal ideation

Studies on the incidence of traffic suicides indicate that suicide attempts play a significant role in motor vehicle crashes. Moreover, it is likely that the reported incidence rates of traffic suicides are an underestimation, due to the methodological difficulties in classifying a traffic death as suicide.

Research indicates the following risk factors for traffic suicides:

- males are significantly more at risk (90% to 95%) than females
- whites are more at risk than other racial groups
- those who are “depressed” or “mentally disturbed” are more at risk than those who are not, and
- those with a history of attempted suicide or a family history of suicide are more at risk than those without such history.

14.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Mood disorders Anxiety disorders ADHD Schizophrenia	Persistent impairment: Functional assessment	Cognitive Psychomotor	Medical assessments Functional assessment
	Episodic impairment: Medical assessment – likelihood of impairment	Cognitive Psychomotor	Medical assessments
Personality disorders	Persistent impairment: Functional assessment	Affective	Medical assessments
	Episodic impairment: Medical assessment – likelihood of impairment	Affective	Medical assessments

Psychiatric disorders can result in either a persistent or episodic impairment of the functions necessary for driving.

The role of insight

A driver's level of insight is a critical consideration when assessing the risk of an episodic impairment of functional ability due to a psychiatric disorder.

Drivers with good insight are more likely to be diligent about their treatment regime and to seek medical attention and avoid driving when experiencing acute episodes. Poor insight may be evidenced by non-compliance with treatment, trivializing the driver's role in a crash or repeated involuntary admissions to hospital, often as a result of discontinuing prescribed medication.

Mood disorders - Major Depressive Disorder, Bipolar Disorder, Dysthymia (Axis I)

Cognitive abilities that may be affected by mood disorders include:

- attention and concentration
- memory
- information processing

- reaction time, and
- psychomotor functioning.

Anxiety disorders (Axis I)

The research on the effects of anxiety disorders on functional ability is limited. Findings from studies examining the effects of anxiety disorders on cognitive functioning are equivocal. Neurobiological studies suggest that medial and temporal lobe structures are affected in anxiety disorders. These are structures that are responsible for memory and higher order executive functioning. From a clinical perspective, the potential for diminished attention or perseverating on errors (including "freezing") in the face of unexpected risks on the road may be of concern for driving.

Attention-Deficit/Hyperactivity Disorder (Axis I)

The pattern of deficits in adults with ADHD is similar to that in children and adolescents. One of the primary cognitive functions that may be affected is the ability to sustain attention, particularly when performing demanding cognitive tasks. In addition to attentional impairments, individuals with ADHD often experience other cognitive deficits such as difficulties with:

- planning and forethought
- flexibility
- problem solving
- working memory, and
- response inhibition.

Symptoms of ADHD referenced in the DSM-IV-TR that may be relevant to driving include:

Inattention

- often fails to give close attention to details or makes careless mistakes in school work, work or other activities
- often has difficulty sustaining attention in tasks or play activities
- often is easily distracted by extraneous stimuli

Hyperactivity-impulsivity

- often is "on the go" or acts as if "driven by a motor"
- often has difficulty awaiting his or her turn

Schizophrenia (Axis I)

Neuropsychological deficits associated with Schizophrenia may impact driving. The degree of functional impairment associated with Schizophrenia varies between the acute and residual phases of the disorder. Neuropsychological functions that may be impaired include:

- attention
- executive function
- spatial abilities
- memory, and
- motor and tactile dexterity.

Personality disorders (Axis II)

The characteristics of personality disorders most likely to affect driving include:

- affectivity (e.g. aggression, frustration, anger)
- interpersonal functioning (e.g. failure to conform to social norms, reckless disregard for the safety of others), and
- poor impulse control.

Suicidal ideation

Suicidal ideation is an important consideration regarding drivers with psychiatric disorders because of the risk of traffic suicide.

Pharmacological treatment

In addition to the direct effects of psychiatric disorders on functional ability to drive, the impact of pharmacological treatment is an important consideration when assessing drivers. The effects of drug treatment are considered in Chapter 15, Psychotropic Drugs.

14.5 Compensation

Drivers with psychiatric disorders are not able to compensate for their impairments.

14.6 Guidelines for assessment

14.6.1 Psychiatric disorder– All drivers

STANDARD **Note: Requires ballot as 6 months is dropped**	**All drivers eligible for a licence if** • **the condition is stable** • **the driver has sufficient insight to stop driving if condition becomes acute** • **the functional abilities necessary for driving are not impaired** • **a treating physician supports a return to driving, for drivers who have stopped driving due to a psychiatric disorder, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Stop driving and report to the authority if hospitalized due to a psychiatric disorder • Remain under regular medical supervision and comply with prescribed psychotropic medication regime or other recommended treatment
Reassessment	• Routine, or more frequently at the discretion of the licensing authority.
Information from health care providers	• Opinion of treating physician whether the condition is stable and controlled • Opinion of treating physician whether the driver has sufficient insight to stop driving if condition becomes acute • Opinion of treating physician whether the functional abilities necessary for driving may be persistently impaired by the condition or its treatment, and if yes, the results of a functional assessment • Whether the driver remains under regular medical supervision • Details of any prescribed psychotropic medication regime or other recommended treatment and opinion of treating physician whether the driver is compliant with the treatment • A specialist's report supporting a return to driving, for drivers who have stopped driving due to a psychotic episode • Date of most recent psychotic episode • Opinion of treating physician as to the appropriate reassessment interval

Rationale	Given the nature of psychiatric disorders, assessment must rely primarily on the clinical judgment of health care professionals involved in treatment. Where the disorder results in a persistent impairment, the impact of that impairment should be functionally assessed.

Chapter 15: Drugs and Driving

15.1 About drugs and driving

It is increasingly clear that psychotropic (capable of affecting the mind, emotions or behaviour) drugs contribute to impairment in driving performance. It has been estimated that at least 10% of all people killed or injured in crashes were taking psychotropic medication, which might have been a contributory factor to the crash.

A 2011 study, *Drug use by fatally injured drivers in Canada (2000-2008*) by the Canadian Centre on Substance Abuse in Ottawa approximately 35% of people killed in accidents in Canada had drugs (includes legal and illicit drugs) in their system.

This chapter focuses on drugs that are commonly prescribed or used to treat medical conditions, and that are known to have psychotropic effects or potential side effects that could impair functional ability to drive. Illicit drugs are not considered in this chapter.

Opioids (narcotics)

Opioids are derived from natural opium or a synthetically produced equivalent and are used primarily for moderate to severe pain relief. Opioid drugs include the following:

- codeine
- fentanyl [Duragesic®]
- morphine [MS-Contin®, M-Eslon®]
- meperidine [Demerol®]
- methadone
- pentazocine [Talwin®]
- hydromorphone [Dilaudid®, Hydromorph Contin®]
- oxycodone [Percodan®, Percocet®, Endocet®, Supeudol®, Oxy Neo®], and
- hydrocodone [Hycodan®]

Antidepressants

Antidepressants are used in the treatment of major depression and a variety of other conditions such as chronic pain, anxiety, eating disorders, personality disorders and Obsessive Compulsive Disorder. Classes of antidepressants and examples of drugs from each class are listed in the table below.

Class	Generic Name	Brand Name
Tricyclic antidepressants (TCAs)	amitriptyline	Elavil®
	imipramine	Tofranil®
	nortriptyline	Aventyl®
	desipramine	Norpramin®
	clomipramine	Anafranil®
	doxepin	Sinequan®
Serotonin antagonist-reuptake inhibitor (SARIs)	trazadone	Desyrel®

Class	Generic Name	Brand Name
Selective serotonin-reuptake inhibitors (SSRIs)	fluoxetine	Prozac®
	fluvoxamine	Luvox®
	sertraline	Zoloft®
	citalopram	Celexa®
	paroxetine	Paxil®
Dual action agents (DAAs)	venlafaxine	Effexor®
Atypical Antidepressants	bupropion	Zyban®, Wellbutrin SR®
Monoamine oxidase inhibitors	phenelzine	Nardil®
	moclobemide	Various generics
	tranylcypromine	Parnate®

Antiepileptics

The following are 8 major categories of drugs used in the treatment of epilepsy and other conditions such as mood disorders or pain, in approximate order of the date they were introduced:

- barbiturates and derivatives (phenobarbital)
- succinimide derivatives (methsuximide [Celontin®])
- hydantoin derivatives (phenytoin [Dilantin®])
- iminostilbene derivatives (carbamazepine [Tegretol®])
- benzodiazepines (clonazepam [Clonapam®])
- carboxylic acid derivatives (divalproex sodium [Epival®], valproic acid [Depakene®])
- various anticonvulsants (lamotrigine [Lamictal®], topiramate [Topamax®])
- GABA derivatives (gabapentin [Neurontin®]).

Antihistamines

Antihistamines inhibit the activity of histamine, a protein involved in many allergic reactions. They are commonly prescribed to alleviate the symptoms of allergic reactions.

Examples of older antihistamines include:

- chlorpheniramine [Chlortripolon®]
- diphenhydramine [Benadryl®].

Examples of newer antihistamines include:

- loratadine [Claritin®]
- cetirizine [Reactine®]
- desloratadine [Aerius®], and
- fexofenadine [Allegra®].

Antipsychotics

Antipsychotics are used primarily in the management of serious mental disorders such as Schizophrenia, Bipolar Disorder and organic psychoses (psychiatric symptoms arising from damage to or disease in the brain). The two major groups of antipsychotics are the "typical" or conventional antipsychotics, introduced in the early 1950s, and the "atypical" antipsychotics, introduced in the early 1990s and later.

Examples of typical antipsychotics include:

- haloperidol [Haldol®], and
- chlorpromazine [Largactil®]
- loxapine [Loxapac®]
- trifluoperazine [Stelazine®].

Examples of atypical antipsychotics include:

- clozapine [Clozaril®]
- risperidone [Risperdal®
- olanzapine [Zyprexa®]
- aripiprazole [Abilify®]
- paliperidone [Invega®]
- quetiapine [Seroquel®], and
- ziprasidone [Zeldox®].

Non-steroidal anti-inflammatories

Non-steroidal anti-inflammatory drugs (NSAIDs) are used for pain relief, the reduction of fever, and to reduce inflammation. Examples of NSAIDs include:

- acetylsalicylic acid [Aspirin®, Entrophen®]
- diclofenac [Voltaren®]
- ibuprofen [Motrin®]
- naproxen [Anaprox®, Aleve®, Naprosyn®]
- celecoxib [Celebrex®], and
- indomethacin [Indocid®].

NSAIDs often are used in the treatment of mild to moderate pain, inflammation and fever in both acute and chronic conditions, such as:

- rheumatoid arthritis and osteoarthritis
- gout
- metastatic bone pain
- headaches and migraines, and
- mild to moderate pain due to inflammation and tissue injury (e.g. pain associated with tooth extraction, root canal, sports injuries, etc.)
- menstrual pain.

Sedatives and hypnotics

Sedative and hypnotic drugs are central nervous system depressants. They are used to treat anxiety, insomnia, alcohol withdrawal, as muscle relaxants, and as anticonvulsants. The major categories are barbiturates, benzodiazepines and a new class of non-benzodiazepine sedatives called Z drugs.

Benzodiazepines can be divided into short acting, (those with a short half-life of 2 to 4 hours), which generally are used to treat insomnia, intermediate acting (those with half life of 12-24 hours) and long-acting (those with a long half-life of >24 hours), which are used to treat anxiety.

Categories of sedatives and hypnotics and examples of drugs in each category are provided in the table below.

Category	**Generic Name**	**Brand Name**
Barbiturates	phenobarbital	Various generics
Benzodiazepines with a short half-life	triazolam	Halcion®
	alprazolam	Xanax®
	oxazepam	Serax®
Benzodiazepines with a medium half-life	lorazepam	Ativan®
	temazepam	Restoril®

	chloridazepoxide	Librium®
Benzodiazepines with a long half-life	clonazepam	Rivotril®
	diazepam	Valium®
	clorazepate	Tranxene®
	flurazepam	Dalmane®
Z drugs (non-benzodiazepines)	zopiclone	Imovane®
	zolpidem	Sublinox®

Stimulants (for ADHD, Narcolepsy)

Examples of stimulants used in the treatment of Attention-Deficit/Hyperactivity Disorder (ADHD) and Narcolepsy include:

- methylphenidate [Ritalin®, Concerta®, Biphentin®)]
- modafinil [Alertec®]
- dextroamphetamine [Dexedrine®], and
- mixed amphetamine salts [Adderall®].

15.2 Prevalence

Opioids

No data are available on the use of opioids as a treatment for medical conditions in Canada.

Antidepressants

The most commonly used classes of antidepressants are SSRIs, dual action agents and tricyclics. Research from 2002 showed that SSRIs had a 46.3% market share, dual action agents had 23.9% and tricyclics had 23.7%. The least commonly used class was monoamine oxidase inhibitors, with a 2.1% market share.

Between 1981 and 2000, total prescriptions for antidepressants increased almost five fold, from 3.2 to 14.5 million. The 2002 Canadian Community Health Survey indicated that 5.8% of Canadians were taking antidepressants. Of those who had a major depressive episode in the past year, 40.4% were taking antidepressants.

Antiepileptics

No data on the prevalence of antiepileptic drug use in Canada is available. Epilepsy itself has a prevalence rate of 0.6% in the Canadian population. The incidence of epilepsy is 15,500 new cases per year, with 60% of these being young children or seniors. Because of the variability of the presentation of epilepsy among those diagnosed, and the use of antiepileptic drugs for conditions other than epilepsy, it is difficult to extrapolate the prevalence of anticonvulsant drug use based on the prevalence and incidence of epilepsy.

Antihistamines

The general use of antihistamines is difficult to ascertain. However, it has been estimated that allergic conditions that may be treated with antihistamines affect 10% to 25% of the population.

Antipsychotics

Prevalence statistics on the use of antipsychotics in Canada using population based surveys are complicated by low prevalence and questionable validity.

Non-steroidal anti-inflammatories

NSAIDs are among the most commonly used pharmacological agents, with 10 million prescriptions dispensed annually in Canada. The use of NSAIDs is predicted to increase with the aging population due to the association between age and musculoskeletal disorders such as osteoarthritis and rheumatoid arthritis.

Sedatives and hypnotics

Data from the 2002 Canadian Community Health Survey indicated that the percentage of those who had used a sedative or hypnotic increased with age, moving from 3.1% of the general population 15 years and older, to 11.1% of those 75 and older. Overall, 7.2% of those with anxiety disorders had taken a sedative-hypnotic over the two days preceding the survey.

Benzodiazepine use made up most of the sedative-hypnotic use in all analyzed demographic and diagnostic groups. Information from this survey and other studies indicate that benzodiazepines are one of the most frequently used classes of drugs by seniors and women.

Stimulants

No data is available on the prevalence or incidence of the use of stimulants as a treatment for ADHD in Canada. An indication of the use of stimulants for ADHD may be gleaned from the prevalence of the condition itself. Research indicates that ADHD affects between 3% and 10% of children and between 4% and 6% of adults. Of adolescents and adults with ADHD, 76% achieve a therapeutic response with stimulant medication.

15.3 Psychotropic drugs and adverse driving outcomes

Opioids

Research indicates that the use of opioids can adversely affect driving performance, with the degree of impairment dependent on the particular opioid used, dosage, previous use and developed tolerance, time of day taken.

Antidepressants

Currently, there is little evidence to associate SSRIs or dual action agents with impaired driving performance. Although limited, research indicates that the use of tricyclic antidepressants is associated with impairments in driving performance. This is evidenced

by elevated crash rates, as well as measures of on-road performance and laboratory tests of psychomotor and cognitive functioning.

Antiepileptics

In general, individuals with epilepsy have an increased risk for adverse driving outcomes, which may be caused by either the episodic impairment (seizures) or persistent impairments caused caused by the condition or treatment.

Antihistamines

Research indicates that the use of older antihistamines may impair driving performance. However, newer antihistamines used in therapeutic doses do not appear to increase the risk of adverse driving outcomes. Many classes of drugs may be used to treat epilepsy as well as combinations of drugs. Driving outcomes would depend on which medications are used in the treatment.

Antipsychotics

Studies examining the driving performance of individuals treated with antipsychotics (primarily those with Schizophrenia) indicate that those treated with atypical antipsychotics perform better than those treated with typical antipsychotics. However, less than 33% of those on atypical antipsychotics and 5% to 11% of those on typical antipsychotics were found to have adequate driving performance. It should be noted that these results are based on functional tests conducted in a laboratory setting, and the relationship of these results to actual driving performance has not been established. Further, it is difficult to determine the relative impact of the underlying condition and antipsychotic treatment on driving performance.

Non-steroidal anti-inflammatories

There is only a small body of literature related to the effects of NSAIDs on driving performance. These limited studies however indicate that the use of NSAIDs is associated with an increased risk of crash in both young and old drivers.

Sedatives and hypnotics

Research indicates that the use of sedatives and hypnotics is associated with a significant risk for adverse driving outcomes.

Stimulants (for ADHD)

There is some indication that pharmacological treatment of ADHD with stimulants may have a positive effect on driving performance. However, research in this area has primarily relied on driving simulators to measure outcomes. A few studies have investigated the relationship between pharmacological treatment of ADHD and on-road performance, but methodological limitations, including small sample size (< 20 in all cases), limit the findings.

