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Determining medical fitness to operate motor vehicles

Dr. Katherine Kohle
Practicing physician

CMA Driver's Guide
9th edition

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Introduction

1.1 A guide for physicians

Following the example set by the Canadian Medical Association (CMA) guide on the evaluation of fitness to drive since publication of the first edition in 1974, this 9th edition continues to provide current, practical information for health professionals involved in the determination of medical fitness to drive.

This edition incorporates the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5) in the sections on alcohol, drugs and psychiatric disorders. The section on dementia and mild cognitive impairment has been completely revised, and most of the other sections have had minor changes. The revisions reflect the aim to maintain the guide's currency as the physician's principal source of up-to-date information on medical fitness to drive.

The authors have continued to reinforce the scientific basis for the guide's recommendations by using CMA's and their own resources to search the literature for the most recent information on the effects of medical conditions on driving fitness. One result of this effort is greater discussion of attention deficit/hyperactivity disorder (ADHD) in the section on psychiatric disorders. A new element is the effect of ADHD on crash risk, which has been the subject of several articles since the publication of the 8th edition.

Adopting levels of evidence for these practice guidelines is proving to be a bigger challenge than we believed to be the case when we described our intention to do so in the introduction to the 8th edition. Consequently, we are proceeding on a section-by-section basis. In this edition the sections on psychiatric disorders and on dementia and mild cognitive impairment were the subject of intensive literature reviews. Other sections will follow in subsequent editions, although all of the section authors have conducted literature searches and provided bibliographies in Appendix A.

Like the 8th edition, the 9th edition will continue to be primarily a digital document. Consequently, if you are using a printed version of the guide more than a year after its publication, you are advised to check the online version for updates.

1.2 Functional assessment

The 7th edition recognized that a landmark legal ruling in *British Columbia (Superintendent of Motor Vehicles) v. British Columbia (Council of Human Rights)* had identified the right of Canadian drivers to have their licence eligibility determined on the basis of an individual functional assessment, rather than exclusively on the basis of a diagnosis, with a corresponding responsibility for licensing authorities to accommodate drivers wherever possible, within safe limits. This accommodation can often be achieved with appropriate licence conditions or restrictions or vehicle modifications, which may be based on a physician's recommendation. Physicians should be aware of the need

to review patients' medical fitness to drive according to an assessment of their overall functional capacity, including their ability to accommodate medical and physical deficits. Physicians should also consider the possibility of synergetic effects of multiple medical conditions, as well as aging or other circumstances, on their patients' overall functional capacity and fitness to drive.

The principle is that the functional effects of the medical condition, rather than the diagnosis alone, determine licence status in most cases. This principle is examined in detail in section 2, Functional assessment — emerging emphasis.

1.3 Medical standards for fitness to drive

Many of the recommendations in this guide are the same as the standards found in similar documents, such as the Canadian Council of Motor Transportation Administrators' *CCMTA Medical Standards for Drivers*. The CCMTA standards were developed in meetings of the medical consultants and administrators from each province and territory who are responsible for advising the motor vehicle licensing authorities on medical matters and safety in driving. The standards are revised annually by that organization's Driver Fitness Overview Group, and the majority are adopted by the provincial and territorial motor vehicle departments. This process achieves a uniformity of standards across Canada, with the result that a driver licensed in one province or territory can easily exchange his or her driver's licence in the event of a move to another province and territory.

To minimize impediments to commercial drivers who must cross the Canada–United States border, an agreement has been reached whereby each country recognizes the medical standards of the other country. The only exceptions concern insulin-treated diabetes, epilepsy, hearing deficits and drivers with medical waivers. Canadian commercial drivers with these conditions and those with a medical waiver cannot cross the border to the United States with their commercial vehicles. Private drivers and commercial drivers who are driving private vehicles are not affected by this measure.

1.4 Methods

A Scientific Editorial Board composed of 3 member physicians and a physician editor-in-chief continued the work they had begun with the production of the 8th edition. Where possible, an evidence-based approach was used, although medical standards for driving will always contain some consensus-based recommendations, since some situations do not lend themselves to an evidence-based approach. For example, the vision section remains consensus-based, as no cutoff points for visual acuity or visual fields based on crash risk have been established.

However, the evidence for medical factors in crash risk is improving. The Scientific Editorial Board was aided in the preparation of this guide by a review of recent scientific reports for each section. Interested readers are referred to a study undertaken by the Monash University Accident Research Centre, entitled *Influence of Chronic Illness on Crash Involvement of Motor Vehicle Drivers*, 2nd edition, November 2010, which is the most complete and detailed review of the evidence supporting medical standards for

drivers at the time of publication of this guide. The 2009 National Highway Traffic Safety Administration's publication *Driver Fitness Medical Guidelines* is another useful publication that contains both extensive references and an analysis of the literature. In addition, a "risk of harm" formula that was introduced in the 7th edition, to support the Canadian Cardiovascular Society recommendations on fitness to drive (section 14), has been retained in this edition. However, the recommendations remain mainly empirical and reflect the fact that the guidelines presented here are based on the consensus opinion of an expert panel supported by a careful review of the pertinent research and examination of international and national standards, as well as the collected experience of a number of specialists in the area. They are intended to impose no more than common sense restrictions on drivers with medical disabilities. This guide is not a collection of hard-and-fast rules, nor does it have the force of law.

1.5 The physician's role

Physicians are regularly called upon to evaluate medical fitness to drive. Traditionally, this occurs when a patient arrives with the driver fitness form from the licensing authority. However, in many parts of Canada, driving is a daily activity, and the potential effects of a medical condition on driving capability should be a consideration for everyone, regardless of age or whether they have a driver fitness form to be completed. For instance, a person with newly diagnosed diabetes should receive counselling on the Canadian Diabetes Association's recommendations for drivers, along with advice about diet and exercise. This observation applies to all medical conditions and to all patients with a driver's licence, although very few physicians routinely inquire about licence status.

Every physician who examines a patient to determine fitness to drive must always consider both the interests of the patient and the welfare of the community that will be exposed to the patient's driving. In the course of the examination, the physician should not only look for physical disabilities but also endeavour to assess the patient's mental and emotional fitness to drive safely. A single major impairment or multiple minor functional defects may make it unsafe for the person to drive. Adaptations to the vehicle or changes in driving habits allow compensation for most physical limitations, but, in most cases, cognitive limitations are not amenable to compensation.

Likewise, physicians should be aware of their responsibility or legislated requirement to report patients with medical conditions that make it unsafe for them to drive, according to the jurisdiction in which they practise. Physicians should also be aware of the circumstances in which patients are likely to function. For example, the extreme demands related to operating emergency vehicles suggest that drivers of these vehicles should be cautioned that even relatively minor functional defects may make it unsafe for them to drive.

1.6 Public health

Motor vehicle crashes kill about 2,000 people in Canada each year and injure another 160,000. By contrast, the number of deaths attributable to severe acute respiratory

syndrome (SARS) in 2003 was 44, the number of deaths from West Nile Virus from 2002 to 2005 was 46, and 158 Canadian soldiers were killed in Afghanistan in 2002–2011.

Most motor vehicle crashes involve people between the ages of 15 and 55 years. Crashes are a leading cause of death and disability in these age groups. Major contributing factors to crashes involving younger people are alcohol, speeding and poor judgment, including driving inappropriately for weather and road conditions and failure to use safety equipment. Older drivers are involved in proportionally fewer crashes than younger drivers, but they are more likely to die in a crash, principally because of increased frailty.

Anything that physicians can do to encourage safe driving by their patients has a positive public health impact. Questions regarding drinking and driving and seat belt use should be considered at least as important as questions regarding smoking behaviour. The prevention of motor vehicle crashes has at least as great an impact on population health as trauma programs that treat crash victims. The health of commercial drivers is also an important consideration, given their long hours on the road and their vulnerability to metabolic disease, fatigue and stimulant use. It is imperative that physicians understand the increased risks associated with obstructive sleep apnea, cardiovascular diseases, addictions and other conditions that may reduce driver fitness.

1.7 Levels of medical fitness required by the motor vehicle licensing authorities

The motor vehicle licensing authorities have the power to issue and suspend licences. Legislation in the provincial and territorial jurisdictions stipulates that these authorities can require licensed drivers to be examined for their fitness to drive. “Fitness” is considered to mean fitness in the medical sense. The provincial and territorial motor vehicle licensing authorities have the final responsibility for determining licence eligibility, and fitness to drive is a major determinant of eligibility. The recommendations of the CMA outlined in this guide are meant to assist physicians in counselling their patients about the effects that their medical conditions will have on their fitness to drive and how to minimize these effects. The guide will also help physicians in determining whether a person is medically fit and in identifying conditions that will likely disqualify a person from holding a licence.

The classification of drivers’ licences does not take into account the context of driving activities, nor do licensing authorities regulate driving activity for most drivers. However, the amount driven and the environment in which driving takes place are important predictors of risk. This guide refers to “private” and “commercial” drivers with various recommended standards of fitness. Drivers of vehicles for which a Class 5 licence is applicable may be considered “commercial” drivers on the basis of the amount driven. Physicians should assess their patients for fitness to drive in the context in which they will be driving and advise them accordingly. Obviously, for a patient with a known risk of a medical event, the risk of the event occurring while the person is at the wheel will be much greater if the person spends much of the day at the wheel than if the person rarely drives.