15.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Use of psychotropic drugs	Persistent impairment: Functional assessment	Cognitive	Medical assessments Functional Assessment

Authorities should be primarily concerned with the persistent cognitive impairment associated with the effects or side effects of medication used for ongoing treatment of medical conditions. Potential temporary impairments from short term treatment or changes in dosage or type of medication are considered transient impairments for licensing purposes. Where an individual is taking multiple drugs (polypharmacy), authorities must also consider the potential compounding effects. Where relevant, authorities should also consider the potential compounding effect of the use of alcohol or illicit drugs.

Opioids

The use of opioids results in depression of the central nervous system. Possible effects on the functions necessary for driving include:

- blurred vision
- poor night vision
- slowed reaction times
- sedation
- tremors
- muscle rigidity
- impairment of short term/working memory and attention, and
- disorientation or hallucinations.

The effects of opioids on an individual depend on a number of factors, including the length of use, dosage and propensity for abuse or addiction. Tolerance is an important consideration in that adverse effects may be evident during acute use but diminish as tolerance develops.

Antidepressants

The effects of antidepressants on cognitive ability vary by therapeutic class. Depression itself may result in cognitive impairment. While the use of antidepressants may improve cognitive function, the side effects may include cognitive impairment, including:

- impairment of thought processing
- attention deficits

- indecisiveness, and
- impairment of psychomotor function.

Therefore, distinguishing between the effects of the disorder and the side effects of antidepressants may be a challenge.

Tricyclic antidepressants

The major side effects of TCAs that may affect driving are anticholinergic effects, such as confusion or blurred vision, and sedating effects. The following table outlines the severity of the sedating effect of common TCAs.

Sedating Effect	**TCAs**
Low	Desipramine, nortriptyline [Aventyl®],
Moderate	imipramine [Tofranil®]
High	amitriptyline [Elavil®], doxepin [Sinequan®]

Selective serotonin-reuptake inhibitors

SSRIs generally have fewer side effects than TCAs. Nonetheless, some studies have shown impairments in both cognitive and psychomotor functioning in individuals using SSRIs.

Dual action antidepressants

Research indicates new DAAs, atypical antidepressants (the most recently introduced class of antidepressants), have fewer side effects than TCAs or SSRIs, but cognitive impairment associated with depression and/or treatment may still be present.

Antiepileptics

Anticonvulsants may impair motor and sensory functions, producing:

- ataxia (lack of coordination; unsteadiness)
- nystagmus (uncontrollable rapid eye movement)
- poor concentration
- slowed thinking
- blurring and double vision, and/or
- tremor.

Disruption of normal cognitive function is a frequent and pervasive side effect of anticonvulsant drugs. A variety of cognitive abilities may be affected, including memory, reaction time, executive functioning and problem solving.

The known side effects of first generation anticonvulsant drugs (phenobarbital, phenytoin, benzodiazepines and valproate) include sedation and cognitive dysfunction. Adverse cognitive effects, including impairments in memory and attention, are also

evident with the use of more recently introduced anticonvulsant drugs (e.g. topiramate), though these generally have fewer side effects.

Antihistamines

Histamine is involved in many brain functions, including the waking-sleep cycle, attention, memory, learning and excitation. The effects of antihistamines differ depending on their generation. Older antihistamines, such as tripolidine [Actifed®], diphenhydramine [Benadryl®], and clemastine are associated with profound sedation, impaired psychomotor function and blurred vision.

Newer antihistamines, such as:

- loratadine [Claritin®]
- cetirizine [Reactine®]
- fexofenadine [Allegra®], and
- desloratadine [Aerius®]

are largely free from the sedating effects of the older antihistamines. However, at high doses, significant side effects have been reported, though still less pronounced than those associated with older antihistamines.

Beta-blockers

Beta-blockers include:

- propanolol [Inderal®], and
- atenolol [Tenormin®]

Common side effects of beta-blockers include tiredness, sleep disturbances and dizziness. Less common side effects relevant to driving include impairments in attention, mental flexibility (executive functioning) and memory.

The available evidence indicates that impairments in cognitive functioning can be a side effect of beta-blockers. However, results from the majority of studies indicate that there is little in the way of evidence to indicate that beta-blockers negatively impact cognitive performance in the general population of beta-blocker users.

Antipsychotics

Research suggests that atypical antipsychotic drugs may improve cognitive functioning in individuals with Schizophrenia compared to treatment with typical antipsychotics. Nonetheless, the research indicates that even with atypical antipsychotics, individuals still experience residual cognitive impairments.

Non-steroidal anti-inflammatories

In general, the analgesic and anti-inflammatory effects of NSAIDs result in improvements in functional abilities (e.g. reduction in pain and stiffness in those with osteoarthritis, resulting in increased physical function and improvements in quality of life). However, there is a suggestion that the use of NSAIDs can impair cognitive ability.

Sedatives and hypnotics

The adverse effects of sedatives and hypnotics may include:

- sedation
- drowsiness
- cognitive and psychomotor impairment
- impaired coordination
- vertigo
- dizziness, and
- blurred or double vision.

Impairments are greater with higher dosages and with drugs that have a longer half-life.

Those using sedatives and hypnotics are subject to developing dependency, addiction and increasing tolerance of the effects. Because of this, Health Canada advises that these drugs should only be used for short periods (e.g. less than 2 months for anxiety; 7 to 10 days for insomnia). Nonetheless, research indicates that long term use is not uncommon. Long term adverse effects of benzodiazepine may include cognitive decline, unwanted sedation and impaired coordination.

Stimulants (for ADHD) and Narcolepsy

There is some indication that stimulants may have a positive effect on driving performance. However, the effect of stimulant medication on the functional ability of drivers with ADHD is unclear because of the methodological limitations of research to date.

15.5 Compensation

A driver can't compensate for the effects of psychotropic drug use.

15.6 Guidelines for assessment

15.6.1 Medication – Prescribed - All Drivers

This standard applies to prescribed medication including psychotropic drugs and prescribed medical marijuana

STANDARD	**All drivers eligible for a licence if** • **The functional abilities necessary for driving are not impaired and** • **Where required, a functional assessment shows that the side effects of medication does not affect ability to drive** **Drivers on a formal methadone maintenance program must provide an addictions specialist report, in addition to meeting the above requirements.**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the licensing authority
Information from health care providers	• Types of psychotropic drugs used • Details of underlying medical conditions • Opinion of treating physician whether the individual is non-compliant or mis-uses psychotropic drugs • Functional imparment, if any
Rationale	The use of a psychotropic drug does not mean that a driver is ineligible for a licence. Where there is some evidence of a persistent cognitive impairment associated with the stable use of a drug, an individual assessment of the effect of the drug is required to determine licence eligibility.

15.6.2 Medication – Non Prescribed (Over the Counter) – All drivers

STANDARD	**All drivers eligible for a licence if:** • **The functional abilities necessary for driving are not impaired and,** • **Where required, a functional assessment shows that the side effects of medication does not affect ability to drive.**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the licensing authority
Information from health care providers	• Types of drugs used • Details of underlying medical conditions • Opinion of treating physician whether the individual is non-compliant or mis-usesdrugs • Functional impairment, if any
Rationale	The use of a psychotropic drug does not mean that a driver is ineligible for a licence. Where there is some evidence of a persistent cognitive impairment associated with the stable use of a drug, an individual assessment of the effect of the drug is required to determine licence eligibility.

15.6.3 Substance Abuse or Dependence - All drivers

This applies to all drivers who are under the influence of alcohol and illicit drugs such as opioids, cocaine, amphetamines etc

STANDARD	**All drivers eligible for a licence if** • **Meets the criteria for remission and/or has abstained from the substance for 12 months.** • **Earlier re-licencing may be considered upon favourable recommendation from an addictions specialist and/or treating physician recognized by the licensing authority and the successful completion of a drug rehabilitation program.** • **The functional abilities necessary for driving are not impaired.** • **Where required, a road test or other functional assessment shows that the functional abilities for driving are not impaired.**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the licensing authority
Information from health care providers	• Types of drugs used • Details of underlying medical conditions • Opinion from a**n addictions specialist and/or treating physician recognized by the licensing authority** • **The successful completion of a substance abuse rehabilitation program and** • Report on whether the individual is abstinent / and or in remission
Rationale	These substances are known to potentially impair the ability to operate a motor vehicle safely

15.6.4 Alcohol and Driving – All drivers

STANDARD	**Impaired individuals are not permitted to drive any class of motor vehicle**
Conditions for maintaining licence	None
Reassessment	• Routine or more frequently at the discretion of the licensing authority
Information from health care providers	n/a
Rationale	Alcohol is known to impair the ability to operate a motor vehicle safely

Chapter 16: Respiratory diseases

16.1 About respiratory diseases

Overview

A number of respiratory diseases may interfere with the safe operation of a motor vehicle by causing reduced oxygen flow to the brain and subsequent cognitive impairment, including impairments in attention, memory, decision making and judgement. Respiratory diseases that are most likely to affect cognitive functioning are those that are chronic in nature.

This chapter focuses on one of the most prevalent respiratory diseases, chronic obstructive pulmonary disease (COPD). However, other respiratory diseases also have the potential to impair driving due to reduced oxygen flow to the brain; where this is the case, the standards in this chapter also apply to them.

Chronic obstructive pulmonary disease

COPD refers to a group of diseases characterized by obstructed air flow, such as emphysema and chronic bronchitis. Emphysema and chronic bronchitis frequently coexist and the term COPD is often applied to individuals suffering from these two disorders.

The level of general impairment caused by respiratory diseases is commonly described as mild, moderate, or severe, as described in the table below.

Level of Impairment	**Symptoms**	**Pulmonary Function Testing[17] result**	**Nature of General Impairment**
Normal	None	FVC > 80% of predicted, *and* FEV1 > 80% of predicted, *and* FEV1/FVC x 100 > 75%, *and* DLCOsb > 80% of predicted	None

[17] FVC = Forced vital capacity; FEV1 = Forced expiratory volume in first second; FEV1/FVC x 100 = Using the previously selected values for FVC and FEV1, compute the ratio and express as percentage; DLCOsb = Single breath diffusing capacity

Level of Impairment	Symptoms	Pulmonary Function Testing[17] result	Nature of General Impairment
Mildly Impaired	Dyspnea when walking quickly on level ground or when walking uphill; ability to keep pace with people of same age and body build walking on level ground, but not on hills or stairs.	FVC > 60 to 70% of predicted, *or* FEV1 > 60 to 79% of predicted, *or* FEV1/FVC x 100 60 to 74%, *or* DLCOsb 60 to 79% of predicted.	Usually not correlated with diminished ability to perform most jobs
Moderately Impaired	Shortness of breath when walking for a few minutes or after 100m walking on level ground	FVC 51 to 59% of predicted, *or* FEV1 41 to 59% of predicted, *or* FEV1/FVC x 100 41 to 59%, *or* DLCOsb 41 to 59% of predicted.	Progressively lower levels of lung function correlated with diminished ability to meet the daily demands of many jobs
Severely Impaired	Too breathless to leave the house, breathless when dressing. The presence of untreated respiratory failure.	FVC 50% or less of predicted, *or* FEV1 40% or less of predicted, *or* FEV1/FVC x 100 > 40% or less, *or* DLCOsb > 40% or less of predicted.	Unable to meet the physical demands of most jobs, including travel to work

16.2 Prevalence

Estimates from the World Health Organization indicate that 80 million people have moderate to severe COPD. Chronic bronchitis affects individuals of all ages. Emphysema is more common among elderly individuals. In Canada men have a higher rate of COPD (6.3%) than women (5.2%). COPD increases in prevalence with age for both men and women with the highest prevalence for men over the age of 75 (9.1%).

16.3 Respiratory diseases and adverse driving outcomes

There have been no studies that examine the relationship between respiratory diseases and adverse driving outcomes.

16.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach[18]	Primary functional ability affected	Assessment tools
COPD or other respiratory disease	Persistent impairment: Functional assessment	Cognitive May also result in general debility	Medical assessments Functional Assessment

Research indicates that drivers with COPD are at risk of cognitive impairment due to chronic hypoxemia. For those with cognitive impairment, the impairment tends to be greater for more complex and demanding cognitive tasks. This cognitive impairment may affect a driver's functional ability to drive.

Drivers with COPD also may develop general debility resulting in a loss of stamina required to support the functions necessary for driving.

Older drivers with COPD are more at-risk for functional impairment because they may experience:

- age-related declines in blood flow to the brain
- disease-related declines in arterial oxygen content, and
- both age and disease-related declines in physical activity which can exacerbate deconditioning.

16.5 Compensation

Drivers with COPD may be able to compensate for their functional impairment by using supplemental oxygen.

[18] See Part 1 for a discussion of the use of functional assessments for driver licensing decisions.

16.6 Guideline for assessment

16.6.1 Mild impairment

STANDARD	All drivers eligible for a licence
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Pulmonary function testing result or statement that the level of impairment resulting from the respiratory disease is mild
Rationale	Mild impairment due to respiratory disease is unlikely to cause significant impairment of the functions needed for driving.

16.6.2 Moderate impairment – Non-commercial drivers

STANDARD	Non-commercial drivers eligible for a licence
Conditions for maintaining licence	None
Reassessment	• Routine, or more frequently at the discretion of the licensing authority
Information from health care providers	• Pulmonary function testing result or statement that the level of impairment resulting from the respiratory disease is moderate
Rationale	Moderate impairment due to respiratory disease is unlikely to cause significant impairment of the functions needed for non-commercial driving. Reassessment is required to monitor for an increase in impairment that may affect ability to drive.

16.6.3 Severe impairment – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **a functional assessment indicates sufficient functional ability**
Conditions for maintaining licence	None
Reassessment	• Routine, or more frequently at the discretion of the licensing authority
Information from health care providers	• Results of functional assessment • Pulmonary function testing result or statement that the level of impairment resulting from the respiratory disease is severe • Whether the driver has insight into the impact their condition may have on driving
Rationale	Severe impairment due to respiratory disease may cause significant impairment of the functions needed for driving, including cognitive impairment. Licensing decisions should be based on an individual functional assessment.

16.6.4 Requiring supplemental oxygen – Non-commercial drivers

This guideline applies to non-commercial drivers who require supplemental oxygen while at rest.

STANDARD	**Non-commercial drivers eligible for a licence if** • **a road test while using supplemental oxygen indicates sufficient functional ability, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive while using supplemental oxygen
Reassessment	• Routine or more frequently at the discretion of the licensing authority
Information from health care providers	• Results of functional assessment • Pulmonary function testing result or statement that the level of impairment resulting from the respiratory disease requires supplemental oxygen • Whether the driver has insight into the impact their condition may

	have on driving • History of compliance with prescribed treatment regime • If known or applicable, whether the driver is compliant with any current conditions of licence
Rationale	Drivers who require supplemental oxygen due to respiratory disease may have significant impairment of the functions needed for non-commercial driving, including cognitive impairment. Licensing decisions should be based on an individual functional assessment, including ability to drive while using supplemental oxygen.

16.6.5 Moderate impairment – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **a functional assessment indicates sufficient functional ability**
Conditions for maintaining licence	None
Reassessment	• Routine, or more frequently at the discretion of the licensing authority
Information from health care providers	• Functional impairment, if any • Pulmonary function testing result or statement that the level of impairment is moderate • Whether the driver has insight into the impact their condition may have on driving • History of compliance with prescribed treatment regime
Rationale	Moderate impairment due to respiratory disease may cause significant impairment of the functions needed for driving. Licensing decisions should be based on an individual functional assessment.

16.6.6 Severe impairment or requiring supplemental oxygen – Commercial drivers

This guideline applies to commercial drivers who require supplemental oxygen while at rest.

STANDARD	**Commercial drivers not eligible for a licence**

Conditions for maintaining licence	N/A
Reassessment	N/A
Information from health care providers	N/A
Rationale	Severe impairment or a requirement for supplemental oxygen due to respiratory disease generally indicates significant impairment of the functions needed for commercial driving.

Chapter 17: Seizures and epilepsy

17.1 About seizures and epilepsy

Seizures

A seizure is caused by a sudden electrical discharge in the brain. A seizure does not always mean that a person falls to the ground in convulsions. It can be manifested in various ways, including:

- feelings of being absent
- visual distortions
- nausea
- vertigo
- tingling
- twitching
- shaking
- rigidity of parts of the body or the entire body, or
- an alteration or loss of consciousness.

Seizures may occur in people who do not have epilepsy. These non-epileptic seizures are often referred to as provoked seizures. Some are caused by transient factors with no structural brain abnormality such as:

- fever
- low blood sugar
- electrolyte imbalance
- head trauma
- meningitis
- simple fainting, and
- alcohol or drug toxicity or withdrawal.

Others are caused by conditions where there is a structural brain abnormality such as a:

- tumour
- stroke
- aneurysm, or
- hematoma.

Provoked seizures are not epilepsy, and they resolve after the provoking factor has resolved or stabilized.

Sometimes people appear to have seizures, even though their brains show no seizure activity. This phenomenon is called a non-epileptic psychogenic seizure (NEPS), sometimes referred to as a pseudoseizure, and is psychological in origin. Some people with epilepsy have NEPS in addition to their epileptic seizures. Other people who have NEPS do not have epilepsy at all.

Epilepsy

Epilepsy refers to a condition characterized by recurrent (at least two) seizures, which do not have a transient provoking cause. The cause of the epileptic seizures may be known or unknown (idiopathic). About two-thirds of epilepsy in young adults is idiopathic, but more than half of epilepsy in those 65 and older has a known cause. Known causes of epilepsy include permanent structural brain abnormality such as scarring from:

- stroke
- prior surgery
- head injury
- infections
- tumours
- aneurysms, or
- arteriovenous malformations.

Types of seizures

Seizures are divided into two main categories: partial (also called focal or local) seizures and generalized seizures. A partial seizure is a seizure that arises from an electrical discharge in one part of the brain. A generalized seizure is caused by discharges throughout the brain.

Partial seizures

There are three types of partial seizures:

- simple partial seizures
- complex partial seizures, and
- partial seizures (simple or complex) that evolve into secondary generalized seizures (see below).

The difference between simple and complex seizures is that individuals experiencing simple partial seizures retain awareness during the seizure, whereas those experiencing complex partial seizures lose awareness during the seizure.

Symptoms of partial seizures depend on which part of the brain is affected. They may include one or more of the following:

- head turning
- eye movements
- mouth movements
- lip smacking
- drooling
- apparently purposeful movements
- rhythmic muscle contractions in a part of the body
- abnormal numbness
- tingling and a crawling sensation over the skin
- sensory disturbances such as smelling or hearing things that are not there, or
- having a sudden flood of emotions.

Individuals who have partial seizures, especially complex partial seizures, may experience an aura, i.e. unusual sensations that warn of an impending seizure. An aura is actually a simple partial seizure. The aura symptoms an individual experiences and the progression of those symptoms tend to be similar every time.

Generalized seizures

Types of generalized seizures and their symptoms are listed in the table below.

Type of Generalized Seizure	**Symptoms**
Absence	Brief loss of consciousness
Myoclonic	Sporadic (isolated), jerking movements
Clonic	Repetitive, jerking movements
Tonic	Muscle stiffness, rigidity
Tonic-clonic or 'grand mal'	Unconsciousness, convulsions, muscle rigidity
Atonic	Loss of muscle tone

Most common seizures

The three most common types of seizures in adults are:

- generalized tonic-clonic or grand mal seizures
- complex partial seizures, and
- simple partial seizures.

Approximately one-third of all individuals with epilepsy have complex partial seizures, with the prevalence increasing to one-half in those with epilepsy who are 65 and older.

Recurrence of seizures

The estimated risk of a recurrence after an initial unprovoked seizure ranges from 23% to 71%, with the average risk of recurrence for adults being 43%. If the seizure is idiopathic (i.e. the cause is unknown) and the individual's electroencephalogram (EEG) is normal, the risk of recurrence is reduced. Individuals who experience a partial seizure and have an abnormal EEG or other neurological abnormality, have an increased risk for seizure recurrence. A family history of epilepsy also increases the risk of recurrence.

Treatment for seizures and epilepsy

Seizure patterns in individuals with epilepsy may change over time, and seizures may eventually stop. Epilepsy is generally treated with anticonvulsant drugs (antiepileptics) and is sometimes treated with surgery to remove the source of epilepsy from the brain. Recent studies indicate that more than half of newly diagnosed individuals with epilepsy can achieve seizure control with antiepileptic drugs. Many of those who achieve seizure control are eventually able to stop taking antiepileptic drugs and remain seizure-free. However, the relapse rate with drug withdrawal is at least 30% to 40%. For a further discussion of the impact of antiepileptics on driving, see Chapter 15, Psychotropic Drugs.

17.2 Prevalence

Research indicates that up to 9% of the general population will have at least one seizure. Epilepsy has an overall prevalence rate of 0.6% in Canada, with an estimated incidence of 15,500 new cases per year (2003). The table below shows the prevalence of epilepsy in Canada by age.[19]

Age (years)	Prevalence (%)	Age (years)	Prevalence (%)
0 – 11	0.3	25 – 44	0.7
12 – 14	0.6	46 – 64	0.7
16 – 24	0.6	> 65	0.7

17.3 Seizures, epilepsy and adverse driving outcomes

Research indicates that, in general, individuals with epilepsy have an increased risk for adverse driving outcomes. Variability in the methodology and study results makes it difficult to determine the extent of the increased risk.

[19] Source: Data from Ontario Health Survey, Community Health Survey and National Population Health Survey (Wiebe S, Bellhouse D, Fallary C, Eliasziv M. Burden of epilepsy: the Ontario health survey. Can J Neurol Sci 1999;26:263-70).

Studies of crash rates indicate that the following factors increase the risk of crash for those with epilepsy:

- age – younger drivers have increased risk, particularly those under 25
- marital status – unmarried drivers are at a greater risk than married drivers, and
- treatment – those not receiving antiepileptic drug treatment are at greater risk than those receiving treatment.

17.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Seizures Epilepsy	Episodic impairment: Medical assessment – likelihood of impairment	Variable – sudden impairment	Medical assessments

The primary consideration for drivers with epilepsy is the potential for a seizure causing a sudden impairment of cognitive, motor or sensory functions, or a loss of consciousness while driving.

17.5 Compensation

As seizures and epilepsy cause an episodic impairment of the functions necessary for driving, a driver can not compensate.

17.6 Guideline for assessment

Rationale for all epilepsy and seizure standards

The general approach of the guideline for drivers with epilepsy or who experience seizures is that seizures must be controlled as a prerequisite to driving.

Most of the guidelines include a requirement for a seizure-free period. The purpose of this requirement for a provoked seizure is to establish the likelihood that the provoking factor has been successfully treated or stabilized. For an unprovoked seizure, the purpose is to allow time to assess the cause, and where epilepsy is diagnosed, to establish the likelihood that

- a therapeutic drug level has been achieved and maintained
- the drug being used will prevent further seizures, and
- there are no side effects that may affect the driver's ability to drive safely.

The guidelines identify exceptions to the requirement to remain seizure free for non-commercial drivers who have epilepsy and who have only simple partial seizures, or seizures that only occur while they are asleep or immediately upon awakening.

17.6.1 Provoked seizures caused by a structural brain abnormality

This standard applies to drivers who have experienced provoked seizures caused by a structural brain abnormality such as:

- a brain tumour
- stroke
- subdural hematoma, or
- aneurysm.

STANDARD	**All drivers eligible for a licence if** • **they have undergone a neurological assessment to determine the cause of the seizure, and epilepsy is not diagnosed** • **it has been 6 months since the provoking factor stabilized, resolved, or was corrected, with or without treatment, and they have not had a seizure during that time** • **the treating neurologist or neurosurgeon indicates that further seizures are unlikely**
Conditions for maintaining licence	None
Suggested Reassessment	• If a seizure occurred within the past 12 months, reassess in 1 year • If a seizure occurred more than 1 year ago, or if no further seizures are reported after the initial reassessment, reassess in 5 years • If no further seizures are reported during those 5 years, at the discretion of the Authority.

Information from health care providers	• Date of the last seizure • Description of the type of seizure • Whether a neurological assessment has been conducted and the results of the assessment • Date that the provoking factor stabilized, resolved or was corrected • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime • Opinion of treating physician on whether further seizures are likely. Depending on the nature of the provoking factor, the opinion of a neurologist may be required to determine the risk of further seizures.

17.6.2 Provoked seizures with no structural brain abnormality

This standard applies to drivers who have experienced provoked seizures caused by a:

- toxic illness
- adverse drug reaction
- trauma, or
- other cause that is not associated with a structural brain abnormality.

STANDARD	**All drivers eligible for a licence if** • **they have undergone a neurological assessment to determine the cause of the seizure, and epilepsy is not diagnosed** • **the provoking factor has stabilized, resolved, or been corrected, with or without treatment, and** • **the treating physician indicates that further seizures are unlikely**
Conditions for maintaining licence	None
Reassessment	• Routine

Information from health care providers	• Description of the type of seizure • Whether a neurological assessment has been conducted and the results of the assessment • Opinion of treating physician on whether the provoking factor has stabilized, resolved or been corrected • Opinion of treating physician on whether further seizures are likely. Depending on the nature of the provoking factor, the opinion of a neurologist may be required to determine the risk of further seizures.

17.6.3 Alcohol-related provoked seizures

STANDARD	**All drivers eligible for a licence if** • **the treating physician has confirmed that the cause of the seizure was alcohol use** • **they have undergone addiction treatment and have received a favourable report from an addiction counsellor,** • **there is no diagnosis of alcohol abuse/dependency** • **it has been at least 6 months since they have used alcohol and have not had a seizure** • **earlier re-licencing may be considered upon favourable recommendation from an addiction specialist and/or treating physician recognized by the licencing authority, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Follow up regularly with treating physician and comply with any prescribed treatment regime • Cease driving and report to the authority and treating physician if driver has a seizure
Reassessment	• Reassess in one year • If no further seizures are reported after the initial reassessment, reassess in five years • If no further seizures are reported during those five years, then routine
Information from health care providers	• Description of the cause of the seizure • Date of the last seizure

	• Details of treatment regime • Date of abstinence • Whether the driver has undergone addiction treatment • Report from an addiction counsellor and / otr treating physician whether the driver is compliant

17.6.4 Single unprovoked seizure – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **Complete neurological assessment has been conducted to determine the cause of the seizure, and epilepsy is not diagnosed, and** • **CNS imaging and EEG results are satisfactory.**
Conditions for maintaining licence	None
Reassessment	• If the seizure occurred within the past 12 months, reassess in one year • If the seizure occurred more than one year ago, or if no further seizures are reported after the initial reassessment, reassess in five years • If no further seizures are reported during those five years, then routine
Information from health care providers	• Date of the seizure • Description of the type of seizure • Whether a neurological assessment has been conducted and the results of the assessment

17.6.5 Single unprovoked seizure – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** • **it has been at least 12 months since the seizure occurred, and** • **Complete neurological assessment has been conducted to determine the cause of the seizure, and epilepsy is not diagnosed, and** • **CNS imaging and EEG results are satisfactory**

Conditions for maintaining licence	None
Reassessment	• Reassess in one year • If no further seizures are reported after the initial reassessment, then routine
Information from health care providers	• Date of the seizure • Description of the type of seizure • Whether a neurological assessment has been conducted and the results of the assessment

17.6.6 Epilepsy – Non-commercial drivers

This standard applies to non-commercial drivers who have been diagnosed with epilepsy, with the following exceptions:

- If the epileptic seizures only occur while the driver is asleep, or immediately after awakening, standard 17.6.7 applies.
- If the driver only experiences simple partial seizures, standard 17.6.8 applies.
- If the driver has had surgery for epilepsy, standard 17.6.9 applies.
- If the driver has changed effective medication, standard 17.6.10 applies.

STANDARD	**Non-commercial drivers eligible for a licence if** • **It has been 6 months since the seizure occurred with or without medication**
Conditions for maintaining licence	• Routinely follows treatment regime and physician's advice regarding prevention of seizures • Driver must cease driving and report to the authority and physician if has a seizure
Reassessment	• Reassess in one year if a seizure occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Date of the last seizure • Details of the driver's treatment regime, including length of time the driver has been on antiepileptic medication • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.7 Epilepsy with seizures only while asleep or upon awakening – Non-commercial drivers

STANDARD	**Non-commercial driver eligible for a licence if** • **it has been 6 months since the last seizure OR,** • **the driver is experiencing seizures but seizure pattern has been consistent for at least 1 year- and therefore no seizure free waiting period required** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures, if the driver is treated • Routinely follow physician's advice regarding continued monitoring of your seizures • Report to the authority and physician if the pattern of seizures changes
Reassessment	• Routine
Information from health care providers	• Description of the seizure pattern • Whether the seizure pattern has been consistent for at least 5 years • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.8 Epilepsy with simple partial seizures – Non-commercial drivers

This standard applies to non-commercial drivers with epilepsy who only experience simple partial seizures (no impairment in level of consciousness), the symptoms of which do not impair their functional ability to drive.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 6 months since the last seizure OR,** • **the driver is experiencing seizures but the seizure pattern has been consistent for at least 1 year- and therefore no seizure free waiting period required** • **favourable assessment from the treating physician or neurologist** • **no impairment in level of consciousness or cognition** • **no head or eye deviation with seizures** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures, if the driver is treated • Must report to the authority and physician if the symptoms of seizures change
Reassessment	• Routine
Information from health care providers	• Description of the symptoms of the seizures • Whether the symptoms of the seizures have been consistent for at least 1 year • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.9 Surgery for epilepsy – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **they have not had a seizure for 6 months after surgery** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures • Cease driving and report to the authority and physician if a seizure occurs
Reassessment	• Reassess in five years • If no seizures reported after initial reassessment, then routine
Information from health care providers	• Date of the last seizure • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.10 Epilepsy with medication change – Non-commercial drivers

This standard applies to non-commercial drivers with epilepsy who undergo a prescribed change to, or withdrawal of, an effective antiepileptic medication. This standard only applies where the driver's treatment was effective (i.e. their epilepsy was controlled) prior to the change to, or withdrawal from, medication. This means they should not have had a seizure for at least six months prior to the change or withdrawal of medication. If their treatment prior to the change was not effective, then guideline 17.6.6 applies.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been 3 months since the change or withdrawal and they have not had a seizure during that time, and** • **the conditions for maintaining a licence are met** **Non-commercial drivers who have a seizure after a change to, or withdrawal from, antiepileptic medication eligible for a licence if** • **they re-establish a previously effective treatment regime** • **the treating physician indicates that further seizures are unlikely,** • **it has been 3 months since the previously effective treatment regime was resumed and they have not had a seizure during that time** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures • Cease driving and report to the authority and your physician if you have a seizure
Reassessment	• If a seizure occurred within the past 12 months, reassess in one year • If no seizures occurred within the past 12 months, or if no seizures are reported after the initial reassessment, reassess in five years • If no seizures are reported during those five years, then routine
Information from health care providers	• Date of the medication change or withdrawal • Date of the last seizure • Details of the driver's treatment regime • Opinion of treating physician whether the driver is compliant with

	their treatment regime • Opinion of treating physician whether further seizures are likely

17.6.11 Epilepsy – Commercial drivers

This standard applies to commercial drivers, who have been diagnosed with epilepsy, except:

- whose seizures only occur while they are asleep or immediately after awakening, and (17.6.12)
- who have only simple partial seizures (no impairment in level of consciousness), the symptoms of which do not impair their functional ability to drive (17.6.13).

See guideline 17.6.12 for commercial drivers who meet this standard and then change medication.

STANDARD	**Commercial drivers eligible for a licence if** • **they have not had a seizure with or without medication for 5 years, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follows treatment regime and physician's advice regarding prevention of seizures • Cease driving and report to the authority and physician if a seizure occurs
Reassessment	• Routine
Information from health care providers	• Date of the last seizure • Details of the driver's treatment regime, including length of time the driver has been on or off antiepileptic medication • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.12 Epilepsy with seizures only while asleep or upon awakening -Commercial Drivers

STANDARD	**Commercial drivers eligible for a licence if** • **the driver is experiencing seizures but the seizure pattern has been consistent for at least 5 years** • **no prolonged postictal impairment in wakefulness**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures, if the driver is treated • Routinely follow physician's advice regarding continued monitoring of your seizures • Report to the authority and physician if the pattern of seizures changes
Reassessment	• Routine
Information from health care providers	• Description of the seizure pattern • Whether the seizure pattern has been consistent for at least 5 years • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.13 Epilepsy with simple partial seizures - Commercial Drivers

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 5 years since the last seizure OR,** • **the driver is experiencing seizures but the seizure pattern has been consistent for 3 years – and therefore no seizure free waiting period required** • **favourable assessment from neurologist to drive** • **no impairment in level of consciousness or cognition** • **no head or eye deviation with seizures** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures, if the driver is treated • Must report to the authority and physician if the symptoms of seizures change
Reassessment	• Routine

Information from health care providers	• Description of the symptoms of the seizures • Whether the symptoms of the seizures have been consistent for at least 1 year • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime

17.6.14 Epilepsy with medication change - Commercial drivers

This standard applies to commercial drivers with epilepsy who undergo a prescribed change to, or withdrawal of, an effective antiepileptic medication. This standard only applies where the driver's treatment was effective (i.e. their epilepsy was controlled) prior to the change to, or withdrawal from, medication. This means they must first meet guideline 17.6.11 before this standard will apply.

STANDARD	**Commercial drivers eligible for a licence if** • **it has been 6 months since the prescribed change or withdrawal and they have not had a seizure during that time, and** • **the conditions for maintaining a licence are met** **Commercial drivers who have a seizure after a prescribed change to, or withdrawal from antiepilectic medication are eligible for a licence if:** • **it has been 6 months since the prescribed change or withdrawal and they have not had a seizureduring that time** • **they have re-established a previously effective treatment regime** • **the treating physician indicates that further seizures are unlikely, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow treatment regime and physician's advice regarding prevention of seizures • Cease driving and report to the authority and physician if seizure occurs
Reassessment	• Routine
Information from	• Date of the medication change or withdrawal

health care providers	• Date of the last seizure • Details of the driver's treatment regime • Opinion of treating physician on whether the driver is compliant with their treatment regime • Opinion of treating physician on whether further seizures are likely

Chapter 18: Sleep disorders

18.1 About sleep disorders

Sleep disorders involve any difficulties related to sleeping, including:

- difficulty falling asleep (insomnia) or staying asleep
- falling asleep at inappropriate times
- excessive total sleep time, or
- abnormal behaviours associated with sleep.

This chapter focuses on the most common forms of sleep disordered breathing - obstructive sleep apnea - and on narcolepsy.