The motor vehicle licensing authorities require a higher level of fitness for commercial drivers who operate passenger-carrying vehicles, trucks and emergency vehicles. These drivers spend many more hours at the wheel, often under far more adverse driving conditions, than drivers of private vehicles. Commercial drivers are usually unable to select their hours of work and cannot readily abandon their passengers or cargo should they become unwell while on duty. 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. In addition, should the professional driver suffer a collision, the consequences are much more likely to be serious, particularly when the driver is carrying passengers or dangerous cargo. People operating emergency vehicles are frequently required to drive under considerable stress because of the nature of their work. Inclement weather, when driving conditions are less than ideal, is often a factor. This group should also be expected to meet higher medical standards than private drivers.

It should also be borne in mind that operators of heavy machinery, such as front-end loaders, may hold a Class 5 (private vehicle) licence, rather than the higher classes of licence normally required for commercial drivers. Alternatively, a patient with this class of licence may be a commercial traveller who drives thousands of kilometres a week in an automobile.

1.8 Driver's medical examination report

If, after completing a driver's medical examination, a physician is undecided about a patient's fitness to drive, the physician should consider arranging a consultation with an appropriate specialist. A copy of the specialist's report should accompany the medical form when it is returned to the motor vehicle licensing authority. Alternatively, physicians may consider referring a patient to a driver assessment centre if a functional assessment is beyond the scope of the examining physician.

A medical examination is mandatory for some classes of licences. The licensing authority may base a final decision regarding a driver's licence eligibility on the examining physician's opinion. When the report differs significantly from previous reports submitted by other physicians or conflicts with statements made by the driver, the motor vehicle licensing authority will often ask its own medical consultants for a recommendation.

Ultimately, it is the licensing authority, not the physician, that makes the final determination of eligibility. Some jurisdictions have ceased to ask the physician's opinion as to the driver's fitness to drive, since it can be difficult to extrapolate office observations to actual driving conditions. In these jurisdictions, the physician's responsibility is to provide accurate information that will permit the licensing authority to make the appropriate decision. Obviously, awareness of the individual jurisdiction's approach and standards is essential for any physician who is assessing and evaluating patients' medical fitness to drive.

1.9 Physician education on driver evaluation

Most medical school curricula spend little, if any, time on driver evaluation. As a result, most physicians have only a passing knowledge of many of the aspects discussed in this guide. Although the guide can be useful in aiding physicians to become familiar with evaluating drivers' fitness, availability of and participation in formal continuing medical education programs are essential if physicians wish to improve their knowledge of the subject. The benefits of interaction with a knowledgeable physician who can explain how the licensing authority applies the principles described in this guide and in the *CCMTA Medical Standards for Drivers*, as well as the particularities of the respective jurisdiction's rules and regulations, cannot be duplicated in a printed document.

Some Canadian jurisdictions already offer such continuing education programs, which have proven popular with physicians. Physicians are encouraged to attend such programs if available in their respective jurisdictions or to request them if not available.

1.10 Payment for medical and laboratory examinations

Since driving is considered a privilege, in most jurisdictions patients are responsible for paying for all medical reports and laboratory examinations carried out for the purpose of obtaining or retaining a driver's licence, even though the examinations or tests may have been requested by the motor vehicle licensing authority. In other provinces, examinations for some drivers, such as seniors, are insured services, or it is the responsibility of drivers' employers to cover such costs. Functional evaluations are often at the drivers' cost.

1.11 Classes of drivers' licences and vehicles

Drivers' licences are divided into classes according to the types of motor vehicles that the holder is permitted to drive. The classifications can vary across jurisdictions, and graduated licensing systems have been instituted in some jurisdictions. In this guide, therefore, licences and vehicles are classified generically, and readers should refer to the provincial or territorial classification when necessary (see Appendix E for contact information).

- **Class 1:** Permits the operation of an articulated truck.
- **Class 2:** Permits the operation of a bus carrying 25 passengers or more.
- **Class 3:** Permits the operation of a non-articulated truck.
- **Class 4:** Permits the operation of a taxicab, a bus carrying no more than 24 passengers and emergency response vehicles, such as ambulances, fire trucks and police cars.
- **Class 5:** Permits the operation of any 2-axle motor vehicle or a 2-axle vehicle and a trailer, so long as the combined weight does not exceed 4,600 kg. In some jurisdictions, a Class 5 licence permits the holder to drive an ambulance, a taxicab or a bus with no passengers on board. Heavy equipment, such as graders and other road-building equipment with 2 axles, is also covered by the Class 5 licence.
- **Class 6:** Permits the operation of a motorcycle, motor scooter or mini-bike only. All other classes of licence must be endorsed to include Class 6 vehicles before the holder may operate a motorcycle, motor scooter or mini-bike.

1.12 Contact us

This guide is produced as a service to CMA members. However, the CMA and Joule does not have the capacity to comment on or respond to questions related to clinical issues arising from the work of the content experts.

Physicians who have comments and suggestions about the guide's recommendations are invited to contact the CMA and Joule at driversguide@cma.ca or toll free at 888-855-2555.

Functional assessment — emerging emphasis

Alert

Medical standards for drivers often cannot be applied without considering the functional impact of the medical condition on the individual.

All Canadian jurisdictions have policies in place that allow individuals the opportunity to demonstrate that they are capable of driving safely despite the limitations implied by a diagnosis. Criteria may vary among jurisdictions.

2.1 Overview

Historically, determining medical fitness to drive was based solely on a medical office examination and a diagnosis. However, recent court decisions have recognized that a driver's ability to accommodate and function with a given medical condition varies with the individual.

These court decisions have also established the right of individuals to be assessed individually for their ability to drive safely. A functional assessment, which is a structured assessment of the individual's ability to perform the actions and exercise the judgment necessary for safe driving, often including a road test, takes this individual variation into account. Functional assessments are usually administered by occupational therapists, although some jurisdictions may have driving rehabilitation specialists who can perform on-road assessments. Some jurisdictions perform their own on-road assessments of driving fitness but these tests are usually less comprehensive than those performed by occupational therapists. In particular, only occupational therapists can assess the requirements for modifications to vehicles that are needed to accommodate drivers with a physical disability.

A driver with a medical condition that can compromise cognitive or motor skills may require a functional assessment to determine fitness to drive. Any compromise of the ability to perform daily activities or of the driver's autonomy should trigger some sort of functional driving assessment.

Functional assessments may be available only in urban centres and may be difficult to arrange for patients in rural areas.

2.2 Standards

Canadian jurisdictions are working to develop and apply standards that permit individual assessment of functional capabilities of drivers with medical conditions that may affect driving.

* <https://www.find-an-ot.ca/>

Medical standards for drivers must address three types of conditions:

Functional or permanent limitations: Certain medical conditions, or combinations of medical conditions, can lead to limitations of functional capabilities (e.g., amputation of a foot will affect the person's ability to drive a vehicle with manual transmission).

Associated risk or episodic limitations: The risk of a catastrophic event due to a medical condition may be judged to be unacceptable. Certain heart conditions are examples of medical conditions where the risk that an incapacitating event will occur while driving has led to the definition of criteria designed to diminish the risk.

Use of substances judged incompatible with driving: Illicit drugs, alcohol and medications may interfere with fitness to drive.

2.3 Assessment

2.3.1 Office assessment

Physicians in a medical office setting can assess their patients' fitness to drive when the patients are clearly either capable or incapable of driving. This guide provides information to assist with those decisions. In less clear-cut situations, it may be necessary for the physician to employ other means of testing to perform a functional assessment. This usually involves on-road testing.

It should be emphasized that, with the exception of temporary restrictions for short-term medical situations, the physician is not required to determine whether a licence will be granted or suspended. The physician's responsibility is to describe the situation, and the licensing authority will make a decision based on the physician's observations, other available information (such as police reports) and its interpretation of the regulations.

2.3.2 Functional assessment

A functional assessment is appropriate when the medical condition in question is present at all times. Functional assessment is not appropriate when the driver has a medical condition that is episodic (e.g., seizures) and known to be associated with increased risk.

Licensing authorities make their own decisions about the evidence and opinions on which to base their decisions. There is a role for specialized road testing and computerized screening, as well as some self-administered tests (as long as the patient has insight). Physicians may choose to refer a patient for additional assessment when such resources are available.

The decision to refer for assessment can be deferred to the licensing authority. Assessments are usually available through private companies and are paid for by the driver. Some public health care facilities offer driving assessments free of charge, but access is limited and waiting lists tend to be long.

Some jurisdictions use off-road evaluations, such as driving simulators or batteries of tests, to predict on-road behaviour. Computerized testing may

provide useful objective information about functions believed to be important for safe driving. However, there is insufficient evidence to support making licensing decisions based solely on their results.

Most Canadian jurisdictions have some form of formal road testing in place, often conducted by occupational therapists specialized in the functional testing of drivers. In some jurisdictions, certified technicians do the testing. Assessments are typically limited to drivers of private cars. Drivers of commercial vehicles and motorcycles usually cannot be evaluated in private centres, although some specialized centres have developed testing for drivers of these vehicles.

Currently, there is insufficient evidence to recommend for or against any specific testing method, although authoritative research in this field has demonstrated clearly that the novice driver's road test is inappropriate for experienced drivers. Any road test for experienced drivers must include driving in unfamiliar surroundings, to test how the driver reacts to situations that differ from his or her daily routine. Although use of the driver's own vehicle may reduce the level of stress, difficulty driving an unfamiliar vehicle may indicate cognitive inflexibility that could have a negative effect upon fitness to drive. Geographic limitations (i.e., restricting drivers to their local area) are not recommended for drivers with cognitive problems, especially those with dementia. In fact, recent guidelines on dementia recommend that any driver with dementia who requires the imposition of licence restrictions to ensure driving safety should be suspended from driving completely.

Reporting — when and why*

Alert

Physicians have a statutory duty to report patients whom they believe to be unfit to drive to the relevant provincial or territorial motor vehicle licensing authority. This duty may be mandatory or discretionary, depending on the province or territory involved. This duty to report is owed to the public and supersedes the physician's private duty with regard to confidentiality.

3.1 Overview

All provinces and territories impose a statutory duty on physicians relating to the reporting of patients deemed unfit to drive. This duty may be mandatory or discretionary, depending on the jurisdiction (Table 1).† The duty to report prevails over a physician's duty of confidentiality. Section 35 of the *CMA Code of Ethics* affirms the notion that physician–patient confidentiality may be breached when required or permitted by law:

Disclose your patients' personal health information to third parties only with their consent, or as provided for by law, such as when the maintenance of confidentiality would result in a significant risk of substantial harm to others or, in the case of incompetent patients, to the patients themselves. In such cases take all reasonable steps to inform the patients that the usual requirements for confidentiality will be breached.

**This section is meant for educational purposes, as a guide to physicians on reporting of patients assessed to be unfit to drive. It is not meant to replace legal counsel. Unless specified, this section refers to fitness to drive motor vehicles.*

†Pilots, air traffic controllers and certain designated railway workers are governed by federal legislation that requires the reporting of certain individuals in these transportation industries who have a medical condition rendering them unfit to perform their duties. These reporting obligations are discussed in separate sections of this guide (sections 26, Aviation and 27, Railway). The marine working environment is challenging, with safety-critical responsibilities and the presence of many hazards including a strenuous workplace, unique living conditions, unpredictable weather and potential emergency duties. Seafarers must be able to live and work in close contact with each other for long periods. The difficulties of this environment can be magnified when medical care is not immediately accessible when needed. For this and other reasons, since 2001, the Canada Shipping Act requires physicians and optometrists to report to Transport Canada Marine Safety and Security without delay when they have reasonable grounds to believe that a seafarer has a medical or optometric condition that is likely to constitute a hazard to maritime safety.

This same law requires certificated seafarers to inform their caregivers of their safety critical role. Further information can be found online at www.tc.gc.ca/eng/marinesafety/mpsp-training-examination-certification-medical-2058.htm or contact Marine Medicine at 866 577-7702 for assistance.

This approach is further reinforced by Principle 9 of CMA’s “Principles for the Protection of Patients’ Personal Health Information,” which states that:

Physicians may use or disclose personal health information without consent when it is required by law. Patient consent is not required to permit physicians to fulfill mandatory reporting requirements such as the duty to report child abuse, fitness to drive, communicable diseases, etc. ... Physicians must limit the personal health information that is disclosed to only that information which is necessary to fulfill the requirement. Physicians will want to consider if it is appropriate in the circumstances to advise the patient when a disclosure has been made.

The *CMA Code of Ethics* is intended to serve as a guidance document for physicians. Hence, physicians should exercise caution in invoking the code as a legal mandate to breach patient confidentiality in situations where they are not legally required to do so.

Despite being legally authorized to breach confidentiality in some circumstances, physicians often find it difficult to report patients who are deemed unfit to drive. Physicians are often concerned about their own liability and, particularly when the patient is a commercial driver, are concerned about the impact of a suspension or restriction of licence on the patient. Physicians also may have difficulty determining the circumstances in which a report should be made. Reference to this guide, to the specific wording of the relevant legislation and to the Canadian Medical Protective Association (CMPA) is helpful in these circumstances.

It is important to emphasize that only motor vehicle licensing authorities can suspend or restrict a person’s licence. Although a physician’s report is an important element in determining the motor vehicle licensing authority’s subsequent action, it is not the physician’s responsibility to determine whether the patient’s driving privileges should be altered.

Physicians should also be aware that, in all jurisdictions, the relevant legislation protects the physician from any legal action brought against him or her for making a report (Table 1). Some provinces and territories specify that the physician must have acted in good faith in order to benefit from this protection.

Physicians should be aware that there have been cases in which people injured in a motor vehicle crash have brought actions against physicians, alleging that the crash was caused in part by the medical disability of their patient, who should not have been allowed to continue driving. Physicians have been found liable for failing to report, notably in those provinces and territories with mandatory requirements.

It is therefore important for physicians to fulfill their statutory duties and report patients whom they believe to have a medical condition that might reasonably make it dangerous for them to drive. Physicians are encouraged to be familiar with this guide when assessing a patient’s fitness to drive and when deciding whether to report a particular patient.

See Appendix B for a message from the CMPA on issues related to patients’ fitness to drive and associated risk management.

3.2 Reporting

Physicians who have determined that a patient's fitness to drive may be compromised should inform the patient that (a) a report will be made to the motor vehicle licensing authority and (b) the motor vehicle licensing authority has processes for appeal and reinstatement. Such patients should be cautioned not to drive until the licensing authority has made and communicated its final decision. Physicians should document any discussions of this topic (specifying the date, any advice given and the names of those present) in the patient's medical chart. In those instances where a patient's fitness to drive is impaired for a brief period, such as a few days or immediately after the patient has undergone a medical test, physicians might wonder whether a report to the motor vehicle licensing authority is warranted, given the time lag of licence revocation. At a minimum, the physician should caution the patient not to drive for the duration of the temporary impairment and should document these discussions. If the physician is unsure about the proper course of action in such situations, he or she should consult the CMPA.

In general, physicians should err on the side of reporting any potentially medically unfit driver. This is especially important in jurisdictions where there is a mandatory reporting obligation. Physicians should contact the provincial or territorial motor vehicle licensing authority for details on the process for reporting in their respective jurisdictions (Appendix E). Physicians are encouraged to contact the CMPA for assistance in interpreting the jurisdictional standards.

Once the physician has made a report to the licensing authority, he or she has discharged his or her legal responsibility. Subsequently, should the physician become aware that a driver whose privileges are known to have been suspended is continuing to drive, the physician has no legal obligation to report the situation to any authority, such as the motor vehicle licensing authority or the police. However, there are ethical considerations, in that an unsafe driver may pose a hazard to the health of other road users. This is a complex issue, and neither legislation nor existing ethical codes provide specific guidance to negate the legal or regulatory risks. In such a situation, the physician is advised to contact the CMPA for advice and to document the reasons for deciding whether or not to make a follow-up report.

Physicians should also contact the CMPA if a patient threatens legal action for making a report to the licensing authority.

3.3 Patient's right of access to physician's report

The right of patients to access reports about fitness to drive made to the motor vehicle licensing authority and any notes made in the medical chart about such a report is subject to provincial/territorial legislation. Physicians should contact the CMPA for further information specific to their jurisdiction.

TABLE 1: Legislation governing reporting of medically unfit drivers and protection for physicians (current as of January 2015)

Jurisdiction	Reporting	MD* protection for reporting	Admissibility of reports as evidence in legal proceedings†
Alberta	Not directly addressed, but interpreted as discretionary	Protected	The identity of the reporting physician remains confidential if the report was made in good faith.
British Columbia	Mandatory for MD if the unfit driver has been warned of the danger and still continues to drive‡	Protected unless physician acts falsely or maliciously	Not addressed
Manitoba	Mandatory	Protected	Privileged Not admissible as evidence for any purpose
New Brunswick	Mandatory	Protected as long as physician acts in good faith	Not addressed
Newfoundland and Labrador	Mandatory	Protected	Privileged Not admissible in evidence at trial except to prove compliance with reporting obligations
Northwest Territories	Mandatory	Protected unless physician acts maliciously or without reasonable grounds	Privileged Not admissible in evidence or open to public inspection except to prove compliance with reporting obligations and in a prosecution of a contravention of section 330 (making false statements or submitting false documents). The person who is the subject of the report is entitled to a copy of the report upon payment of a prescribed fee. <i>(cont'd)</i>

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Nova Scotia	Discretionary	Protected	Not addressed
Nunavut	Mandatory	Protected unless physician acts maliciously or without reasonable grounds	Privileged Not admissible in evidence or open to public inspection except to prove compliance with reporting obligations and in a prosecution of a contravention of section 330 (making false statements or submitting false documents). The person who is the subject of the report is entitled to a copy of the report upon payment of a prescribed fee.
Ontario	Mandatory	Protected	Privileged Not admissible in evidence except to prove compliance with reporting obligations
Prince Edward Island	Mandatory	Protected	Privileged Not admissible in evidence except to prove compliance with reporting obligations
Quebec	Discretionary	Protected	Privileged Not admissible in evidence except in cases of judicial review of certain decisions of the motor vehicle licensing authority
Saskatchewan	Mandatory	Protected as long as physician acts in good faith	Privileged Not admissible in evidence except to show that the report was made in good faith in accordance with reporting obligation
Yukon	Mandatory	Protected	Not addressed

* Used with the permission of the Canadian Medical Protective Association (CMPA)

† Information in this column is subject to the access-to-information legislation of the respective province or territory.

Pending legislation in British Columbia will change the province from a mandatory reporting province to a hybrid mandatory/discretionary reporting province.

Note: MD = physician.

Driving cessation

Alert

Despite research showing that life expectancy exceeds driving expectancy by 9.4 years for women and 6.2 years for men, most current drivers do not plan well for driving cessation.

4.1 Overview

Driving plays a central role in the daily lives of many people, not only as a means of meeting transportation needs, but also as a symbol of autonomy and competence. The prerogative to drive often is synonymous with self-respect, social membership and independence.