In addition to sleep disorders, a number of other factors such as work schedules or lifestyle choices may result in inadequate nocturnal sleep. Regardless of the cause, the risks of excessive sleepiness for driving safety are similar.

Sleep disordered breathing

Sleep disordered breathing consists of three distinct clinical syndromes:

- obstructive sleep apnea-hypopnea syndrome (OSAHS): apnea-hypopnea caused by repeated closure of the throat or upper airway during sleep. This is the most common form of sleep disordered breathing. In the medical standards in this section, obstructive sleep apnea-hypopnea syndrome is referred to as OSA.
- central sleep apnea-hypopnea syndrome (CSAHS): includes types of apnea-hypopnea caused by a neurological problem that interferes with the brain's ability to control breathing during sleep, as well as high altitude periodic breathing and apnea-hypopnea due to drug or substance abuse.
- sleep hypoventilation syndrome (SHVS): a type of sleep disordered breathing characterized by insufficient oxygen absorption during sleep. It usually occurs in association with restrictive lung disease in morbidly obese individuals, respiratory muscle weakness or obstructive lung disease such as COPD.

Obstructive sleep apnea-hypopnea syndrome (OSA)

With OSA, the tissue and muscles of the upper airway repetitively collapse during sleep, reducing or preventing breathing. As oxygen levels in the blood fall, arousal causes the airway to re-open. Although individuals with OSA often remain asleep, their sleep patterns are disrupted. These sleep disturbances result in excessive daytime sleepiness. Impairments in cognitive function are common in individuals with OSA and these may include difficulties in attention, concentration, complex problem solving, and short-term recall of verbal and spatial information.

Sleep monitoring is used to confirm a diagnosis of OSA. The preferred test used in diagnosis is nocturnal polysomnography. This test involves monitoring a number of physiological functions, such as brain activity, respiration, heart activity and oxygenation of the blood, while an individual is sleeping. A diagnosis of sleep apnea is based on the apnea-hypopnea index (AHI), where apnea is defined as a cessation of airflow lasting at least 10 seconds and hypopnea is defined as a reduction in airflow with a decline in blood oxygen level lasting at least 10 seconds. Generally, an individual is diagnosed with sleep apnea if they have greater than 5 apnea/hypopnea episodes per hour of sleep.

There are a number of scales used to measure the severity of OSA. A scale based on the AHI describes the following levels of severity:

- Mild: 5 to 14 events per hour
- Moderate: 15 to 30 events per hour
- Severe: more than 30 events per hour.

Although nocturnal polysomnography is considered to be the best test for the diagnosis of OSA, a number of other tests may be used by sleep specialists to assist in evaluation or diagnosis. Overnight oximetry is similar to polysomnography, but only measures oxygen level and heart rate. Results from overnight oximetry alone are not considered adequate to diagnose OSA.

A number of tests are used to evaluate daytime sleepiness. These include the Maintenance of Wakefulness Test (MWT), the Multiple Sleep Latency Test (MSLT) and the Epworth Sleepiness Scale (ESS). MWT measures the level of daytime drowsiness based on how long a person can remain awake during the day under controlled conditions. The MSLT is similar to the MWT, but measures how long it takes a person to fall asleep when taking daytime naps, rather than how long they can stay awake. The ESS is a subjective test in which a person is asked to rate on a scale of 1 to 4 the likelihood that they would fall asleep in different situations, such as when watching TV, riding in a car or engaging in conversation.

Treatment options for OSA include:

- lifestyle changes such as weight loss, alcohol abstinence or change in sleep position
- the use of oral appliances
- the use of a nasal continuous positive airway pressure (CPAP) device,
- bariatric surgery (for morbidly obese individuals), and
- in rare cases, corrective upper airway surgery.

CPAP is the most effective treatment, and the only one which has been shown to reduce the risk of motor vehicle crashes. A CPAP machine blows heated, humidified air through a short tube to a mask worn by the individual while sleeping. As the individual breathes, air pressure from the CPAP machine holds the nose, palate and throat tissues open.

An immediate reduction (usually within 2 weeks) in daytime sleepiness is often reported with CPAP treatment, although studies indicate that approximately 6 weeks of treatment

are required for maximum improvement in symptoms. Medical consensus supports the resumption of driving after 2 weeks of treatment. Estimates of compliance with CPAP treatment vary depending on how it is measured. Subjective rates of compliance based on self-report are higher than objectively determined rates. Using objective measures, a 1993 study found that 46% of individuals were acceptably compliant with their CPAP treatment. The study defined acceptable compliance as the use of the CPAP machine for at least four hours per night for more than 70% of the observed nights.

All commercial drivers must file periodic mandatory medical reports to assess their fitness to hold a commercial licence. Non-commercial drivers are assessed for fitness to drive on a case by case basis, taking into account the treating physicians specific recommendations.

OSA Indicators

During periodic medical assessments it is essential the examining physician screen for sleep disorders risk factors. The FMCSA Expert Panel Recommendations on Obstructive Sleep Apnea and Commercial Motor Vehicle Driver Safety (2008) reflected the following on OSA.

Symptoms suggestive of OSA:

- Chronic loud snoring
- Witnessed apneas or breathing pauses during sleep
- Daytime sleepiness

Risk factors for OSA:

- Male
- Advancing age
- BMI>28 kg/m2 (BMI - Body Mass Index)
- Small jaw
- Large neck size ($\geq$17 inches male, $\geq$15.5 inches female)
- Small airway
- Family history of OSA

Conditions associated with OSA:

- HBP (High Blood Pressure) or HTA (Hipertension Arterial)
- Type 2 diabetes
- Hypothyroidism

OSA Assessment

Patients with severe OSA, who have been involved in a crash in which their medical condition was a causal factor, are at high risk of having more accidents if they are not treated successfully. Even without having experienced a crash, severe sleep apnea has been identified as a factor that increases crash risk. Consequently, commercial drivers who have experienced a crash associated with falling asleep, or report they have experienced excessive sleepiness while driving, should be advised to stop driving immediately pending completion of sleep studies and effective treatment.

Furthermore, licensing agencies must decide if commercial drivers with OSA risk factors associated with the symptoms listed are fit to hold class 1, 2, 3 or 4 driver licences pending a sleep expert assessment given current waiting times for sleep studies.

Treated OSA is subject to annual medical review by the licensing agency for all Class 1, 2, 3 and 4 driver licence holders.

Narcolepsy

Narcolepsy is a chronic neurological disorder in which the brain is unable to regulate sleep-wake cycles normally. It is characterized by excessive daytime sleepiness and may also cause cataplexy (abrupt loss of muscle tone), hallucinations and sleep paralysis. There is no known cure. The symptoms of narcolepsy relevant to driving are sleepiness and cataplexy.

The excessive daytime sleepiness of narcolepsy comprises both a background feeling of sleepiness present much of the time and a strong, sometimes irresistible, urge to sleep recurring at intervals through the day. This desire is heightened by conducive or monotonous circumstances, but naps at inappropriate times, such as during meals, are characteristic. The naps associated with narcolepsy usually last from minutes to an hour and occur a few times each day. Potential secondary symptoms related to sleepiness may include visual blurring, diplopia and cognitive impairment. Cognitive impairment may include difficulties with attention and memory.

Cataplexy refers to an abrupt loss of skeletal muscle tone. It is estimated that 60% to 90% of individuals with narcolepsy experience cataplexy. During a cataplexy attack, which can last up to several minutes and occur several times a day, an individual remains conscious but is unable to move. Generalized attacks can cause an individual to completely collapse, although the muscles of the diaphragm and the eyes remain unaffected. Partial attacks, which affect only certain muscle groups, are more common than generalized attacks. Laughter or humorous events are a common trigger of cataplexy attacks, although anger, embarrassment, surprise or sexual arousal can also trigger an attack.

As there is no cure, treatment for narcolepsy is focussed on the control of sleepiness and cataplexy where present. Medications used for treatment may include:

- stimulants such as Modafinil (Altertec™)
- tricyclic antidepressants

- selective serotonin reuptake inhibitors
- venlafaxine (Effexor™), or
- reboxetine (Edronax™).

See Chapter 15, Psychotropic Drugs, for more information about medications and driving.

18.2 Prevalence

OSA affects at least 2% of women and 4% of men. It is more prevalent among middle aged and older individuals and those who are obese. It commonly remains undiagnosed, with estimates suggesting that 93% of women and 82% of men with moderate to severe sleep apnea are undiagnosed.

Canadian data on the prevalence of narcolepsy are lacking. Research in the United States indicates a prevalence rate of 47 per 100,000 individuals (.05%). It is more common in men than in women.

18.3 Sleep disorders and adverse driving outcomes

Numerous studies have investigated the relationship between OSA and adverse driving outcomes. OSA may cause daytime drowsiness and reduced concentration that are symptoms that can negatively affect driving safely. OSA is also of special concern for the commercial driver who often drives long distances with few breaks and whose work schedule may not be conducive to healthy sleep hygiene.

The majority of studies indicate that individuals with OSA have a 2 to 4 times greater risk for a crash, and the crashes result in more severe injuries. Although numerous tests are available to measure daytime sleepiness, the research also indicates that measures of daytime sleepiness and the severity of sleep apnea are not consistent predictors of impairments in driving performance.

Unlike OSA, there are few studies on narcolepsy and adverse driving outcomes. Although limited, this research suggests that narcolepsy is also associated with elevated crash rates.

18.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
OSA Narcolepsy	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation Cognitive –	Medical assessments

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
		reduced alertness	
	Persistent impairment: Functional assessment	Cognitive	Medical assessments Functional Assessments

18.5 Compensation

Drivers with sleep disorders are not able to compensate for their impairment.

Recently, a number of warning systems for drowsy drivers have been developed. These systems are designed to detect drowsiness by monitoring the driver's eye movement, head movement or other physical activity, or by sensing when a vehicle is drifting on the road. When drowsiness is suspected, a warning system alerts the driver. These systems are in various stages of development and production.

Research on the effectiveness of drowsy driving warning systems is limited. The existing research indicates that these technologies show promise as a means to warn drivers of fatigue or drowsiness. However, it is recognized that alertness is a complex phenomenon, and no single measure alone may be sensitive and reliable enough to quantify driver fatigue. Further research and development is required before the use of these warning systems can be applied in driver licensing decisions.

18.6 Guideline for assessment

18.6.1 OSA – All drivers

STANDARD	**All drivers eligible for a licence if** • **has untreated obstructive sleep apnea with an AHI < 20, and has no daytime sleepiness or,** • **has obstructive sleep apnea that is treated successfully** • **may not operate any class of vehicle if has experienced a crash associated with falling asleep or reports excessive sleepiness while driving until the sleep disorder has been treated successfully** • **the conditions for maintaining a licence are met**
Conditions for	• All commercial drivers must file periodic mandatory medical reports to assess their fitness to hold a commercial licence.

maintaining licence	• Non-commercial drivers are assessed for fitness to drive on a case by case basis, taking into account the treating physician's specific recommendations. • Cease driving and report any episodes of sleep at the wheel to the treating physician and the authority.
Reassessment	• At the discretion of the authority for non commercial drivers, • Annual medical review for commercial drivers with OSA.
Information from health care providers	• History of sleep at the wheel within the past five years • Opinion of treating physician whether the driver understands the nature of the condition and the potential impact on driving
Rationale	The primary concerns with OSA are daytime sleepiness (risk of sleep while driving) and persistent cognitive impairment. Determining who is at risk of adverse driving outcomes due to daytime sleepiness is problematic. Because existing measures of daytime sleepiness and the severity of sleep apnea are not consistent predictors of impairments in driving performance, the standard looks to driver history of sleep at the wheel for identifying current risk of sleep while driving. The standard also emphasizes the responsibility of the driver to be attentive to the risk for daytime sleepiness.

18.6.2 Narcolepsy – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **there have been no daytime sleep attacks, with or without treatment, during the past 12 months** • **there have been no episodes of cataplexy, with or without treatment, during the past 12 months**
Conditions for maintaining licence	None
Reassessment	• At the discretion of the Authority
Information from health care providers	• Type of treatment • Whether there have been daytime sleep attacks within the past 12 months • Whether there have been episodes of cataplexy within the past 12 months

Rationale	The general approach of the standard for drivers with narcolepsy is that attacks must be controlled as a prerequisite to driving. Where a driver is treated, the standard includes a requirement for an attack-free period to establish the likelihood that: • a therapeutic drug level has been achieved and maintained • the drug being used will prevent further attacks, and • there are no side effects that may affect the driver's ability to drive safely. The episodic risk of a sleep attack or cataplexy while driving is addressed in the requirement for a 12 month period without an episode prior to driving. The length of this no driving period is based on consensus medical opinion in Canada.

18.6.3 Narcolepsy – Commercial drivers

Guidelines	**Commercial drivers not eligible for a licence**
Conditions for maintaining licence	N/A
Reassessment	N/A
Specific information required	N/A
Rationale	Consensus medical opinion in Canada indicates that the risks from the increased driving exposure associated with commercial driving are such that drivers with narcolepsy may not drive.

Chapter 19: Syncope

19.1 About syncope

Syncope refers to a partial or complete loss of consciousness, usually resulting from a temporary reduction in blood flow to the brain. The onset of syncope is relatively rapid and recovery is generally prompt, spontaneous and complete. The non-medical term for syncope is fainting.

Syncope has many different causes, including cardiovascular disease and neurological disorders. In some cases, no underlying cause can be found.

The following are the major types of syncope:

- vasovagal syncope
- postural syncope, and
- cardiac syncope.

The most common types of syncope are vasovagal (neurocardiogenic) and cardiac syncope.

Vasovagal syncope

Vasovagal or neurocardiogenic syncope refers to syncope that is triggered by an exaggerated and inappropriate nervous system response to a particular stimulus. The response is characterized by alterations in heart rate and blood flow, with a subsequent reduction in blood pressure. The stimulus can be any of a wide range of events such as:

- dehydration
- intense emotional stress
- anxiety
- fear
- pain
- hunger, or
- the use of alcohol or drugs.

Stimuli can also include forceful coughing, turning of the neck or wearing a tight collar (carotid sinus hypersensitivity), or urinating (micturition syncope).

Postural syncope

Postural syncope is syncope that results from a sudden drop in blood pressure immediately after standing or sitting up. It can be a side-effect of some medications or may be caused by dehydration or medical conditions such as Parkinson's disease.

Cardiac syncope

Cardiac syncope refers to syncope caused by cardiac conditions such as:

- valvular heart disease
- chronic heart failure, or
- arrhythmias (bradycardias or tachycardias).

Cardiac arrhythmias are the most common cause of cardiac syncope.

19.2 Prevalence

The prevalence of syncope is difficult to determine. One study reported that 3% of males and 3.5% of females had at least one episode of syncope over a 26 year period. The Canadian Cardiovascular Society estimates that syncope may affect as many as 50% of Canadians at some point during their lives. Higher rates of syncope are reported in older individuals.

19.3 Syncope and adverse driving outcomes

Few studies have considered the relationship between syncope and driving. Of those that have, most indicate a relationship between syncope and impaired driving performance for at least some groups that experience syncope.

19.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Syncope	Episodic impairment: Medical assessment – likelihood of impairment	All – sudden incapacitation	Medical assessments

Syncope causes an episodic impairment of all the functions necessary for driving.

19.5 Compensation

As syncope causes an episodic impairment of the functions necessary for driving, compensation does not apply.

19.6 Guideline for Assessment

The following table lists the standards applicable to various types of syncope.

Type of syncope		Standards for non-commercial drivers	Standards for commercial drivers
Single (one episode within a 12 month period)	**Typical vasovagal -** Typical vasovagal syncope is a vasovagal syncope that occurs when standing and is preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.	19.6.1	19.6.8
	Unexplained	19.6.2	19.6.10
	Atypical vasovagal - Atypical vasovagal syncope is a vasovagal syncope that occurs in the sitting position or is not preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.	19.6.2	19.6.10
Recurrent (two or more episodes within a 12 month period)	**Reversible cause**	19.6.3	19.6.3
	Diagnosed and treated cause (e.g. pacemaker for bradycardia)	19.6.4	19.6.9
	Typical vasovagal (see definition above)	19.6.5	19.6.10
	Situational with an avoidable trigger (e.g. micturition syncope, defecation syncope)	19.6.6	19.6.6
	Unexplained	19.6.7	19.6.10
	Atypical vasovagal (see definition above)	19.6.7	19.6.10

The following table summarizes the syncope standards and waiting periods

STANDARD	Non Commercial Driver Class 5-8	Commercial Driver Class 1-4
Single episode of typical vasovagal syncope*	No restriction	
Diagnosed and treated cause e.g. permanent pacemaker for bradycardia	1 week	1 month
Reversible cause e.g. hemorrhage, dehydration	Successful treatment of underlying condition	
Situational syncope with avoidable trigger e.g. micturition syncope, defecation syncope	1 week	
- Single episode of unexplained syncope - Recurrent (within 12 months) vasovagal syncope	1 week	12 months
Recurrent episode of unexplained syncope (within 12 months)	3 months	12 months
Syncope due to documented tachyarrhythmia, or inducible tachyarrhythmia at EPS	Refer to Cardiac Section on Syncope	

* No restriction is recommended unless the syncope occurs in the sitting position or if it is determined that there may be an insufficient prodrome to pilot the vehicle to the roadside to a stop before losing consciousness. If vasovagal syncope is atypical, the restrictions for "unexplained" syncope apply. ***EPS****: Electrophysiology study*

Rationale for all syncope standards

These guidelines are based primarily on recommendations contained in the final report of the 2003 Canadian Cardiovascular Society (CCS) Consensus Conference Assessment of the Cardiac Patient for Fitness to Drive and Fly. When applying these standards, the CCS indicates that waiting periods may be modified based on individual factors such as length of any reliable warning symptoms (prodrome), reversible or avoidable precipitating factors, and position from which the individual experiences syncope.