Driving cessation can result from a gradual change in driving behaviour (i.e., restrictions leading to driving cessation), a progressive illness (e.g., dementia) or a sudden disabling event (e.g., a stroke). Some drivers voluntarily stop driving; for others, driving cessation is involuntary. Gradual, voluntary driving cessation is more common than sudden driving cessation. However, the decision to stop driving is often complex and affected by a number of factors.

4.2 Voluntary driving cessation

Voluntary driving cessation refers to self-induced changes in driving practices that are made for reasons other than the revocation of a licence or other strong influence from external sources. A number of general factors are associated with voluntary driving cessation.

- Age — older drivers are more likely to stop driving of their own accord.
- Gender — women are more likely to give up driving voluntarily.
- Marital status — drivers who are single, widowed or divorced are more likely to stop driving than those who are married.
- Socio-economic status — drivers with lower income are more likely to stop driving.
- Education — drivers with lower levels of education are more likely to stop driving.
- Place of residence — drivers living in urban settings are more likely to stop driving than drivers living in rural areas.
- Functional impairment — drivers with impairments in sensory, motor, or functional abilities are more likely to stop driving than drivers without impairments.

- Transportation support — drivers who have transportation support (i.e., from family, friends, organizations) are more likely to stop driving than drivers without such support.

These general factors can assist physicians in anticipating who may be more comfortable giving up driving privileges when it becomes medically advisable to stop driving.

4.3 Involuntary driving cessation

Involuntary driving cessation occurs when a licence is revoked or outside sources (e.g., physician, family members) bring their influence to bear. Involuntary driving cessation often is due to the presence of one or more medical conditions or the medications used to treat those conditions.

The most difficult situation physicians face is when a patient is functionally incapable of driving safely, but perceives him- or herself as competent to drive. Physician interventions include frank but sensitive discussions with the patient (with or without the patient's family present), referral for a driving evaluation and reporting to the licensing authority. Counselling on alternative means of mobility is needed. For those with cognitive impairment, "through the door" service, as opposed to regular "door to door" public transportation, will be needed. For progressive illnesses (e.g., dementia, macular degeneration, multiple sclerosis), early discussions can help the person and his or her family to plan for the inevitable need to stop driving.

Involuntary driving cessation is more likely to be required when awareness of ability declines or is impaired (e.g., with dementia). To date, only a few factors are known to be associated with involuntary driving cessation.

- Gender — men are more likely to require outside intervention to cease driving.
- Insight — those with impaired insight are more likely to continue to drive and require intervention.

These factors can assist physicians in predicting who may be resistant to discussions about the need for driving cessation or who will be resistant to and non-compliant with advice or a directive to stop driving. In addition to patients, families also may lack insight into the negative impact of an illness on driving. Family members may have their own reasons for wanting the person to continue driving (e.g., loss of mobility for the patient and often the spousal caregiver, time demands associated with a family member becoming the transportation provider, increased caregiver burden). Education and support for caregivers and other family members frequently are necessary.

Specialized driving cessation support groups have been shown to be effective in helping patients with dementia and their caregivers in coping with the loss of driving privileges. Such groups may be available to assist patients (and their caregivers) in the transition from being a driver to being a non-driver.

4.4 Planning for retirement from driving

Few drivers plan for “retirement from driving.” However, data indicate that, on average, men outlive their driving careers by 6.2 years and women by 9.4 years. Incorporating “driving retirement plans” with financial planning for retirement may be an effective means of engaging both current and future cohorts of drivers in planning for the day when they will no longer drive. Research indicates that many older drivers are open to conversations about transitioning from the driver’s seat to the passenger seat, and older drivers believe that physicians and family members can assist with the decision-making process. Advance driving directives, similar to advance directives for end-of-life care, may help to facilitate discussions about driving. Responsive forms of alternative transportation, as well as transportation assistance from family and friends, are needed to allow those who have retired from driving to remain engaged with their community. However, most forms of public transportation (e.g., light rail transit, public buses) are designed primarily for individuals who are relatively healthy and mobile. Ensuring the availability of alternative transportation that is responsive and accommodating to patients who wish not to or can no longer drive (e.g., volunteer driver programs, for-profit services such as [Driving Miss Daisy](#)) is critical to meeting the needs of this growing segment of the population. Physicians can and do play an important role in helping patients and their families to become familiar with the transportation resources available in their communities.

4.5 Strategies for discussing driving cessation

It is important to recognize the consequences of driving cessation for both patients and families.

The following suggestions will help physicians to develop a strategy before meeting with the patient to discuss driving cessation.

- Before the appointment, consider the patient’s impairments. It may be important to ask if the spouse or another caregiver can be present. This can provide emotional support and help to ensure that the family understands that the person needs to stop driving. It also may be helpful to meet with the family (with the patient’s consent) before holding a meeting with the patient and family.
- Whenever possible, the appointment should be in a private setting where everyone can be seated. Always address the patient preferentially, both in the initial greeting and in the discussion.
- For patients with progressive illnesses, such as dementia, discuss driving early in the course of the condition, before it becomes a problem. Early discussions also allow patients and family members to prepare for the day when driving is no longer an option.
- Be aware that patient and caregiver reports of driving competence often do not reflect actual competence. Evidence of impaired driving performance from an external source (e.g., driving assessment, record of motor vehicle crashes or near

misses) can be helpful. Discuss the risks of continuing to drive with the patient and family members.

- Emphasize the need to stop driving, using the driving assessment, if available, as the appropriate focus.
- Often the patient will talk about his or her past good driving record. Acknowledge that accomplishment in a genuine manner, but return to the need to stop driving. Sometimes saying “medical conditions can make even the best drivers unsafe” can help to refocus the discussion.
- It is common for drivers, especially those who are older, to talk about a wide range of accomplishments that are intended, somehow, to show that there could not be a problem now. Again, acknowledge those accomplishments, but follow with “Things change. Let’s not talk about the past. We need to focus on the present” to end that line of conversation and refocus the discussion.
- Ask how the person is feeling and acknowledge his or her emotions. Avoid lengthy attempts to convince the person through rational explanations. Rational arguments are likely to evoke rebuttals.
- It is likely that emotions and feelings of diminished self-worth represent a real issue behind resistance to accept advice or direction to stop driving. Explore these feelings with empathy. A focus on the feelings can deflect arguments about the evaluation and the stop-driving directive.
- Ask the patient what he or she understands from the discussion. It may be important to schedule a second appointment to further discuss the patient’s response and explore next steps.
- Document all discussions about driving in the patient’s chart.
- To assist patients in staying mobile, have them create a “mobility account,” using the money that they would have used to own and operate their own vehicle. For example, the 2012 edition of the Canadian Automobile Association (CAA) Driving Costs brochure indicates that it costs \$13,654 to own and operate a mid-sized car, based on 32,000 km driven per year. The purpose of the mobility account is to have funds set aside to cover the costs of alternative transportation. Patients and their families can access the form for calculating driving costs by visiting the [CAA Website \(www.caa.ca\)](http://www.caa.ca).

4.6 Compliance

An important consideration with involuntary driving cessation is compliance. Research indicates that as many as 28% of people with dementia continue to drive, despite failing an on-road assessment. Family members play a pivotal role in monitoring and managing compliance with a stop-driving directive. Families have tried numerous methods to ensure that a family member stops driving. Numerous suggestions have been made to assist family members in getting a patient to stop driving, including hiding the keys, disabling the car, cancelling the insurance or selling the car. However, evidence of the success of these interventions is largely anecdotal.

Alcohol

Alert

- Acute impairment is an immediate contraindication to driving.
- Patients suspected of having an alcohol use disorder should be assessed to determine the nature of the problem and should be advised not to drive until the condition has been effectively treated and remission has been achieved. Abstinence-based recovery is the treatment of choice for alcohol dependence to prevent recurrent impaired driving.

5.1 Overview

Alcohol is a depressant drug that has both sedative and disinhibitory effects. It also impairs a driver's judgment, reflex control and behaviour toward others. Impairment from alcohol use is the single most common risk factor for motor-vehicle-related crashes and injury.

People charged by police for impaired driving will have their driving privileges restricted according to provincial legislation. The guidelines provided here are not meant to conflict with such legislation.

In some people who are regular users of alcohol, withdrawal from alcohol may trigger seizures. For seizures induced by alcohol withdrawal, see section 11.4.7.

5.2 Assessment

5.2.1 Clinical history

Researchers have identified a group of drivers (often referred to as “hard-core drinking drivers”) who drive with blood alcohol levels averaging twice the legal limit, have previous driving convictions and licence suspensions, may drive without a valid driving licence and likely need treatment for an alcohol use disorder.

A number of clinical “red flags” have been identified, which may indicate ongoing alcohol use that will impair ability to drive safely. These indicators include

- driver with at least 1 previous driving offence, especially an alcohol- or drug-related offence
- driver arrested with blood alcohol concentration of 32.6 mmol/L (equivalent to 0.15% or 150 mg/100 mL) or more (the low risk of detection implies that they have probably driven in this condition previously)

- clinical diagnosis of alcohol dependence or abuse
- resistance to changing drinking-and-driving behaviour, often associated with antisocial tendencies such as aggression and hostility
- concomitant use of illicit drugs (e.g., alcohol and marijuana or alcohol and cocaine in combination; when ingested concomitantly, the latter combination leads to the formation of cocaethylene, a dangerous, longer-lasting toxic metabolite)
- male gender
- age 25–45 years
- education level: high school or less
- history of prior traffic or other criminal offences
- risk-taking behaviour in situations other than driving
- evidence of poor judgment in situations other than driving
- evidence of aggression in situations other than driving
- lifestyle associated with fatigue and lack of sleep
- intoxication at the time of a routine office visit.

People demonstrating drinking-and-driving behaviour, those showing evidence of driving while impaired and those assessed as having a high probability of driving while impaired should not drive any motor vehicle until further assessed.

Physicians are encouraged to use screening tools, such as the [Alcohol Screening, Brief Intervention and Referral tool](#) (previously known as the Alcohol Risk Assessment and Intervention tool; www.sbir-diba.ca) made available by the College of Family Physicians of Canada (CFPC) for identifying problems and helping their patients to reduce the risks of alcohol-related harm. More comprehensive assessment and the facilitation of behavioural changes require asking open-ended questions and engaging individuals in reflective dialogue to enhance their awareness of ongoing problems. Willingness to participate in self-reflection and to honestly face personal issues and dysfunctional emotional responses and a commitment to change are critical to the sustained action required to maintain recovery.

Physicians need to be familiar with the signs and symptoms that would raise concerns about drinking and driving. Screening and assessment for appropriate referrals need to be considered, in addition to reporting patients to the provincial ministry of transport, in accordance with applicable provincial legislation. Physicians should be aware that reporting drinking-and-driving behaviour to licensing authorities in some jurisdictions might lead to immediate suspension of the person's licence pending further assessment.

Any level of alcohol use disorder warrants diagnostic evaluation and treatment planning to reduce driving risk. Treatment may include referral to a rehabilitation program, attendance at mutual-support groups (e.g., Alcoholics Anonymous) or both. Continuing care and biological monitoring to ensure remission must be considered to ensure fitness to drive.

It is important for primary care physicians to monitor patient compliance with treatment recommendations and recovery, as the risk of relapse remains for the duration of the person's life. Clinical judgment is required in assessing the risk of drinking and driving. Consultation with an addiction medicine physician should be considered in cases where the primary care physician has any degree of uncertainty about the individual's adherence to abstinence-based recovery.

Evidence supports a role for ignition interlock devices for those with repeat drinking-and-driving offences, especially those with high recidivism scores on the Research Institute on Addictions Self-Inventory (RIASI), a screening test used by addiction specialists. Not only does ignition interlock technology contribute to improved safety on the road, but it also uses a system of monitoring to detect early relapse and to provide prompt direction back to treatment resources.

In high-risk drivers with alcohol dependence who have recurrent relapses and problems maintaining recovery, ethylglucuronide in hair can be analyzed to ensure that abstinence is being maintained, as presence of this metabolite indicates ongoing alcohol use that may not be acknowledged or evident in clinical interviewing.

In some cases, the addition of medications to promote recovery may be beneficial. There is evidence supporting the use of

- naltrexone (25 to > 50 mg per day; because this drug is an opioid antagonist, any opioid medications must be stopped 3–5 days before administration is started)
- disulfiram (125–250 mg per day; not to be used with proton-pump inhibitors, as toxicity has been reported when combined with omeprazole)
- acamprosate (a gamma-aminobutyric acid [GABA] analogue; 333 mg capsules 3 times daily cost \$187 per month; it may be more effective when used in combination with naltrexone or disulfiram).
- Other drugs purported to be useful may cause cognitive impairment or have potential for abuse. Consultation with an addiction specialist may be warranted.

5.2.2 Screening tools

Tools to screen for an alcohol use disorder include the CAGE questionnaire (Appendix C) and AUDIT, a 10-question alcohol use disorder identification test (Appendix D). A variety of other screening tools are available on the website of the SAMHSA (Substance Abuse and Mental Health Services Administration)-HRSA (Health Resources and Services Administration) Center for Integrated Health Solutions (www.integration.samhsa.gov/clinical-practice/screening-tools).

The National Institute on Alcohol Abuse and Alcoholism has a fact sheet comparing the changes in the diagnostic criteria for alcohol use disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5, published in 2013) with those in the previous edition, DSM-IV (2000) (pubs.niaaa.nih.gov/publications/dsmfactsheet/dsmfact.pdf). Although the Medical Council of Canada has adopted DSM-5 for examination purposes (mcc.ca/2014/01/transition-to-dsm-5/), many physicians, especially addiction medicine and occupational medicine specialists, remain critical of the loss of clear differentiation between the definitions of *abuse* and of *dependence*. This differentiation has been important in the workplace; *dependence* is considered a workplace disability that requires a duty to accommodate, whereas *abuse* does not require the same duty. As well, the presence of an alcohol dependence has additional implications for treatment.

Alcohol-related problems must also be considered in the context of the latest definition of addiction, as established by the American Society of Addiction Medicine (ASAM) in 2011 and adopted by the Canadian Society of Addiction Medicine (Appendix G). Addiction includes *substance dependence*, whereas *substance abuse* is a term that is better avoided. Hazardous use (episodic) and harmful use (regular) that are below threshold for a diagnosis of addiction are the preferred terms, as defined by ASAM. The [ASAM Standards of Care](https://www.asam.org/docs/default-source/publications/standards-of-care-final-design-document.pdf) for the Addiction Specialist Physician (adopted January 29, 2014; www.asam.org/docs/default-source/publications/standards-of-care-final-design-document.pdf) are also a useful resource, as is ASAM's work on the ASAM Criteria: Treatment Criteria for Addictive, Substance-Related, and Co-occurring Conditions, 3rd edition, and CONTINUUM,TM The ASAM Criteria Decision Engine (www.asam.org/quality-practice/guidelines-and-consensus-documents/the-asam-criteria).

Drugs

**Alert**

Immediate contraindications to driving — a patient seen or reported to have any of these problems should be advised not to drive until the condition is evaluated and has been treated or has resolved:

- conscious sedation
- stimulation
- visual blurring
- delayed recovery from glare
- impaired coordination or movement
- impaired performance on skills testing
- changes in behaviour, especially risk taking
- changes in processing of information
- changes in thought processing.

6.1 Overview

Patients taking illicit, non-prescription or prescription drugs known to have pharmacologic effects or side effects that can impair the ability to drive should be advised not to drive until their individual response is known or the side effects no longer result in impairment (e.g., patients stabilized on chronic opioid therapy for chronic pain or opioid dependence). Keep in mind that drugs can have unexpected adverse effects as well, which may affect ability to drive.

There is growing concern that there is significant impairment among commercial drivers due to alcohol, cannabis (marijuana or hashish) and its derivatives, and stimulants. Alcohol and cannabis are well known to deteriorate driving performance. Although stimulants are sometimes used for fatigue management by truck drivers on long hauls, studies have shown that stimulant users were found to engage in more risky driving behaviours, to show poorer compliance with traffic and driving regulation, and to be at greater risk of falling asleep and of crashes. Studies of motor vehicle accidents and impairment after taking medications have demonstrated increased risk with antidepressants, benzodiazepines and Z-drugs, which are commonly prescribed as sleep aids. Although Z-drugs, such as zopiclone, are marketed as non-benzodiazepines, they act on the benzodiazepine receptor complex and are clearly sedative-hypnotics. The effects of zopiclone 7.5 mg have been found to be equivalent to blood alcohol concentrations of

0.5–0.8 mg/mL. Residual effects that led to lane weaving and speed variability while driving have been found to persist at least 11 hours after the nighttime dose.

Concomitant use of several drugs (e.g., alcohol combined with antihistamines, benzodiazepines or Z-drugs) may intensify side effects. In the elderly, increasing the number of prescribed medications, regardless of type, may be associated with increased risk of driving impairment due to cognitive side effects and drug interactions, especially when 5 or more medications were dispensed.

Appropriate patient assessment is essential, including consideration of substance dependence, to ensure that the risk of impairment while driving is not compounded.

Since the last edition of this guide, the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV; APA, 2000) has been replaced by the 5th edition (DSM-5; APA, 2013). As discussed in section 5, Alcohol, although the [Medical Council of Canada has adopted DSM-5 for examination purposes \(mcc.ca/2014/01/transition-to-dsm-5/\)](http://mcc.ca/2014/01/transition-to-dsm-5/), many physicians, especially addiction medicine and occupational medicine specialists, remain critical of the loss of clear differentiation between the definitions of *abuse* and of *dependence*. This differentiation has been important in the workplace; *dependence* is a workplace disability that requires a duty to accommodate, whereas abuse does not require the same duty. As well, the presence of a drug *dependence* has additional implications for treatment.

Patients with a diagnosis of substance use disorder with *dependence* need specialized treatment. They must not drive until sufficient stability is achieved in recovery (see section 6.4, Addiction).

Continuing effects of prescribed medications (e.g., chronic opioid therapy for chronic pain or opioid dependence) do not result in impairment affecting driving. Keep in mind that medications taken as directed or prescribed can have unexpected adverse effects as well.

Care and biological monitoring to ensure remission must be considered to ensure fitness to drive. It is important for primary care physicians to monitor patient compliance with treatment recommendations and recovery, as the risk of relapse remains for the duration of the person's life. Clinical judgment is required in assessing the risk of using drugs and driving. Consultation with an addiction medicine physician should be considered if the primary care physician has any degree of uncertainty about the individual's recovery.

Patients experiencing a reaction to withdrawal from psychoactive or psychotropic medications may be temporarily impaired in their driving ability and should be advised to refrain from driving until the acute symptoms have abated.

6.2 Clinical history

In assessing a patient's fitness to drive, the patient's use of all drugs — alone or in combination — should be considered, including alcohol (see “red flags” in section 5.2.1) and illicit, over-the-counter (OTC) or prescription drugs.