19.6.1 Single episode of typical vasovagal syncope – Non-commercial drivers

Typical vasovagal syncope is a vasovagal syncope that occurs when standing and is preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

STANDARD	**Non-commercial drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Description of the type of syncope

19.6.2 Single episode of unexplained syncope or atypical vasovagal syncope – Non-commercial drivers

Atypical vasovagal syncope is a vasovagal syncope that occurs in the sitting position or is not preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been at least 1 week since the last episode of syncope, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Report to the authority and your physician if you have another episode of syncope
Reassessment	• Reassess in one year if an episode occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Description of the type of syncope • Date of the last episode of syncope

19.6.3 Syncope with a reversible cause

STANDARD	**All drivers eligible for a licence if** • **the cause has been successfully treated, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Report to the authority and your physician if you have another episode of syncope
Reassessment	• Routine, unless reassessment is required because of the underlying medical condition or treatment
Information from health care providers	• Description of the cause of the syncope • Opinion of the treating physician whether the treatment was successful

19.6.4 Syncope with a diagnosed and treated cause – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been at least one week since successful treatment, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Report to the authority and your physician if you have another episode of syncope
Reassessment	• Routine, unless reassessment is required because of the underlying medical condition or treatment
Information from health care providers	• Description of the cause of the syncope • Date of treatment • Opinion of the treating physician whether the treatment was successful

19.6.5 Recurrent typical vasovagal syncope – Non-commercial drivers

This guideline applies to non-commercial drivers who have had two or more episodes of typical vasovagal syncope within a 12 month period.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been at least one week since the last episode of syncope**
Conditions for maintaining licence	None
Reassessment	• Reassess in one year if an episode occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Description of the type of syncope • Date of the last episode

19.6.6 Recurrent situational syncope with an avoidable trigger

This guideline applies to drivers who have had two or more episodes of situational syncope with an avoidable trigger (e.g. micturition syncope, defecation syncope) within a 12 month period.

STANDARD	**All drivers eligible for a licence if** • **it has been at least one week since the last episode of syncope**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Description of the type of syncope • Date of the last episode of syncope

19.6.7 Recurrent atypical vasovagal or recurrent unexplained syncope – Non-commercial drivers

This guideline applies to non-commercial drivers who have had two or more episodes of atypical vasovagal syncope, or unexplained syncope within a 12 month period.

Atypical vasovagal syncope is a vasovagal syncope that occurs in the sitting position or is not preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

STANDARD	**Non-commercial drivers eligible for a licence if** • **it has been at least three months since the last episode of syncope, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Report to the authority and your physician if you have another episode of syncope
Reassessment	• Reassess in one year if an episode occurred within the past 12 months • Otherwise, routine
Information from health care providers	• Description of the type of syncope • Date of the last episode of syncope

19.6.8 Single episode of typical vasovagal syncope – Commercial drivers

This guideline applies to commercial drivers who have had a single episode of typical vasovagal syncope within a 12 month period.

Typical vasovagal syncope is a vasovagal syncope that occurs when standing and is preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

STANDARD	**Commercial drivers eligible for a licence if** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	Report to the authority and your physician if you have another episode of syncope
Reassessment	• Routine
Information from health care providers	• Description of the type of syncope

19.6.9 Syncope with a diagnosed and treated cause – Commercial drivers

This guideline applies to commercial drivers who have syncope with a diagnosed and treated cause (e.g. pacemaker for bradycardia).

STANDARD	**Commercial drivers eligible for a licence if** • **it has been at least one month since successful treatment, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Report to the authority and your physician if you have another episode of syncope
Reassessment	• Routine, unless reassessment is required because of the underlying medical condition or treatment
Information from health care providers	• Description of the cause of the syncope • Date of treatment • Opinion of the treating physician whether the treatment was successful

19.6.10 Single or recurrent unexplained, single or recurrent atypical vasovagal, or recurrent typical vasovagal syncope – Commercial drivers

This standard applies to commercial drivers who have had:

- single or recurrent atypical vasovagal syncope
- single or recurrent unexplained syncope, or
- recurrent typical vasovagal syncope

within a 12 month period.

Typical vasovagal syncope is a vasovagal syncope that occurs when standing and is preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

Atypical vasovagal syncope is a vasovagal syncope that occurs in the sitting position or is not preceded by warning signs that are sufficient to allow a driver to pull off the road before losing consciousness.

STANDARD	**Commercial drivers eligible for a licence if** • **it has been at least 12 months since the last episode of syncope, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Routinely follow your treatment regime and physician's advice regarding prevention of syncope • Report to the authority and your physician if you have another episode of syncope
Reassessment	• Reassess in one year • After initial reassessment, routine
Information from health care providers	• Description of the type of syncope • Date of the last episode of syncope • Opinion of treating physician whether the driver is compliant with the treatment regime and the physician's advice regarding prevention of syncope

Chapter 20: Traumatic brain injury

20.1 About traumatic brain injury

Traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical and psychosocial functions, with an associated diminished or altered state of consciousness. The leading causes of TBI are falls and motor vehicle crashes.

Descriptions of the severity of a TBI reflect the length of time a person is unconscious or lacks awareness of their environment. Mild TBI indicates only a brief change in mental status or consciousness, while severe TBI describes an extended period of unconsciousness or amnesia after the injury.

TBI can result in a wide range of impairments, which will vary depending on the severity and location of the injury, and the age and general health of the injured person. Possible sensory impairments include:

- visual field deficits
- visual neglect
- diplopia, and
- loss of sensation or hearing.

Possible motor impairments include paralysis, paresis (partial loss of movement or impaired movement) and slowed reaction times. Possible cognitive impairments include deficits in:

- attention
- memory
- executive functioning
- processing speed, and
- visuo-spatial abilities, including visual memory.

Behavioural impairments are common, including disorders affecting mood and impulse control. Sleep disturbances, sleep apnea and fatigue are also commonly reported. TBI is also associated with epilepsy.

Anosognosia (unawareness of impairment) is common in individuals with TBI, particularly in those with moderate to severe TBI, and is of particular concern for driving. Research suggests that anosognosia is more frequently associated with cognitive and behavioural impairments than with physical deficits.

20.2 Prevalence

Rates of incidence and prevalence of TBI are difficult to determine due to a lack of uniformity in definitions and reporting methods. Canadian data suggest that the overall prevalence of TBI is 62.3 per 100,000 adults. Rates were highest in the 45 to 64 year old age range, three times the rate of those in the 15 to 24 year old range.

20.3 Traumatic brain injury and adverse driving outcomes

Numerous studies have examined the relationship between TBI and driving outcomes. Although few studies have examined crash rates, the existing research indicates higher rates of crashes and traffic violations for those who have experienced a TBI. Notably, studies indicate that approximately 50% of those experiencing a TBI will not resume driving after the TBI. Research examining road test results indicates that approximately 30% of individuals who have experienced a TBI will fail a subsequent road test.

20.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Traumatic brain injury	Persistent impairment: Functional assessment	Variable – cognitive, motor or sensory	Medical assessments Functional assessment
	Episodic impairment: Medical assessment – likelihood of impairment	Variable – sudden impairment (epilepsy)	Medical assessments

Traumatic brain injury may result in a persistent cognitive, motor or sensory impairment, or an episodic impairment (epilepsy), or both.

20.5 Compensation

Drivers who have experienced a persistent impairment of motor or sensory function may be able to compensate. An occupational therapist, driver rehabilitation specialist, driver examiner or other medical professional may recommend specific compensatory vehicle modifications or restrictions based on an individual functional assessment.

Some examples of compensatory mechanisms are shown in the following table.

Motor impairment	Sensory (vision) impairment
• Steering wheel spinner knob • Restriction to automatic transmission or power-assisted brakes	• Scanning horizon more frequently • Turning head 90◦ to maximize area scanned • Large left and right side mirrors

20.6 Guidelines for assessment

20.6.1 Traumatic brain injury

If a driver has epilepsy as a result of a TBI, also see the standards in Chapter 17.

STANDARD	**All drivers eligible for a licence if** • **movement and strength are sufficient to perform the functions necessary for driving** • **cognitive and visual functions necessary for driving are not impaired** • **any pain associated with the condition, and any treatment for the condition, do not impair the functional abilities necessary for driving** • **where required, a functional assessment indicates that the driver is able to compensate for any loss of functional ability necessary for driving, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Only drive vehicles that have the permitted modifications and devices required to compensate for functional impairment
Reassessment	• Routine
Information from health care providers	• Whether the driver suffers from epilepsy as a result of the TBI. See the standards under Chapter 17 if epilepsy is present. • Opinion of treating physician on whether the driver has a loss of movement or strength that may affect functional ability to drive • Opinion of treating physician on whether pain or treatment may adversely affect functional ability to drive • Opinion of treating physician on whether the driver suffers from diplopia and/or a visual field deficit that may affect functional ability to drive. See the standards under Chapter 22 if the treating physician indicates that either of these conditions may be present. • Where required, the results of a functional assessment
Rationale	The potential functional impairments associated with traumatic brain injury are variable.

Chapter 21: Vestibular disorders

21.1 About vestibular disorders

The vestibular system - or balance system - is a sensory apparatus localized in the inner ears. It provides information to the nervous system about a person's movement and orientation in space. Vestibular input contributes to:

- control of balance
- gaze stabilization so that a person can see clearly while moving, and
- spatial orientation so that a person knows their position with reference to gravity.

Vestibular disorders may result in:

- vertigo
- dizziness
- disturbed vision such as involuntary eye movement, and
- illusory movement of the visual world as a result of head movement.

A hallmark of vestibular disorders is vertigo, a term that refers to the sensation of spinning or whirling resulting from a disturbance in balance (equilibrium). Most commonly an attack of vertigo generally lasts less than one minute (30 seconds is typical) but it may last up to 60 minutes. A small number of people may experience vertigo lasting as long as 24 hours and an even smaller number may experience vertigo lasting up to, or beyond, 30 days.

Disorders of the vestibular system are classified as either peripheral or central.

Peripheral vestibular disorders

Peripheral disorders are characterized by episodic fluctuating symptoms; the dominant symptom is 'true spinning vertigo', that is the sensation of motion when no motion is occurring relative to earth's gravity. Peripheral vestibular disorders typically occur as a single acute episode or as recurrent acute episodes. However, complete bilateral hypofunction may result in severe and constant disequilibrium and motion sensitivity.

The most common peripheral vestibular disorders and the typical duration of an episodic event are shown in the following table.

Disorder	Duration
benign paroxysmal positioning vertigo (BPPV)	20-30 seconds
vestibular neuronitis (labyrinthitis)	Tends to be single attack lasting days to weeks
Meniere's Disease	20 minutes – 24 hours

Less common peripheral vestibular disorders are described in the following table.

Disorder	Description
Drop Attacks (Tumarkin's Otolithic Crisis)	Sudden, spontaneous fall to the ground without prior warning
Complete bilateral vestibular hypofunction (absence of function)	May result in severe and constant disequilibrium and motion sensitivity

Central vestibular disorders

Central vestibular disorders generally arise from underlying persistent medical conditions. Because of this, they are more likely to produce prolonged continuous non-specific dizziness. They are characterized by difficulty in interpretation of vestibular, visual and proprioceptive (the unconscious perception of movement and spatial orientation arising from stimuli within the body itself) inputs. Gaze stabilization and posture during locomotion may also be affected.

Common persistent medical conditions that can cause persistent central vestibular dysfunction are:

- cerebrovascular disease
- cervical vertigo
- epilepsy
- multiple sclerosis
- normal pressure hydrocephalus
- paraneoplastic syndromes (a response to the effects of a tumour in the body), and
- traumatic brain injury.

Common episodic medical conditions that are not related to structural brain disease but that may cause central vestibular disorders, and typical episode duration, are shown in the following table.

Disorder	Duration
migraines	a few seconds to hours
Psychogenic vertigo/anxiety (hyperventilation syndrome)	a few seconds to hours

21.2 Prevalence

Peripheral vestibular disorders are more common than central vestibular disorders.

Age-related decrements in vestibular function are well documented and are likely due to degeneration at both the central and peripheral level. BPPV is reported as a common underlying cause of impairments in balance with aging.

A 2005 study on the frequency of moderate or severe vertigo and dizziness reported that 36.2% of women and 22.4% of men had experienced vertigo or dizziness at some point in their life.

One study identified that 32.5% of people with Meniere's disease developed drop attacks (Tumarkin's otolithic crisis); the attacks typically occurred in a flurry during a period of 1 year or less. No patient in the study required treatment for the drop attacks. Most people with this have a spontaneous remission of the drop attacks.

21.3 Vestibular disorders and adverse driving outcomes

The evidence linking vestibular disorders with adverse driving outcomes is weak because there has been little empirical research in this area. Nonetheless driving ability is dependent on the normal functioning of the vestibular mechanism to sense movement and position.

In subjective studies where drivers with vestibular disorders were asked about driving, driving difficulties were commonly reported and included a wide range of difficulties including driving in the rain, at night, pulling in and out of parking spaces, changing lanes, and freeway and rush hour driving.

In one study, 20-40% of drivers reported that they had had to pull off the road while driving due to vertigo. In a different study, 43% indicated that they had felt dizzy while driving; only 27% indicated that they 'always' or 'usually' got a warning that a dizzy spell was about to occur, with more than 1/3 indicating that they 'rarely' or 'never' get warnings. Of those who did get warnings, 56% indicated that there was less than a 5-second interval between the warning and the dizzy spell.

21.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Vestibular disorders resulting in episodic impairment, including: • migraines • psychogenic vertigo/anxiety (hyperventilation syndrome) • benign paroxysmal positioning vertigo (BPPV) • Meniere's Disease • vestibular neuronitis (labyrinthitis) • Drop Attacks (Tumarkin's Otolithic Crisis)	Episodic impairment: Medical assessment – likelihood of impairment	Sensorimotor	Medical assessments
	Persistent impairment: Functional assessment	Cognitive	Medical assessments Functional assessment
Vestibular disorders resulting in persistent impairment, including: • complete bilateral vestibular hypofunction (absence of function), or • vestibular disorder resulting from an underlying persistent medical condition.	Persistent impairment: Functional assessment	Sensorimotor Cognitive	Medical assessments Functional assessment

The functional effects associated with vestibular disorders can occur suddenly and with sufficient severity to make safe driving of any type of vehicle impossible.

People with vestibular disorders become disoriented more easily by extraneous visual stimuli or visual noise. This means that drivers are more likely to have difficulty driving in reduced visual conditions such as driving at night or in the rain.

Rapid head movements are also likely to elicit vertigo in people with vestibular disorders. This means that tasks such as parking a car, manoeuvring in a parking space, lane maintenance and lane changes, and entering traffic may be risk factors for the onset of vertigo.

Research also indicates that damage to the vestibular system results in cognitive deficits in people with both peripheral and central vestibular disorders. People with vestibular disorders exhibit a range of cognitive deficits including those that are spatial and non-spatial. The cognitive deficits do not appear to be related to any particular episode of

vertigo or dizziness and the deficits may occur even in those people who have no symptoms of dizziness or postural deficits.

Central vestibular disorders

The majority of central vestibular disorders have a persistent impact on driving because they arise from underlying persistent medical conditions. However, two common causes of central vestibular disorders - migraines and hyperventilation syndrome - are episodic in nature with short disease duration.

Peripheral vestibular disorders

Peripheral vestibular disorders are generally more episodic with, in general, shorter disease duration. Drivers, however, with complete bilateral vestibular hypofunction (absence of function) may have severe and constant disequilibrium and motion sensitivity forever. These drivers may have more difficulty driving, particularly during evening hours or on bumpy roads, and may not be safe to drive.

21.5 Compensation

Drivers with vestibular disorders are not able to compensate for their functional impairment.

21.6 Guideline for assessment

21.6.1 Recurrent episodes of vertigo that occur with warning symptoms

This may include drivers with:

- benign paroxysmal positioning vertigo (BPPV)
- Meniere's disease
- vestibular neuronitis (labyrinthitis)
- migraines, or
- psychogenic vertigo/anxiety (hyperventilation syndrome).

STANDARD	**All drivers eligible for a licence if** • **warning symptoms do not themselves impair ability to drive** • **warning symptoms are of a sufficient duration to allow a driver to safely pull off the road, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Stop driving whenever experiencing warning symptoms and do not resume driving until all symptoms associated with the episode have subsided
Reassessment	• Routine
Information from health care providers	• Description of warning symptoms and effect on functional ability • Whether the driver has insight into the impact their vestibular dysfunction may have on driving • History of compliance with prescribed treatment regime • If known, whether the driver is compliant with any current conditions of licence related to their vestibular dysfunction
Rationale	The risk from an episodic vestibular dysfunction can be mitigated where the episode is consistently preceded by warning symptoms that are not incapacitating and which last long enough for a driver to safely stop their driving until the episode is over.