Risk factors that may enhance the risk of driving when impaired by a drug are

- the “red flags” listed in section 5.2.1
- youth or relative inexperience, especially among male drivers
- older age in combination with prescribed benzodiazepines or Z-drugs, especially if there is concomitant use of alcohol
- low psychologic constraint
- demonstrated antisocial behaviour
- other demonstrated risk-taking behaviour while driving (e.g., speeding, non-use of seat belts).

6.3 Common drugs

It is important to consider drugs that, either alone or in combination with other medications, have a psychoactive effect on the central or peripheral nervous system or side effects on other bodily systems.

6.3.1 Sedatives and hypnotics

Patients taking mild sedatives or short-acting hypnotics (sleeping pills) who experience no drowsiness (other than predictable sleep enhancement) may still have residual impairment the next day. Use of benzodiazepines is a significant risk factor for unsafe driving, especially among young people and the elderly. Patients who are more heavily sedated for therapeutic reasons should not drive. Concomitant use of alcohol in these situations raises the risk of impairment.

6.3.2 Non-prescription antihistamines, motion-sickness medications and muscle relaxants

Drowsiness and dizziness are frequent — and unpredictable — side effects of older antihistamines, motion-sickness medications and muscle relaxants, such as carisoprodol or cyclobenzaprine. The newer “non-drowsy” antihistamines are considered safer, but they may have a depressant effect on the central nervous system. Patients using these drugs for the first time must be warned not to drive until it is determined whether they are prone to these side effects.

A patient’s use of OTC preparations that may cause dizziness and drowsiness, such as dimenhydrinate, older-generation antihistamines and muscle relaxants (including products containing any of these agents) needs to be evaluated carefully. Dextromethorphan, a common cough suppressant, has been shown to cause impairment (lane weaving, failure to obey traffic signals and involvement in collisions), especially when combined with an antihistamine such as chlorpheniramine.

6.3.3 Opioids

Euphoria, depression or inability to concentrate can follow the use of opiates

such as codeine (prescription or OTC), heroin, morphine and synthetic opioids such as meperidine and fentanyl. Patients should be assessed for side effects, as well as frequency of use, tolerance and dependence. Patients on long-term prescribed opioid analgesic therapy should be monitored for side effects, especially drowsiness.

Patients on a formal opioid agonist maintenance program of methadone or buprenorphine prescribed by a physician are usually eligible for Class 5 and 6 drivers' licences. A waiting period following initiation of an agonist maintenance program is recommended before resumption of driving, and clinical monitoring for concomitant use of other drugs is recommended (e.g., by urine drug screening). Patients in opioid agonist treatment programs may also be eligible for certain commercial licences. Assessment and follow-up monitoring need to be tailored to the individual.

6.3.4 Central nervous system stimulants

The side effects of central nervous system stimulants, such as amphetamines and cocaine, are unpredictable and often impair ability to drive safely. Abuse of these drugs is a contraindication to driving.

Prescription use of amphetamines, such as those used for attention deficit and sleep disorders, may not impair ability to drive if used regularly at a stable dose. However, these patients should be followed regularly by the prescribing physician.

6.3.5 Hallucinogens

Drugs such as cannabis (marijuana or hashish) and its derivatives, lysergic acid diethylamide (LSD) and methylenedioxymethamphetamine (MDMA) alter perception. Driving is contraindicated if any of these drugs is causing impairment. Patients using medicinal marijuana must be assessed on an individual basis to determine safety related to driving. It is illegal to drive a motor vehicle while under the influence of any drug that causes impairment of the driver's ability to safely operate a motor vehicle, regardless of whether the drug has been prescribed by a physician.

6.3.6 Inhalants

Inhalants, such as solvents, glue and gasoline, are toxic to the central nervous system. Use of these inhalants may also result in substance dependence and impairment of the ability to operate a motor vehicle during acute intoxication or because of chronic damage to the brain.

6.3.7 Antidepressants and antipsychotics

Patients taking antidepressants or antipsychotics should be observed during the initial phase of dose adjustment and advised not to drive if they show any evidence of drowsiness or hypotension. Tricyclic antidepressants have been found to impair driving ability, especially in the elderly. Patients who are stable

and symptom free on maintenance doses can usually drive any class of motor vehicle.

6.3.8 Anticonvulsants

Some of the drugs used to control epileptic seizures can cause drowsiness in certain patients, particularly when first prescribed or when the dose is increased. Patients should be closely observed and warned not to drive while this side effect persists. Patients taking these drugs may also be restricted from driving because of the underlying seizure disorder. Patients should be advised of the risk of seizure activity and the potential for driving restriction that may occur with dose adjustments. Please see section 11, Nervous system in this guide, specifically the Alert Box at the beginning of the section, and subsection 11.4, Seizures.

6.3.9 Conscious sedation in an outpatient setting

Patients should be advised not to drive for 24 hours following conscious sedation (see section 23, Anesthesia and surgery).

6.3.10 Anti-infective agents

Heavy doses of some anti-infective agents or therapeutic doses in some instances may cause drowsiness or imbalance. Patients should be warned not to drive if these side effects occur.

Antimicrobial and antiprotozoal agents reported to affect consciousness are amoxicillin, cloxacillin, ticarcillin, cephalothin, cefazolin, ceftazidime, cefuroxime, tobramycin, lomefloxacin, pefloxacin, amphotericin B, acyclovir, chloroquine, clioquinol and metronidazole.

6.3.11 Anticholinergics

Anticholinergics frequently cause sedation and delirium (acute onset of cognitive deficits often associated with hallucinations and fluctuating levels of consciousness), especially in older people. Patients (and their families) should be warned that people who experience these side effects should not drive.

Examples of drugs with possible anticholinergic effects include antidepressants, antipsychotics, antihistamines and antipruritics, antiparkinsonian agents, antispasmodics, and anti-emetics.

6.3.12 “Designer drugs” and herbal preparations

Impairment may result from episodic or regular use of so-called designer drugs and herbal substances; hence, patients should be cautioned about driving when using any of these products for psychoactive effect or for sleep.

6.3.13 Antiparkinsonian drugs

All medications for Parkinson’s disease can trigger excessive daytime somnolence, which can be quantified by the [Epworth Sleepiness Scale](http://epworthsleepinessscale.com/about-the-ess/) (<http://epworthsleepinessscale.com/about-the-ess/>). This problem is particularly

evident with the newer dopamine agonists (ropinirole and pramipexole). Patients requiring these medications must be cautioned about this risk and advised not to drive if they experience daytime drowsiness or any episodes of falling asleep without warning or in unusual settings (e.g., during a conversation or a meal). Medication adjustment or treatment of an associated sleep disorder may allow safe return to driving after a period of observation.

6.3.14 Medical marijuana

Marijuana is a psychoactive substance that contains the specific addictive ingredient delta-9-tetrahydrocannabinol (THC) that affects the reward circuitry in the brain and results in cognitive and affective impairment that can affect driving ability, specifically by causing disturbances in perception and in reaction to the environment. Pharmaceutical products such as dronabinol, nabilone and nabiximols (a combination of THC and a non-psychoactive substance in the marijuana plant, cannabidiol [CBD]) are available. Although marijuana remains an illegal substance in Canada and is considered harmful, Health Canada was required to render marijuana available for individuals who wished to use it for medical purposes following a court decision. Medical marijuana is not an approved drug and its efficacy remains questionable to scientists and clinicians. As the CFPC position paper on this subject states:

Smoke is a hazardous delivery system, because (a) psychoactive ingredients reach the CNS much faster than other routes, causing intoxication; and (b) smoke contains hundreds of chemicals that are potentially carcinogenic or harmful to the heart or other organs. Similarly, there is no evidence for the safety or efficacy of oral ingestion of herbal cannabis. (CFPC, 2013)

There is a direct dose relationship between blood THC concentration and impaired driving ability due to impairment in judgment, motor coordination and reaction time (Ramaekers et al., 2004). No “low-risk” level of use has been established, and the dose is difficult to determine when marijuana is smoked. Although the acute or chronic level of THC intoxication is difficult to gauge, it is notable that marijuana is the illicit drug most frequently found in drivers involved in fatal crashes. A meta-analysis of multiple studies has estimated the risk of being involved in an accident to be doubled after marijuana use (Hartman and Huestis, 2014). Another study has noted that higher levels of THC in the blood of accident-involved drivers is associated with a likelihood of being responsible for the accident 3 to 7 times greater than for drivers who had not used drugs or alcohol (Brady and Li, 2014). The risk associated with marijuana in combination with alcohol has also been found to be greater than for either drug alone (Lenné et al., 2010). ASAM has noted in a white paper (ASAM, 2012) that increased crashes, injuries and fatalities are to be expected as rates of driving under the influence of marijuana increase as a result of increased availability and use by drivers following legislative changes in various jurisdictions.

Statistics published by Health Canada derived from the medical marijuana program before the recent changes in the legislation show that the average user was consuming 2.5 g of dried marijuana per day. This equates to approximately five joints (marijuana cigarettes) per day, since the typical joint contains between 500 and 750 mg of dried marijuana. The CFPC paper cited previously recommends that patients refrain from driving for 5 hours after smoking a joint (CFPC, 2013). Consequently, the average user under the Health Canada program should not drive on any day when he or she has consumed the average amount of marijuana or for at least 5 hours after a single joint. Licensing agencies in Canada have encountered drivers consuming, according to their physicians' reports, up to 30 g per day (45 to 60 joints) while supposedly remaining fit to drive. This is a dangerous situation, as physicians may be held liable for any mishaps that happen in context of a dosage endorsed by the physician.