21.6.2 Recurrent episodes of vestibular dysfunction that occur without warning symptoms – All drivers

This may includes ~~non-commercial~~ drivers with:

- benign paroxysmal positioning vertigo (BPPV)
- Meniere's disease
- vestibular neuronitis (labyrinthitis)
- migraines, or
- psychogenic vertigo/anxiety (hyperventilation syndrome).

STANDARD	**All drivers eligible for a licence if** • **it has been at least 6 months since an episode of vestibular dysfunction** • **the treating physician or specialist indicates that their symptoms have been controlled or have abated, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Immediately stop driving and report to the authority and treating physician if experiencing an episode of vestibular dysfunction
Reassessment	• Routine
Information from health care providers	• Date of last episode of vestibular dysfunction • Treating physician's opinion as to whether the symptoms have been controlled or have abated • Treating physician's opinion as to whether the driver has insight into the impact their vestibular dysfunction may have on driving • History of compliance with prescribed treatment regime • If known or applicable, whether the driver is compliant with any current conditions of licence related to their vestibular dysfunction
Rationale	Where episodes of vestibular dysfunction are not preceded by warning symptoms or the warning symptoms are not sufficient to allow the driver to safely stop driving, evidence that further episodes are unlikely to occur is required to mitigate the risk. Consensus medical opinion suggests that this evidence should include a minimum period of 6 months without an episode and opinion of the treating physician that this episode-free period reflects effective treatment or abatement of the episodes.

21.6.3 Drop attacks (Tumarkin's otolithic crisis)

STANDARD	**All drivers eligible for a licence if** • **it has been at least 6 months since experiencing a drop attack, or** • **the treating physician indicates that the attacks have been successfully treated, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Immediately stop driving and report to the authority and treating physician if experiencing a drop attack
Reassessment	• If attack has occurred in past 12 months, reassess in one year • If no new attacks after initial reassessment, then routine reassessment for commercial drivers and reassess after 5 years for non-commercial drivers • If no new attacks upon subsequent reassessment, then routine
Information from health care providers.	• Date of last drop attack or opinion of treating physician as to success of treatment • Treating physician's opinion as to whether the driver has insight into the impact their condition may have on driving • History of compliance with prescribed treatment regime • If known or applicable, whether the driver is compliant with any current conditions of licence related to their vestibular disorder
Rationale	For drop attacks, which occur without warning, evidence that further attacks are unlikely to occur is required to mitigate the risk. Consensus medical opinion suggests that this evidence should be an opinion from the treating physician that the driver has been successfully treated or that 6 months has passed without an attack.

21.6.4 Single episode of vestibular dysfunction – transient impairment

STANDARD	**All drivers eligible for a licence**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers.	None
Rationale	A single episode of vestibular dysfunction is a transient impairment.

21.6.5 Vestibular disorder resulting in a persistent impairment

STANDARD	**All drivers eligible for a licence if** • **functional assessments indicate ability required for driving safely**
Conditions for maintaining licence	None
Reassessment	• To be determined on an individual basis
Information from health care providers.	• Results of functional assessment • Treating physician's opinion as to whether the driver has insight into the impact their vestibular disorder may have on driving • History of compliance with prescribed treatment regime • If known or applicable, whether the driver is compliant with any current conditions of licence related to their vestibular dysfunction
Rationale	Persistent vestibular dysfunction may cause significant impairment of the functions needed for driving. Decisions about driver fitness should be based on an individual functional assessment.

Chapter 22: Vision impairment

22.1 About vision impairment

Vision impairment is defined as a functional limitation of the visual system and can be manifested as:

- reduced visual acuity
- reduced contrast sensitivity
- visual field loss
- loss of depth perception
- diplopia (double-vision)
- visual perceptual difficulties, or
- any combination of the above.

This chapter focuses on common vision impairments and medical conditions and treatments that can cause vision impairments.

Common vision impairments

Impaired visual acuity

Visual acuity is the ability of the eye to perceive details. It can be described as either static or dynamic. Static visual acuity, the common measure of visual acuity, is defined as the smallest detail that can be distinguished in a stationary, high contrast target (e.g. an eye chart with black letters on a white background). When tested, it is reported as the ratio between the test subject's visual acuity and standard "normal" visual acuity. Normal visual acuity is described as 20/20 or 6/6 in metric. A person with 20/40 vision (6/12 metric) needs to be 20 feet (6 metres) away to distinguish detail that a person with normal vision can distinguish at 40 feet (12 metres). The standard Snellen chart for measuring visual acuity and a table of standard ratings is included in 22.7.1

Dynamic visual acuity is the ability to distinguish detail when there is relative motion between the object and the observer. Given the nature of driving, dynamic visual acuity would seem to be more relevant to licensing decisions than static visual acuity. However, barriers to the use of dynamic visual acuity for decision-making include:

- the absence of a practicable method of testing dynamic visual acuity
- limited research on its relevancy for driving, and
- the lack of established levels of dynamic visual acuity required for driving safely.

Myopia, hyperopia, presbyopia and astigmatism (refractive errors)

Myopia, hyperopia, presbyopia and astigmatism are conditions associated with reduced visual acuity. They are known as refractive errors and are the result of errors in the focusing of light by the eye.

Myopia (nearsightedness) is a condition in which near objects are seen clearly but distant objects do not come into proper focus. Individuals with normal daytime vision may experience "night myopia." Night myopia is believed to be caused by pupils dilating to let more light in, which adds aberrations that result in nearsightedness. It is more common in younger individuals and people who are myopic.

Hyperopia (farsightedness) is a condition in which distant objects are seen clearly but close objects do not come into focus. Age-related farsightedness is called presbyopia. It is not a disease, but occurs as a natural part of the aging process of the eye and usually becomes noticeable as an individual enters their early to mid 40s.

Astigmatism is a visual condition that results in blurred vision. It commonly occurs with other conditions such as myopia and hyperopia.

Visual field loss

The visual field is the extent of the area that a person can see with their eyes held in a fixed position, usually measured in degrees. The normal binocular (using both eyes) visual field is 135 degrees vertically and 180 degrees horizontally from the fixed point.

The visual field can be divided into central and peripheral portions. Central vision refers to vision within 30 degrees of the point of fixation or gaze. The macula, a small area in the centre of the retina, is responsible for fine, sharp, straight-ahead central vision. Peripheral vision allows for the detection of objects and movement outside the scope of central vision.

Visual field impairment refers to a loss of part of the normal visual field. The table and diagram on the following two pages provide further information on various types of visual field defects. The term "scotoma" refers to any area where the area of lost visual field is surrounded by normal vision.

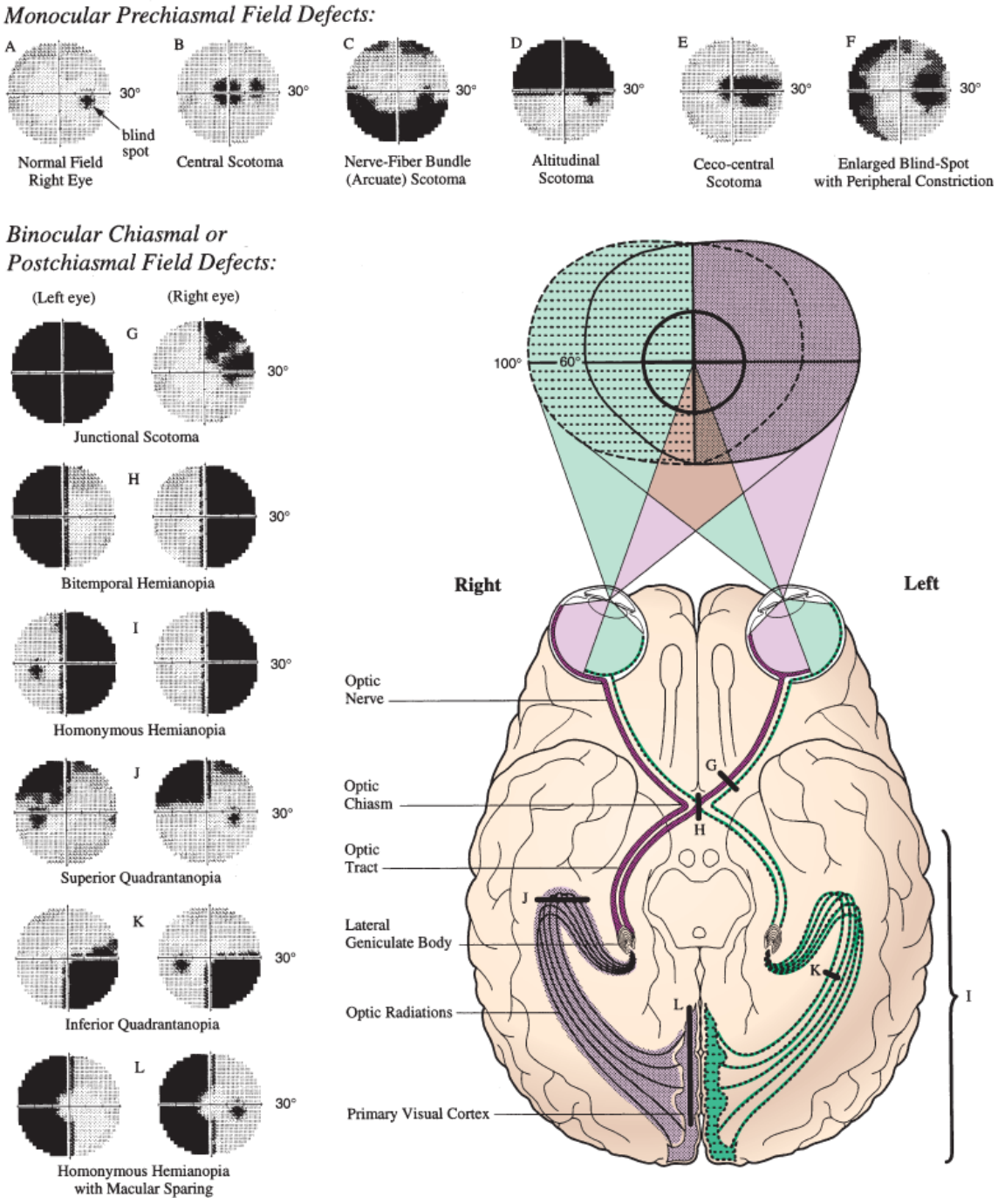
Hemianopia, vision loss in one half of the visual field, or quadrantanopia, vision loss in one quarter of the visual field, can occur as a result of a stroke, trauma or tumour. They are not usually caused by a problem with the eye itself.

An important consideration related to hemianopia is the potential for anosognosia. Anosognosia is a condition in which a person with an impairment caused by a brain injury is unaware of the impairment. Research indicates that hemianopic anosognosia is relatively frequent, occurring in approximately two-thirds of those with hemianopia. Unawareness of visual field deficits has an obvious negative impact on safe driving performance.

Types of visual field defects[20]		
Type	**Description**	**Causes**
Altitudinal field defect	Loss of all or part of the superior or inferior half of the visual field, but in no case does the defect cross the horizontal median	More common: Ischemic optic neuropathy, hemibranch retinal artery occlusion, retinal detachment Less common: Glaucoma, optic nerve or chiasmal lesion, optic nerve coloboma
Arcuate scotoma	A small, arcuate-shaped field loss due to damage to the ganglion cells that feed into a particular part of the optic nerve head, which follows the arcuate shape of the nerve fibre pattern; the defect does not cross the horizontal median	More common: Glaucoma Less common: Ischemic optic neuropathy (especially nonarteritic), optic disk drusen, high myopia
Binasal field defect (uncommon)	Loss of all or part of the medial half of both visual fields; the defect does not cross the vertical median	More common: Glaucoma, bitemporal retinal disease (e.g. retinitis pigmentosa) Rare: Bilateral occipital disease, tumour or aneurysm compressing both optic nerves
Bitemporal hemianopia	Loss of all or part of the lateral half of both visual fields; the defect does not cross the vertical median	More common: Chiasmal lesion (e.g. pituitary adenoma, meningioma, craniopharyngioma, aneurysm, glioma) Less common: Tilted optic disks Rare: Nasal retinitis pigmentosa
Blind-spot enlargement	Enlargement of the normal blind spot at the optic nerve head	Papilledema, optic nerve drusen, optic nerve coloboma, myelinated nerve fibres at the optic disk, drugs, myopic disk with a crescent
Central scotoma	A loss of visual function in the middle of the visual field, typically affecting the fovea centralis	Macular disease, optic neuropathy (e.g. ischemic, Leber's hereditary, optic neuritis), optic atrophy (e.g. from tumour compressing the nerve, toxic/metabolic disease) Rare: Occipital cortex lesion
Homonymous hemianopia	Loss of part or all of the left half or right half of both visual fields; the defect does not cross the vertical median	Optic tract or lateral geniculate body lesion; temporal, parietal, or occipital lobe lesion of the brain (stroke and tumour more common; aneurysm and trauma less common). Migraine may cause a transient homonymous hemianopia
Constriction of the peripheral fields leaving only a small residual central field	Loss of the outer part of the entire visual field in one or both eyes	Glaucoma, retinitis pigmentosa or some other peripheral retinal disorder, chronic papilledema after panretinal photocoagulation, central retinal artery occlusion with cilioretinal artery sparing, bilateral occipital lobe infarction with macular sparing, nonphysiologic vision loss, carcinoma-associated retinopathy Rare: drugs

[20] From http://www.merck.com/mmpe/sec09/ch098/ch098a.html - Adapted from *The Wills Eye Manual*, Douglas J. Rhee, M.D. and Mark F. Pyfer, M.D.© 1999 by Lippincott Williams & Wilkins.

Visual field defects diagram[21]



[21] Source?

Blindness/low vision

Total blindness is the complete lack of vision and is often described as no light perception. A person may be considered "blind" even though they have some vision. There is no universally accepted level of visual acuity to define blindness. In North America and most of Europe a person is considered to be legally blind if their visual acuity is 20/200 (6/60) or less in the better eye with the best correction possible, or if their visual field is less than 20 degrees in diameter. The World Health Organization (WHO) defines "low vision" as visual acuity between 20/60 (6/18) and 20/400 (6/120) or a visual field between 10 and 20 degrees in diameter. The WHO definition of "blindness" is visual acuity less than 20/400 (3/60) or a visual field less than 10 degrees.

Monocular vision/Loss of stereoscopic depth perception

Monocular vision refers to having vision in one eye only and is associated with the loss of stereoscopic vision. Stereoscopic vision, in which the brain processes information from each eye to create a single visual image, is integral to depth perception in those with binocular vision.

Impaired colour vision

Individuals with impaired colour vision (colour blindness) lack a perceptual sensitivity to some or all colours. These impairments are usually congenital and, in general, drivers learn to compensate for the inability to distinguish colours when driving.

Impaired contrast sensitivity

Visual contrast sensitivity refers to the ability to perceive differences between an object and its background. Depending on the cause, a loss of contrast sensitivity may or may not be associated with a corresponding loss of visual acuity. Declines in contrast sensitivity are associated with normal aging, and can also result from conditions such as:

- cataracts
- age-related macular degeneration
- glaucoma, and
- diabetic retinopathy.

Impaired dark adaptation and glare recovery

Dark adaptation refers to the process in which the visual system adjusts to a change from a well lit environment to a dark environment. Glare recovery refers to the process in which the eyes recover visual sensitivity following exposure to a source of glare, such as oncoming headlights when driving at night.

Prolonged dark adaptation is associated with normal aging and results in decreased visual acuity at night. It may also be the result of a medical condition, and where severe, may be referred to as "night blindness." Night blindness may be caused by a number of medical conditions including:

- retinitis pigmentosa
- vitamin A deficiency
- diabetes
- cataracts, or
- macular degeneration.

As with dark adaptation, individuals require a longer time to recover from glare as they age. Cataracts and corneal edema are also associated with prolonged glare recovery. Individuals may also experience prolonged glare recovery following laser assisted in situ keratomileusis (LASIK) or panretinal laser photocoagulation (PRP) surgery.

A number of illnesses can affect glare recovery time, with prolonged recovery times reported in individuals with diabetes, vascular disease and hypertension. Retinal conditions with demonstrated relationships to prolonged glare recovery include age-related maculopathy, "cured" retinal detachment and central serous retinopathy.

Diplopia

Diplopia (double vision) is the simultaneous perception of two images of a single object. These images may be displaced horizontally, vertically or diagonally in relation to each other.

Diplopia can be binocular or monocular. Binocular diplopia is present only when both eyes are open, with the double vision disappearing if either eye is closed or covered. Monocular diplopia is also present with both eyes open, but unlike binocular diplopia, the diplopia persists when the problematic eye is open and the other eye is closed or covered.

Binocular diplopia, or true diplopia, is an inability of the visual system to properly fuse the images viewed by each eye into a single image. It may be caused by the physical misalignment of the eyes (strabismus) or diseases such as Parkinson's disease or multiple sclerosis. Two of the most common causes of binocular diplopia in people over 50 are thyroid conditions, such as Grave's disease, and cranial nerve damage.

Monocular diplopia is not caused by misalignment, but rather by problems in the eye itself. Astigmatism, dry eye, corneal distortion or scarring, vitreous abnormalities, cataracts and other conditions can cause monocular diplopia.

Nystagmus

Nystagmus is an involuntary, rapid, rhythmic movement of the eyeball. The movements may be horizontal, vertical, rotary or mixed. Nystagmus which occurs before 6 months of age is called congenital or early onset, whereas that occurring after 6 months is labelled acquired nystagmus. Early onset nystagmus may be inherited, or the result of

eye or visual pathway defects. In many cases, the cause is unknown. Causes of acquired nystagmus are many and it may be a symptom of another condition such as stroke, multiple sclerosis, or even a blow to the head.

Many individuals with nystagmus have significant impairments in their vision, with some having low vision or legal blindness.

Medical conditions causing vision impairments

Cataracts

A cataract is an opacification or clouding of the crystalline lens of the eye, which blocks light from reaching the retina. Cataracts may be due to a variety of causes. Some are congenital, but few occur during the early years of life. The majority of cataracts are the result of the aging process. The presence of a cataract can interfere with visual functioning by decreasing acuity, contrast sensitivity and visual field.

Diabetic retinopathy

Diabetic retinopathy is the most common eye disease in those with diabetes, results in significant impairments in vision (blurred vision, vision loss) and is a leading cause of blindness in adults. It is caused by changes in the blood vessels of the retina (microvascular retinal changes) as a result of the disease.

There are two types of diabetic retinopathy: background (non-proliferative) and proliferative. Background retinopathy reflects early changes in the retina and often is asymptomatic. However, it may result in decreased visual acuity. Background diabetic retinopathy can progress into a more advanced or proliferative stage.

Proliferative retinopathy is the result of retinal hypoxia (lack of oxygen to the retina) and carries a much graver prognosis. The lack of oxygen to the retina results in a proliferation of new vessels in the retina or on the optic disc (neovascularization). Without treatment, the new vessels can leak blood into the centre of the eye, resulting in blurred vision. Fluid (exudate) also can leak into the centre of the macula (that part of the eye where sharp, straight-ahead vision occurs), a condition called macular edema. The leakage causes swelling of the macula, resulting in blurred vision. Macular edema can occur at any stage of diabetic retinopathy, but is more likely to occur as the disease progresses. Research indicates that approximately half of those with proliferative retinopathy also have macular edema.

An example of the effects of diabetic retinopathy on vision is shown below[22].

Normal vision

Vision of individual with diabetic retinopathy

Glaucoma

Glaucoma is a group of diseases characterized by increased intraocular pressure. The increased pressure can lead to optic nerve damage, resulting in blindness. Types of glaucoma include adult primary, secondary, congenital and absolute glaucoma. Open angle glaucoma, a type of adult primary glaucoma, is the most common. It is often referred to as the "silent blinder" because extensive damage may occur before the patient is aware of the disease. Early diagnosis and treatment are important for the prevention of optic nerve damage and visual field loss (primarily peripheral vision) due to glaucoma.

An example of the effects of glaucoma on vision is shown below[23].

Normal vision

Vision of individual with glaucoma

[22] Source National Eye Institute - http://www.nei.nih.gov/resources/strategicplans/neiplan/frm_impairment.asp
[23] Source National Eye Institute - http://www.nei.nih.gov/resources/strategicplans/neiplan/frm_impairment.asp

Age-related macular degeneration (ARMD)

Age-related macular degeneration (ARMD) is associated with the advanced stages of age-related maculopathy, or disease of the macula. The macula is the central portion of the retina and is responsible for central vision in the eye. Most individuals with maculopathy have impairments in their central vision. Those with ARMD, however, experience a progressive destruction of the photoreceptors in the macula, resulting in profound central vision loss.

ARMD has two forms, dry and wet. The dry form is the result of atrophy to the retinal pigment, resulting in vision loss due to the loss of photoreceptors (rods and cones) in the central portion of the eye. High doses of certain vitamins and minerals have been shown to slow the progression of the disease and reduce associated vision loss.

Wet ARMD (neovascular or exudative) is due to abnormal blood vessel growth in the eye, leading to blood and protein leakage in the macula. The bleeding, leaking and scarring from these blood vessels eventually result in damage to the photoreceptors, with a rapid loss of vision if left untreated. Treatment for wet ARMD has improved. Recent pharmaceutical advancements have resulted in compounds that, when injected directly into the vitreous humor, can cause regression of the abnormal blood vessels, leading to an improvement in vision.

An example of the effects of ARMD on vision is shown below[24].

Normal vision

Vision of individual with macular degeneration

Retinitis pigmentosa

Retinitis pigmentosa is the term given to a group of hereditary retinal diseases that result in the degeneration of rod and cone photoreceptors. The diseases cause progressive visual loss, ending in blindness. Night blindness is an early symptom of retinitis pigmentosa, followed by a constriction of the peripheral visual field. Loss of central vision typically occurs late in the course of the illness.

[24] Source National Eye Institute - http://www.nei.nih.gov/resources/strategicplans/neiplan/frm_impairment.asp

Typically, symptoms are not prominent in childhood, but with progressive degeneration of the photoreceptor cells, vision is gradually lost during adolescence and adulthood.

Medical treatments causing vision impairments

Laser surgery – LASIK and PRP

Laser surgery may cause vision impairments. Laser assisted in situ keratomileusis (LASIK) is a type of refractive laser eye surgery performed by ophthalmologists. It is increasingly being used to correct myopia, hyperopia and astigmatism. Panretinal laser photocoagulation (PRP) is the current treatment of choice for diabetic retinopathy.

Possible complications of laser procedures include:

- over or under correction
- regression (return to the original refractive state)
- halos and glare
- double vision (ghosting)
- loss of contrast sensitivity, and
- loss of visual acuity.

22.2 Prevalence

Common vision impairments

Blindness/low vision

Based on WHO classifications, the prevalence of low vision and blindness in Canada is 35.6 and 3.8 per 10,000 individuals, respectively. Among individuals with some vision loss (vision worse than 20/40), cataract and visual pathway disease were the most common causes, together accounting for 40% of visual impairment. Age-related macular degeneration and other retinal diseases were the next most common causes of vision loss, with diabetic retinopathy and glaucoma less frequently encountered as causes of visual impairment.

Myopia, hyperopia, presbyopia and astigmatism (refractive errors)

The prevalence of visual conditions such as astigmatism, hyperopia, myopia and presbyopia in Canada is difficult to determine due to the absence of population based studies evaluating the ocular health of Canadians.

Night myopia is relatively common among younger individuals, with an estimated prevalence of 38% in those 16 to 25 years of age.

Monocular vision, impaired contrast sensitivity, impaired dark adaptation and glare recovery

There are no data on the prevalence of monocular vision, impaired contrast sensitivity or impaired dark adaptation and glare recovery.

Visual field loss including hemianopia

Research indicates that the prevalence of visual field loss for those age 16 to 60 years is between 3% and 3.5%, rising to 13% for those 65 and older.

Diplopia

There are no data on the prevalence of diplopia.

Nystagmus

Although the prevalence of nystagmus is not accurately known, the condition is believed to affect around 1 in 5,000 individuals.

Medical conditions causing vision impairments

Cataracts

Canadian data on the prevalence of cataracts are lacking, but statistics from the United States indicate that approximately 17% of Americans aged 40 years and older have a cataract on at least one eye. Cataracts frequently occur bilaterally (in both eyes), with the prevalence of bilateral cataracts greater among women than men. Overall prevalence of cataracts increases with age, leading to increasing prevalence in the future as the population ages. United States census estimates project that the prevalence of cataracts will increase by 50% by the year 2020.

Cataracts are more common in women and affect Caucasians somewhat more frequently than other races, particularly with advancing age. Risk factors for age-related cataracts include:

- diabetes
- prolonged exposure to sunlight
- use of tobacco, and
- use of alcohol.

Diabetic retinopathy

Individuals with both Type 1 and Type 2 diabetes are at-risk for diabetic retinopathy. At present there is little published information about the prevalence of diabetic retinopathy in Canada. A study from the United States indicates that, after 20 years from the onset of

diabetes, over 90% of people with Type 1 diabetes and more than 60% of people with Type 2 diabetes will have diabetic retinopathy.

Glaucoma

Approximately 67 million people worldwide have glaucoma, with more than 250,000 affected in Canada. Two percent of people over the age of 40 have glaucoma and the prevalence increases to 4% to 6% in people over 60. Those at increased risk for developing glaucoma include Blacks, those over the age of 60 and individuals with a family history of glaucoma.

Glaucoma is one of the leading causes of blindness, accounting for between 9% and 12% of all cases of blindness. The rate of blindness from glaucoma is between 93 and 126 per 100,000 population 40 years or older.

Age-related macular degeneration (ARMD)

In Canada using 2010 data, more than two million people over the age of 50 have some form of ARMD, with the numbers projected to triple in the next 25 years due to the aging of the population. Dry ARMD is more common than wet ARMD, accounting for 85% of all cases of ARMD. The greatest risk factor for acquiring macular degeneration is age. Other risk factors include:

- gender (females more at risk than males)
- race (Caucasians more at risk than Blacks)
- smoking, and
- family history.

Retinitis pigmentosa

The worldwide prevalence of retinitis pigmentosa is approximately 1 in 4,000. Based on this prevalence rate, approximately 8,500 individuals in Canada currently suffer from retinitis pigmentosa.

Vision impairments resulting from medical treatments

Laser surgery – LASIK and PRP

The incidence of unresolved complications in refractive surgery (e.g. LASIK) patients six months after surgery has been estimated to range from 3% to 6%.

22.3 Vision impairments and adverse driving outcomes

Common vision impairments

Impaired visual acuity

There is a considerable body of research examining the relationship between static visual acuity and driving performance. Despite the obvious importance of vision when driving, research has failed to find a strong relationship between the two. One of the primary reasons for this is methodological. Given that most jurisdictions have minimum vision requirements for licensing, individuals with significant vision impairments are not licensed and therefore not included in measures of driving performance.

Monocular vision

Research on monocular vision and driving is limited, with most studies conducted before 1980. The evidence suggests that monocular drivers have higher crash and traffic violation rates.

Impaired contrast sensitivity

In general, the available research suggests that impairments in contrast sensitivity are associated with impairments in driving performance. However, those associations are insufficient to support specific decisions regarding loss of contrast sensitivity and continued driving. More research is required to develop screening tools for contrast sensitivity that are valid and reliable in the driver fitness context.

Impaired dark adaptation and glare recovery

Despite its obvious relevance to safe driving performance, there is little in the way of research to assist the medical community or authorities in making decisions related to dark adaptation, glare recovery and driving.

Visual field loss including hemianopia

A significant body of literature now exists on the relationship between visual field loss and driving performance, as measured either by crashes, on-road performance or simulator studies. Few studies have been done on hemianopia and driving. Taken together, the results from the on-road and crash literature suggest that visual field deficits can and do compromise driving performance. However, the current body of evidence fails to inform on the extent of deficit in the visual field that must be present before driving is impaired.

Diplopia and Nystagmus

There is little or no research on diplopia or nystagmus and driving performance.

Medical conditions causing vision impairments

Cataracts

Results on the impact of cataracts on driving performance are mixed, with some studies showing increased risk of crashes, ranging from 1.3 to 2.5 times higher than those without cataracts. However, other studies have failed to find an association between cataracts and crash rates. Results from studies that have examined self-reported difficulties in driving performance are more uniform, with the majority of participants reporting difficulties in many aspects of driving.

Notably, cataract surgery results in an improvement in visual functioning. However, a significant percentage of drivers continue to report difficulties in driving, particularly at night. An important consideration is when driving can safely resume following cataract surgery. Unfortunately, there is a paucity of data to inform on this issue. Of equal importance are the effects of wait times for cataract surgery on visual functions related to driving. Current literature indicates that wait times of 6 months or longer result in decrements in vision that may have an impact on safe driving performance.

Diabetic retinopathy

The majority of research on diabetic retinopathy and driving is concerned with the effects of laser surgery (PRP) for proliferative diabetic retinopathy on visual fields. PRP reduces the risk of severe visual loss in proliferative diabetic retinopathy but also is associated with visual field loss and reductions in peripheral vision.

Glaucoma

There is evidence that drivers with glaucoma are at a significantly greater risk for impaired driving performance than those without the disease, likely due to loss of visual field.

Age-related macular degeneration (ARMD) and retinitis pigmentosa

There is little research on the relationship between ARMD or retinitis pigmentosa and driving performance.

22.4 Effect on functional ability to drive

Condition	Type of driving impairment and assessment approach	Primary functional ability affected	Assessment tools
Vision impairment	Persistent impairment: Functional assessment	Sensory - Vision	Medical assessments Visual assessment field test Functional assessment

Drivers with impaired visual acuity may lack the ability to perceive necessary details while driving. Visual field impairments may interfere with driving by limiting the area that a driver can see.

Drivers with reduced contrast sensitivity may have difficulty seeing traffic lights or cars at night. Limitations in research and testing preclude standards for impairments in contrast sensitivity, dark adaptation or glare recovery, although some individuals with these impairments may not be able to drive safely.

22.5 Compensation

The loss of certain visual functions can be compensated for adequately, particularly in the case of long-standing or congenital impairments. When a person becomes visually impaired, the capacity to drive safely varies with the ability to compensate. As a result, there are people with visual deficits who do not meet the vision standards for driving but who are able to drive safely.

Corrective lenses

Most drivers can compensate for a typical loss of visual acuity from myopia, hyperopia, astigmatism or presbyopia by wearing eyeglasses or contact lenses.

Telescopic lenses/other low vision aids

Low vision and telescopic lens aids cannot be used to meet the vision standard.

Telescopic (bioptic) lenses are sometimes used to assist drivers with low vision. A telescopic lens typically is mounted at the top half of a regular spectacle lens, and provides the driver with a magnified view of objects (e.g. text or detail of traffic signs that otherwise could be seen only at distances too short for a safe or timely stop). For the most part, the driver views the road through the spectacle lens, looking intermittently through the telescopic lens to read road signs, determine the status of traffic lights or scan ahead for road hazards.

Although telescopic spectacles, hemianopia aids and other low vision aids may enhance visual function, there are significant problems associated with their use in driving a motor vehicle. These include the loss of visual field, magnification causing apparent motion and the illusion of nearness. There has been little research to evaluate the use of telescopic lenses for driving by drivers with low vision. Although limited, studies indicate that drivers with low vision who drive with telescopic lenses have higher crash rates.

Prism lenses/eye patch

Drivers with binocular diplopia may be able to compensate for their impairment with the use of prism lenses or an eye patch.

Driving in daylight only

Drivers who have a vision impairment may be able to compensate for their impairment by driving during daylight hours only.

Strategies to compensate for visual field loss

Drivers with visual field loss may be able to compensate for their reduced visual field by practicing more rigorous scanning techniques involving more frequent eye and head movement.

Exceptional Cases

The loss of some visual functions can be compensated for adequately, particularly in the case of long-standing or congenital impairments. When an individual becomes visually impaired, the capacity to drive safely varies with his/her compensatory abilities. As a result, there may be individuals with visual deficits who do not meet the vision standards for driving but who are able to drive safely. On the other hand, there may be individuals with milder deficits who do meet the vision standards but who cannot drive safely.

In these exceptional situations, it is recommended that the individual undergo a special assessment for the fitness to drive. The decision on fitness to drive can only be made by the appropriate licensing authorities. However, it is recommended the following information be taken into consideration: (1) favourable reports from the ophthalmologist or optometrist; (2) good driving record; (3) stability of the condition; (4) no other significant medical contraindications; (5) other references (e.g. professional, employment, etc); (6) functional assessment.

In some cases it may be reasonable to grant a restricted or conditional licence to an individual to ensure safe driving. It may also be appropriate to make such permits exclusive to a single class of vehicles.

22.6 Guidelines for assessment

22.6.1 Impaired visual acuity – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **visual acuity is not less than 20/50 (6/15) with both eyes open and examined together, and** • **the conditions for maintaining a licence are met**
Conditions for maintaining licence	• Wear corrective lenses while driving, if a driver requires corrective lenses in order to meet the standard above
Reassessment	• Routine if the condition causing the visual acuity loss is not progressive • To be determined on an individual basis for drivers with impaired visual acuity that is progressive such as cataracts, macular degeneration, glaucoma and diabetic retinopathy
Information from health care providers	• Uncorrecte and corrected standard rating of visual acuity for both eyes open and examined together. Standards for testing visual acuity are outlined in 22.7.1
Rationale	There is little research evidence regarding the level of visual acuity required for driving fitness. The minimum acuity requirement in the standard is based on consensus medical opinion in Canada.

22.6.2 Impaired visual acuity – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** **Class 4 (Taxi) and 5 (commercial)** • **visual acuity is not less than 20/40 (6/12) with both eyes open and examined together. Worse eye not less than 20/200 (6/60).** **Class 1-4 (Emergency)** • **visual acuity is not less than 20/30 (6/9) with both eyes open and examined together. Worse eye not less than 20/100 (6/30).**
Conditions for maintaining licence	• Wear corrective lenses while driving, if a driver requires corrective lenses in order to meet the standard above

Reassessment	• Routine if the condition causing the visual acuity loss is not progressive • To be determined on an individual basis for drivers with impaired visual acuity that is progressive such as cataracts, macular degeneration, glaucoma and diabetic retinopathy
Information from health care providers	• Uncorrected and corrected standard rating of visual acuity for both eyes open and examined together. Standards for testing visual acuity are outlined in 22.7.1
Rationale	There is little research evidence regarding the level of visual acuity required for driving fitness. The minimum acuity requirement in the standard is based on consensus medical opinion in Canada.