Physicians need to evaluate patients and discuss very carefully their use of medical marijuana regarding the risk related to impaired driving. Recommendations to refrain from driving for a period after using marijuana must be included in this discussion. It should also be emphasized that driving under the influence of marijuana, no matter what the justification for its use, is illegal under the *Criminal Code* and subject to sanctions. Some jurisdictions, such as Quebec, have a requirement that patients wishing to be prescribed marijuana must sign an acknowledgement that they have been counselled on the risks associated with its use, including those involved in driving.

Consideration should be given to informing the provincial ministry of transportation if the medical condition for which the marijuana is being taken or the use of medical marijuana could interfere with a patient's ability to drive safely.

6.4 Addiction

Drug-related problems must be considered in the context of the latest definition of addiction, as established by the ASAM in 2011 and adopted by the Canadian Society of Addiction Medicine (Appendix G). Addiction includes *substance dependence*, whereas *substance abuse* is a term that is better avoided. Hazardous use (episodic) and harmful use (regular) that are below threshold for a diagnosis of addiction are the preferred terms, as defined by ASAM. The [ASAM Standards of Care](http://www.asam.org/docs/default-source/publications/standards-of-care-final-design-document.pdf) for the Addiction Specialist Physician (adopted January 29, 2014; www.asam.org/docs/default-source/publications/standards-of-care-final-design-document.pdf) are also a useful resource, as is ASAM's work on the ASAM Criteria: Treatment Criteria for Addictive, Substance-Related, and Co-occurring Conditions, 3rd edition, and CONTINUUM,TM The ASAM Criteria Decision Engine (www.asam.org/quality-practice/guidelines-and-consensus-documents/the-asam-criteria).

Aging

Alert

- Driving restrictions based solely on age are inappropriate
- Resources are identified to assist physicians in assessing the impact of hidden disease or of multiple comorbidities on older drivers

7.1 Overview

Most of the health-related conditions listed in this guide that affect driving are more prevalent in older age groups. Older drivers may be involved in crashes because of the accumulation of medical illnesses and/or medications that affect function.

Unfortunately, the standard physical examination does not directly assess functional skills such as the ability to drive. At best, it can be used to detect the presence of medical conditions and to evaluate their severity and related complications, which may allow the physician to make judgments regarding possible effects on functions, such as fitness to drive.

Despite the above limitations of the standard physical examination, most Canadian provinces and territories require that physicians report patients who have medical conditions that may make it unsafe for them to drive (see section 3: Reporting – when and why). Even where such reporting is not mandatory, physicians may still be found liable if they fail to report a patient who is later determined to have caused harm to others as a result of medical impairment affecting fitness to drive.

When involved in motor vehicle crashes, older drivers suffer higher rates of morbidity and mortality than younger drivers. Accurate assessments of fitness to drive allow physicians to help their patients avoid disabling injury or death. Such assessments also help patients and their families avoid the grief and legal repercussions associated with contributing to the injuries or deaths of other road users or bystanders. Thus, assessing fitness to drive represents a form of preventive health care that benefits not only one's patients but also the public. The reality is that, although physicians cannot completely assess all aspects of fitness to drive, they can make significant contributions to this assessment that will prevent unnecessary trauma to their patients and to the general public. While physicians therefore represent a major part of the solution, it is unrealistic to expect them to be able to detect all issues affecting fitness to drive in all situations. It should also be noted that physicians do not determine licence status. Rather, physicians provide accurate, timely and relevant data to allow licensing authorities to make the most appropriate licensure decisions.

The objective of this section is to optimize physicians' ability to fulfill this important societal role by addressing complex situations specifically related to aging that are not covered by other sections in this guide.

7.2 Red flags — the 3Rs

The following red flags should trigger screening and evaluation of fitness to drive:

Record (family/caregiver history) — family members and caregivers' reports of concerns regarding driving safety (ask them to be specific), unexplained damage to the patient's vehicle, moving violations (e.g., speeding tickets), near crashes or crashes. Discuss this information with the family/caregiver(s) in a location separate from the patient so that they will be comfortable providing full disclosure.

Recent crashes reported by patient (Joseph et al., 2014).

Restriction of driving to less complex situations (Classen et al., 2013).

7.3 Hidden disease

A variety of age-related changes in sensory input (e.g., vision), cognition (e.g., speed of cognitive processing, attention, scanning) and motor output (e.g., reaction time, power, coordination) can affect driving safety. Fortunately, because of compensatory driving strategies at both the strategic level (e.g., planning when and where to drive, such as restricting driving to optimal traffic and weather conditions) and the tactical level (e.g., defensive driving strategies such as increasing following distance), as well as years of driving experience, healthy seniors remain the safest drivers on the road.

Nonetheless, when older drivers experience medical conditions, either the conditions themselves or the medications used to treat them may affect fitness to drive. This guide provides a wealth of information regarding how to address such situations.

There may, however, be situations in which physicians or family members or both feel that a problem with driving is developing, but they cannot identify the precise cause. As a result, the physician may have difficulty employing the recommendations provided in other sections of this guide. An example of such a concern would be a sudden change in driving habits (e.g., marked decrease in distances driven or new avoidance of challenging driving situations), which the American Academy of Neurology suggests is a marker of possible driving concerns. Often, these concerns arise from changes related not to aging but rather to hidden, as-yet-undiagnosed medical conditions. In such situations, tools such as the CANDRIVE fitness to drive assessment mnemonic (Figure 1) can help physicians to structure their review of potential causes contributing to the concerns about fitness to drive. Identification of likely causes will in turn allow them to use the most relevant sections of this guide. The CANDRIVE mnemonic is similar to but incorporates more detail (e.g., in-car experiences) than the SAFEDRIVE mnemonic that appeared in the 7th edition of this guide. In particular, the CANDRIVE mnemonic captures reaction time as both speed of mentation and speed of movement.

For cases in which physicians and family members are concerned but the CANDRIVE fitness to drive assessment mnemonic does not yield any identifiable medical domains where physicians can focus their diagnostic skills and for cases in which the functional effects are too subtle to determine whether they represent a significant risk to fitness to drive, physicians should consider referral to specialized driving assessment programs, many of which provide on-road evaluation (Appendix E).



FIGURE 1: CANDRIVE fitness to drive assessment mnemonic*

C	Cognition	Dementia, delirium, depression, executive function, memory, judgment, psychomotor speed, attention, reaction time, and visuospatial function
A	Acute or fluctuating illness	Delirium, seizures, Parkinson disease, and syncope or presyncope (cardiac ischemia, arrhythmia, postural hypotension)
N	Neuromusculo-skeletal disease or neurological effects	Speed of movement, speed of mentation, level of consciousness, stroke, Parkinson disease, syncope, hypoglycemia, hyperglycemia, arthritis, cervical arthritis, and spinal stenosis
D	Drugs	Drugs that effect cognition or speed of mentation, such as benzodiazepines, narcotics, anticholinergic medications (e.g., tricyclic antidepressants, antipsychotics, oxybutynin, dimenhydrinate), and antihistamines
R	Record	Patient or family report of accidents or moving violations
I	In-car experiences	Patient or family descriptions of near accidents, unexplained damage to car, change in driving skills, loss of confidence or self-restriction, becoming lost while driving, others refusing to be driven by patient, need for assistance of a copilot (particularly concerning would be the need for cues to avoid dangerous situations that could result in a crash), and other drivers having to drive defensively to accommodate changes in the patient's driving skills
V	Vision acuity	Visual field defects, glare, contrast sensitivity, comfort driving at night
E	Ethanol use	Physician's opinion regarding whether ethanol use is excessive and whether alcohol is imbibed before driving

* Reprinted, with permission, from Molnar FJ, Simpson CS. *Approach to assessing fitness to drive in patients with cardiac and cognitive issues*. *Can Fam Physician* 2010;56(11):1123–1129 (<http://www.cfp.ca/content/cfp/56/11/1123.full.pdf>).

7.4 Multiple comorbidities

Often the issue is not that the medical conditions are hidden but, rather, that there are too many conditions to assess vis-à-vis fitness to drive. Again, it may be unreasonable to expect that a physician who has never been trained to assess function directly will be able to determine medical fitness to drive in the face of multiple comorbidities that may be interacting (at times in a synergistic fashion).

For complex cases of this nature, the physician may start with general lists, such as the CANDRIVE fitness-to-drive assessment mnemonic (Figure 1). In the setting of multiple comorbidities, the main limitation of such lists is that they do not provide guidance on sequencing complex assessments.

In the November 2010 edition of *Canadian Family Physician* (www.cfp.ca/content/56/11/1123.full.pdf+html), Molnar and Simpson described a complementary approach to assessing patients with multiple comorbidities, based on classifying the problems identified into *acute intermittent* and *chronic persistent* disorders. Acute intermittent disorders (called “episodic limitations” in section 2 of this guide and “acute or fluctuating illnesses” in the CANDRIVE mnemonic) are medical problems that can suddenly incapacitate an otherwise low-risk driver. These problems (e.g., syncope, seizures) can cause sudden changes in cognition or level of consciousness or both, but are less likely to be detected by physical examination, because they are not present most of the time. Decisions regarding when patients can resume driving after the occurrence of one of these episodes are based on the probability of recurrence (see “risk of harm” formula, Appendix F). Chronic persistent disorders, called “permanent limitations” in section 2 of this guide, are medical problems that are present at all times and can be detected by examining and testing the patient. Specific acute intermittent and chronic persistent disorders are reviewed in greater detail in other sections of this guide.