22.6.3 Visual field loss – Non-commercial drivers

STANDARD	**Non-commercial drivers eligible for a licence if** • **visual field is at least 120 continuous degrees along the horizontal meridian and 15 continuous degrees above and below fixation with both eyes open and examined together**
Conditions for maintaining licence	None
Reassessment	• Routine if the condition causing the visual field loss is not progressive (e.g. eye trauma, stroke, head injury) • To be determined on an individual basis for drivers with medical conditions that cause progressive visual field loss, such as: o retinitis pigmentosa o diabetic retinopathy o vascular retinopathy o glaucoma, or o brain tumour
Information from health care providers	• Binocular field print using an approved visual field testing technique. Standards for testing visual field loss are outlined in 22.7.2
Rationale	There is little research evidence regarding the level of visual field required for driving fitness. The minimum visual field requirement in the standard is based on consensus medical opinion in Canada.

22.6.4 Visual field loss – Commercial drivers

STANDARD	**Commercial drivers eligible for a licence if** **Class 4 (Taxi) and 5 (commercial)** • **visual field is at least 120 continuous degrees along the horizontal meridian and 15 continuous degrees above and below fixation with both eyes open and examined together** **Class 1-4 (Emergency)** • **visual field is at least 150 continuous degrees along the horizontal meridian and 20 continuous degrees above and below fixation with both eyes open and examined together**
Conditions for maintaining licence	None
Reassessment	• Routine if the condition causing the visual field loss is not progressive (e.g. eye trauma, stroke, head injury) • Reassess drivers with diabetic retinopathy annually • To be determined on an individual basis for drivers with other medical conditions that cause progressive visual field loss, such as: o retinitis pigmentosa o vascular retinopathy o glaucoma, or o brain tumour
Information from health care providers	• Binocular field print using an approved visual field testing technique. Standards for testing visual field loss are outlined in 22.7.2
Rationale	There is little research evidence regarding the level of visual field required for driving fitness. The minimum visual field requirement in the standard is based on consensus medical opinion in Canada.

22.6.5 Loss of stereoscopic depth perception or monocularity – All drivers

STANDARD	**All drivers eligible for a licence if** • **standards for visual acuity and visual fields are met** • **the treating opthalmologist or optometrist indicates sufficient time has elapsed since loss of stereoscopic depth perception to allow the driver to adjust and compensate for the change in vision.** • **Where required, a road test or other functional assessment indicates the driver is able to compensate for any loss of functional ability necessary for driving, and** • **the conditions for maintaining a license are met**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Date of loss of stereoscopic depth perception • Opinion of a vision specialist whether the driver has adjusted and compensated for the change in vision
Rationale	Drivers with monocular vision can compensate for the loss of stereoscopic depth perception by using visual cues, such as the relative size of objects, and generally have adequate depth perception for everyday activities such as driving. The Canadian Ophthalmological Society notes that a driver who has recently lost the sight of an eye or stereoscopic vision may require a few months to recover the ability to judge distance accurately.

22.6.6 Diplopia

This guideline applies to drivers with diplopia within the central 40 degrees of primary gaze (i.e. 20 degrees to the left, right, above, and below fixation).

STANDARD	**Eligible for any class of licence if** • **the diplopia can be corrected using prism lenses so that they no longer have diplopia within the central 40 degrees of primary gaze** • **visual acuity and visual fields are met with prisms** • **the treating ophthalmologist or optometrist indicates that adequate adjustment has occurred, and** • **when required a functional assessment indicates the driver is able to compensate for any loss of functional ability necessary for driving**
Conditions for maintaining licence	• Wear corrective lenses while driving (if a driver requires prism lenses)
Reassessment	• Determined on an individual basis if the diplopia is the result of a progressive condition; as recommended by the treating physician or in accordance with the reassessment standard for that medical condition. • Otherwise, routine
Information from health care providers	• Description of corrective mechanism • Opinion of vision specialist whether adequate adjustment has occurred
Rationale	Consensus medical opinion in Canada indicates that a individual who has diplopia within the central 40 degrees of primary gaze is not eligible for a licence unless they can compensate for this impairment by wearing an eye patch or prism lenses while driving.

22.6.7 Impaired colour vision

STANDARD	**All drivers eligible for a licence if** • **Drivers can discriminate between different traffic lights**
Conditions for maintaining licence	None
Reassessment	• Routine
Information from health care providers	• Opinion of treating physician whether a lack of insight or cognitive impairment impairs the ability to compensate
Rationale	Impaired colour vision is usually congenital and in general, drivers learn to compensate for the inability to distinguish colours when driving.

22.7 Standards for testing visual functions

22.7.1 Visual acuity

The distance visual acuity of drivers should be tested using the refractive correction (spectacles or contact lenses) that they will use for driving. The examiner should assess visual acuity under binocular (both eyes open) conditions. It is recommended that visual acuity be assessed using a Snellen chart (see below) or equivalent at the distance appropriate for the chart under bright photopic lighting conditions of 275 to 375 lux (or greater than 80 candelas/m^2). Charts that are designed to be used at 3 meters or greater are recommended.

Snellen chart and standard ratings of visual acuity

Standard ratings in feet and metres	
Feet	Metres
20/200	6/60
20/100	6/30
20/70	6/21
20/50	6/15
20/40	6/12
20/30	6/9
20/25	6/7.5
20/20	6/6
20/15	6/4.5
20/10	6/3

22.7.2 Visual field

When a confrontational field assessment is carried out to screen for visual field defects the following procedure should be used at a minimum:

1. The examiner is standing or seated approximately 0.6 m (2 feet) in front of the examinee with eyes at about the same level.
2. The examiner asks the examinee to fixate on the nose of the examiner with both eyes open.
3. The examiner extends his or her arms forward, positioning the hands halfway between the examinee and the examiner. With arms fully extended, the examiner asks the examinee to confirm when a moving finger is detected.
4. The examiner should confirm that the ability to detect the moving finger is continuously present throughout the area specified in the applicable visual

field standard. Testing is recommended in an area of at least 180° horizontal and 40° vertical, centred around fixation.

If a defect is detected, the driver should be referred to an ophthalmologist or optometrist for a full assessment. During a full assessment, binocular testing is required and the following techniques are acceptable:

1. Goldmann III/4e and V4e isopters
2. Humphrey Esterman test
3. Humphrey 81, 120, 135, or 246 point screener. Set test strategy to single intensity or 3 zone and all other parameters to standard. Two zone Humphrey testing is inadequate.
4. Medmont 700 Driving Field
5. Other visual field techniques will be accepted if appropriate.

Please note:

Goldman, Esterman and Humphrey 135 are the only tests that will test 150 degrees of horizontal vision as required for professional (class 1 to 4) drivers.

22.7.3 Contrast sensitivity

Assessment of contrast sensitivity is recommended for applicants referred to an ophthalmologist or optometrist for vision problems related to driving. Contrast sensitivity may be a more valuable indicator of visual performance in driving than Snellen acuity. The Canadian Ophthalmological Society therefore encourages increased use of this test as a supplement to visual acuity assessment.

Contrast sensitivity can be measured by means of several commercially available instruments:

- the Pelli-Robson letter contrast sensitivity chart
- either the 25% or the 11% Regan low-contrast acuity chart
- the Bailey-Lovie low-contrast acuity chart, or
- the VisTech contrast sensitivity test.

The testing procedures and conditions recommended for the specific test used should be followed.

Chapter 23 Medical Review for Drivers

The functional declines associated with aging are well documented. These functional declines in healthy aging drivers are unlikely to lead to unsafe declines in driving performance, except in the case of extreme old age. However, aging is also associated with increased risk for a broad range of medical conditions, such as visual impairments, musculoskeletal disorders, cardiovascular disease, diabetes, and cognitive impairment and dementia. These medical conditions and medications used to treat them may affect fitness to drive.

Because of the association between age and many chronic medical conditions, aging drivers are more likely to have one or more of these conditions. A 2003 survey found that 33% of Canadians age 65 and older had 3 or more chronic medical conditions. The survey also found that the average number of chronic conditions increases with age.

All Canadian jurisdictions have the legal authority to examine a driver's fitness and ability to drive. Authorities are specifically concerned with individuals whose fitness and ability to drive may be impaired by medical conditions. This includes individuals who may be impaired by medications or treatment regimes prescribed as treatment for a medical condition, general debility or a lack of stamina.

As a result, Canadian jurisdictions have developed a medical review for drivers as noted below:

STANDARD	**Recommended Frequency Of Medical Review** **Class 1, 2, 3, 4** • **On application** • **At least every 5 years to age 45, and** • **thereafter every 3 years to age 65** • **annually at 65 and over** **Class 5 and 6** • **at age 75 and 80** • **every 2 years over age 80**

PART 3:

APPENDICES

Appendix 1: Canadian Driver Licence Classes

NSC STANDARD 4: CLASSIFIED DRIVER LICENSING SYSTEM

Although the following standard appears in the CCMTA publication *National Safety Code for Motor Carriers* (NSC), it is important to note that it applies to all drivers, including commercial drivers.

INTRODUCTION

The Classified Driver Licensing System is comprised of seven distinct licence classes, each designating a certain type of vehicle in accordance with the degree of capability necessary for its operation.

In summary:

Classes 1 to 4 are generally described as commercial classes of driver licence.
Class 5 is required to drive a passenger vehicle
Class 6 is required for driving a motorcycle
Class 7 is a learner/instructional driver licence

The following provides the specific details of each class as prescribed in the NSC.

Class 7

This is designed as a Learner/Instructional Driver Licence

This licence authorizes the holder to operate a motor vehicle other than a motorcycle while accompanied by a driver holding the class of licence required to operate the vehicle in which training is being given. Jurisdictions which do not issue instruction permits to operate motorcycles would exclude this type of vehicle from Class 7. Those issuing instruction permits permitting the operation of motorcycles would be required either to issue a separate instruction permit specifically authorizing the operation of motorcycles, or to endorse the classified licence.

Age: Left to the discretion of each jurisdiction.

Reciprocity: It is not recommended that reciprocity be extended to this class of licence.

Class 6

This licence class permits the operation of motorcycles, motor-scooters or minibikes only. Any other class of licence must be endorsed to include Class 6 before the holder may operate a motorcycle, motor-scooter or minibike.

Age: Left to the discretion of each jurisdiction, but reciprocity is applicable only when the holder of this class of licence reaches the age of sixteen.

Reciprocity: It is recommended that this licence, subject to the provision referred to under "Age", be fully reciprocal between jurisdictions.

Class 5

Permits the operation of:

- any two-axle single vehicle;
- any combination of a two-axle towing vehicle and a towed vehicle that does not exceed 4,600 kg;
- any recreational vehicle;
- any bus, taxi or ambulance without passengers;
- any motorcycle known as a moped, but excluding the operation of any other type of motorcycles; and
- any motor vehicle known or described as a tractor, grader, loader, shovel, roller, scraper or any other self-propelled road building machine used for grading or paving of highways or other construction work, but excluding a construction vehicle with more than two axles other than a grader or three-axle compactor. (The operation of a vehicle equipped with air brakes is not allowed unless specifically permitted in the licence.).

Age: Minimum age of sixteen.

Reciprocity: This class of licence shall be fully reciprocal between all jurisdictions.

Class 4

Permits the operation of:

- any bus having a seating capacity of not more than 24 passengers;
- any taxi or emergency response vehicles such as ambulances, fire trucks and police cars; and
- any motor vehicle or combination of vehicles in Class 5.

Age: The minimum age for this class of licence is eighteen. No maximum is established. This standard will not preclude any jurisdiction from establishing a higher standard if it so desires. Jurisdictions may prescribe a maximum age and require drivers to undergo re-examination upon reaching age sixty-five and at such intervals thereafter as may be deemed desirable.

Reciprocity: This class of licence shall be fully reciprocal. Those that have established a maximum age are not under any obligation to extend reciprocity to persons having reached or exceeded the limit.

Class 3

Permits the operation of:

- any single vehicle with three or more axles;
- any motor vehicle or combination of vehicles in Class 5; and
- any combination of vehicles where the towed vehicle does not exceed 4,600 kg.

Age: Minimum age of sixteen, but jurisdictions may establish a higher age.

Reciprocity: This class of licence shall be fully reciprocal between jurisdictions except in those cases where a jurisdiction has established a higher minimum age.

Class 2

Permits the operation of:

- any motor vehicle or combination of vehicles in Classes 5 and 4; and
- any bus of any seating capacity.

Age: Minimum age of eighteen. No maximum is recommended, but jurisdictions may establish one.

Reciprocity: This class of licence shall be fully reciprocal, except in those cases where a jurisdiction has established a higher minimum age or a maximum age. In the latter event, reciprocity shall be accorded only to those licence holders who are within the age limit prescribed by the laws of a particular jurisdiction.

Class 1

Permits the operation of:

- any tractor semi-trailer or truck trailer combination; and
- all vehicles in Classes 5, 4, 3 and 2.

Age: Minimum age of eighteen. No maximum is recommended, but jurisdictions may impose a higher minimum and prescribe a maximum age.

Reciprocity: This licence shall be fully reciprocal between jurisdictions. However, reciprocity shall be limited to those persons whose age falls within the range prescribed by the laws of that jurisdiction.

NOTE:

The above licence classes provide for specific divisions of vehicle types or styles. In some cases, a jurisdiction may desire to subdivide a particular class. For example, Class 2 could be divided in order to distinguish between buses used for transit operation as opposed to those used as school buses. Class 3 could be divided in order to determine the difference between industrial vehicles and ordinary and straight trucks. The mutually agreed method devised is to annotate the basic

class numerical designator with an upper case letter. Therefore, in the first example, Class 2A would identify the transit bus operator, while Class 2B would identify the school bus operator.

Class 7, as stated previously, is issued primarily for the purpose of allowing the applicant to undertake driving practice or obtain driving instruction. It has been agreed the person applying for a Class 7 licence must at least qualify to the standards of Class 5, that is, must meet the initial knowledge and vision requirements. However, should the Class 7 licence be issued for a higher licence class (1 through 4), it is recommended that the higher-class vision standards be met and medical assessment be initiated. In addition, it is also highly advantageous to forego the knowledge test part of the examination until the applicant has completed training.

Endorsement to Class 5 or 4 for operators of pickup with gooseneck trailer combinations other than recreational vehicles is permitted under the following conditions:

- it is done in conjunction with Class 5 or 4 only;
- written tests are given to Class 3 standards;
- vision tests meet Class 3 standards;
- medical tests meet Class 3 standards;
- a road test is taken in pickup with gooseneck or similar type trailer; and
- a driver licence is endorsed upon completion of examination (subject to medical approval).

Please refer to the individual jurisdictions for deviations from the above CCMTA Classified Driver Licensing System.

Air Brake Endorsement

A driver who operates any class of motor vehicle equipped with an air brake system must qualify for an air brake endorsement on his driver's licence.

Air Brake Adjustment Certification

This certification requirement is optional for all drivers involved in intra-jurisdictional operations.

To obtain air brake adjustment certification an applicant must successfully demonstrate his/her ability to inspect, test and adjust the air brake system by means of a practical test.

Training curriculum and/or practical testing criteria must meet or exceed the Canadian Air Brake Standard Curriculum as developed by the Canadian Trucking Alliance.

Certification may be met through testing programs operated or sanctioned by jurisdictional authorities.
Proof of successful completion of the required testing may be reflected as a specific endorsement on the driver licence, incorporated under the existing air brake endorsement, or issuance of separate documentation.

Appendix 2: Canada – US Reciprocity Agreement

Effective April 1, 1992, the US Department of Transport required all American commercial drivers to hold an American Commercial Drivers Licence (CDL).

In preparation for this requirement, a reciprocity agreement between Canada and the US completed 1989. This ensured that commercial driver's licences issued by Canadian provinces and territories under the National Safety Code Standards are recognised in the US. In fact, to ensure the one driver, one licence concept, the holder of a provincial or territorial commercial driver licence is prohibited from obtaining a CDL. The US Federal Register of Tuesday, May 23, 1989 proclaimed the Reciprocity Agreement.

Subsequently on December 30, 1998, Canada and the US signed reciprocity letters on medical fitness requirements for operators of commercial motor vehicles. The elements prescribed in the reciprocity agreement related to Canadian provinces and territories adhering to the National Safety Code (NSC) and that the licensing and testing standards were deemed equivalent to US standards. A similar evaluation by jurisdictions deemed the US CDL to be equivalent to the NSC.

Letters between the US and Canadian federal governments were used as the agreement, and when taken together constituted the understanding between Canada and the US respecting reciprocity of commercial driver licences.

By virtue of the agreement, the two countries medical standards were deemed equivalent with the exception of the requirements regarding (Cdn) (i) insulin-dependent diabetic drivers, (ii) hearing impaired drivers, (iii) drivers with epilepsy and (iv) drivers operating under a medical waiver or who are operating under medical *grandfather rights* who are prohibited from operating in international commerce.

Both countries agreed to adopt a unique identifier code to be displayed on the licence and the driving record to identify a commercial driver who is not qualified or disqualified from operating a commercial vehicle in the other country.

In December 2001, CCMTA agreed the Canadian identifier would be "W", and defined as: "restricted commercial class - Canada only". In December 2008, FMCSA announced it will implement the identifier "V" which will indicate the US driver is only allowed to drive in the US and is not medically qualified to drive in Canada. The identifier "V" is scheduled for implementation on January 2014.

As part of the Canada – US agreement commercial drivers (Class 1, 2, 3 and 4 licence holders) are required to file a satisfactory medical report on application, every 5 years to age 45, at least every 3 years from age 46 to 65 and annually thereafter.