An effective way to employ this categorical breakdown is to first decide when the patient might resume driving according to his or her acute intermittent disorders (e.g., myocardial infarction, arrhythmia treated with implantable cardioverter defibrillator, seizure). This will provide time for recovery from any apparently persistent features that may in fact have a degree of reversibility (e.g., delirium, postural hypotension, stroke, traumatic brain injury, sleep apnea). At that point, the physician can more accurately assess irreversible chronic persistent conditions (e.g., dementia). For an example of how to employ this approach, readers are directed to the article by Molnar and Simpson.

As useful as the above approaches are, what is truly needed are provincially and territorially funded continuing professional development (CPD) programs focused on the assessment of fitness to drive, as suggested by Dow and Jacques (2012). For such CPD programs to attract large numbers of physicians, linking attendance to CPD credits issued by the College of Family Physicians and the Royal College of Physicians and Surgeons of Canada should be considered.

To learn more regarding the assessment of fitness to drive in older patients, see the Canadian Geriatrics Society Journal of CME (<http://canadiangeriatrics.ca/category/dementia/driving/>).

Dementia and mild cognitive impairment

Alert

- Cognitive screening alone cannot be used to determine fitness to drive.
- If a patient's fitness to drive is unclear, the physician should recommend an on-road assessment.

8.1 Overview

Current demographic trends predict major increases in the number of older drivers over the next 20 years. Given that the prevalence of dementia increases with age, this indicates that the number of older drivers with dementia will increase significantly. Cognitive problems often have a direct effect on ability to drive safely. Physicians must therefore not neglect any indications of possible cognitive compromises of fitness to drive.

The term “dementia” encompasses a group of diseases (i.e., different types of dementia) that may have different effects on the functional skills required for safe driving. It is known that patients with Alzheimer's dementia show a predictable decline in cognition, with the decline in driving abilities over time being steep but less predictable (Duchek et al., 2003). However, to date, no longitudinal studies of declines in driving ability have been conducted for other forms of dementia. Nonetheless, certain characteristics of these dementias may have implications for fitness to drive. For example, vascular dementia can present with abrupt periods of worsening associated with the accumulation of vascular lesions. Parkinson's dementia and Lewy Body dementia are often associated with motor, executive and visuospatial dysfunction, any of which can be hazardous on the road. Furthermore, some frontotemporal dementias are associated with early executive dysfunction and behavioural changes (e.g., anger control issues) that may render driving hazardous. Finally, all people with dementia are more prone to delirium, with unpredictable and sudden cognitive decline. Ultimately, then, progression to unsafe driving status is unpredictable for patients with dementia.

8.2 Canadian Dementia Guidelines

The Third Canadian Consensus Conference on Dementia (CCCD3; Hogan et al., 2008) recommendations on fitness to drive for patients with dementia and mild cognitive impairment are as follows:

- Diagnosis of dementia is not sufficient to withdraw driving privileges.
- Moderate to severe dementia is a contraindication to driving.
- Driving is contraindicated in people who, for cognitive reasons, have an inability to

independently perform multiple instrumental activities of daily living or any of the basic activities of daily living. This degree of functional impairment describes a moderate or worse stage of dementia.

- People with mild dementia should receive comprehensive off- and on-road testing at specialized driving centres.
- No test, including the MMSE (Mini-Mental State Examination), has 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.
- Patients with mild dementia who are deemed fit to continue driving should be re-evaluated every 6 to 12 months or sooner if indicated.
- (Note recommendations are rated by CCCD3 at Grade B, Level 3: Fair evidence to support this manoeuvre. Opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees.)

8.3 Reporting according to stage of dementia

To date, there are no published guidelines as to when patients with mild dementia or mild cognitive impairment should be reported in jurisdictions with mandatory physician reporting (table in section 3). However, it is clear, given the guidelines listed in section 8.2, above, that those with moderate to severe dementia should be reported.

The determination of whether a patient has crossed the threshold from mild to moderate dementia is challenging. As a basic guideline, the CCCD3 defined moderate dementia as the loss of one or more basic activity of daily living (ADLs) or the loss of 2 or more instrumental activities of daily living (IADLs including medication management, banking, shopping, use of the telephone or cooking) due to cognitive problems.

Another means of defining stages of dementia is the [Clinical Dementia Rating scale](#) (www.rgp.toronto.on.ca/dmcourse/toolkit/app5.htm). A score of 2 (moderate dementia) or 3 (severe dementia) on this scale would preclude driving. Unfortunately, the Clinical Dementia Rating scale is of limited clinical utility because it requires training and is rarely used in general clinical practice.

A general rule of thumb is that any physician who suspects that a patient's cognitive problems may affect safe driving should refer the patient for a functional driving assessment, either through an occupational therapy evaluation or directly to the licensing authority.

8.4 Red flags — the 3Rs

The following red flags should trigger screening and evaluation of fitness to drive:

Record (family/caregiver history) — family members and caregivers report concerns regarding driving safety (ask them to be specific), unexplained damage to the patient's vehicle, moving violations (e.g., speeding tickets), near crashes or crashes. Discuss this

information with the family/caregiver(s) in a location separate from the patient so that they will be comfortable providing full disclosure.

Recent crashes reported by patient (Joseph et al., 2014).

Restriction of driving to less complex situations (Classen et al., 2013).

For patients with dementia, it has been shown that caregivers are able to predict driving safety more accurately than can the patients themselves, but in some circumstances, the caregivers may have a vested interest in preserving the patient's autonomy beyond a safe window. This possibility must also be taken into consideration.

8.5 Assessment of non-cognitive factors

Dementia does not occur in isolation. It is most common among older adults in whom medical comorbidities, physical frailty and the use of multiple medications are also factors that must be taken into consideration when assessing fitness to drive or considering reporting (see section 7, Aging).

No studies have supported the notion that cholinesterase inhibitors extend the window for safe driving, but some drugs, such as anticholinergic medications or benzodiazepines have a clear propensity to worsen a person's driving ability. These medication classes, as well as antipsychotics should raise concerns. For more details on medications see section 6, Drugs.

Behavioural disturbances, including agitation, personality change and psychosis, are common over the course of dementia and can increase the risk of collision (Rapoport et al., 2008).

8.6 Cognitive screening tools

Many in-office cognitive screening tools have been proposed to predict which patients are most likely to have problems with driving. For the most part, these tools have been developed to assess cognition or to screen for dementia, rather than to identify unsafe drivers. Furthermore, most studies of these tools have involved populations that included both patients with dementia and healthy controls, and none has yet consistently shown consistently reliable cut-offs beyond which patients' driving becomes unsafe.

The most studied of office-based screening tool is the [Trails B](#), which has a recommended 3-minute or 3-error cut-off (3 or 3 rule) (cgjonline.ca/index.php/cgj/article/view/76).

Some screening tests are claimed to have been designed to determine fitness to drive, but these tests have not been demonstrated to have a predictive value that permits licensing decisions based solely on their results. No single test currently available has sufficient sensitivity or specificity to accurately predict, in the office setting, a person's driving safety in all situations but may be helpful in some situations. If cognition is impaired enough (i.e., where test results are so poor that sensitivity is not a concern), the results may be specific enough (i.e., unlikely to represent false results) to justify reporting the findings as being of concern and meriting licensing review. With the exception of

such clear situations, the consequences of misclassifying a safe driver as unsafe or an unsafe driver as safe solely on the basis of current cognitive screens can be substantial, both for the safe driver who is inappropriately deprived of independent mobility and for the unsafe driver who continues driving and is involved in a crash.

It is recommended that physicians administer more than 1 cognitive screening tool. If the results of cognitive tests such as the MMSE, the [Montreal Cognitive Assessment](#) (MoCA®; www.mocatest.org), the clock-drawing test, the trail-making test, or other in-office tests are markedly abnormal (i.e., where the results are specific and believable), consideration should be given to whether the patient has moderate or severe dementia, taking into account the history and recalling that moderate or severe dementia is a contraindication to driving.

It is important that screening tools not be misused. To optimize the use of current screening tools, despite the limitations of the evidence described above, [an article](#) (Molnar et al., 2012; <http://74.220.219.145/~canadjf9/wp-content/uploads/2016/12/Dementia-and-Driving-Maximizing-the-Utility-of-In-Office-Screening-and-Assessment-Tools.pdf>) suggests applying the following considerations when using in-office screening tests:

- **Determine if the test result is consistent with other evidence** — Are the results of the test consistent with the history provided by the patient, caregiver and family and with the results of other tests? Conversely, is the result of this single test an outlier and possibly not reflective of the patient's true functional ability?
- **Make certain you know what you are really measuring** — Ensure that low scores are not due to confounding variables, such as a language barrier, low education, dyslexia, performance anxiety, depression or sensory deficits.
- **Consider the trajectory of the patient's condition** — Consider whether the patient's function is expected to improve (e.g., delirium, recent head injury, recent stroke), remain stable (e.g., stable head injury, stable stroke) or decline (e.g., progressive degenerative disorders such as dementia, Parkinson's disease).
- **Understand your role** — Even in jurisdictions where reporting is mandatory, the role of physicians is not to directly determine fitness to drive, but rather to report clinical findings that raise concerns regarding fitness to drive. The licensing authorities then decide if the patient is fit to drive or needs more testing based, in part, on accurate, fair and timely information from physicians.
- **Use common sense and consider the severity of the findings** — Examine the entire picture, including any physical and behavioural limitations. Sometimes it is obvious that a patient is not safe to drive, given low valid test scores, dangerous behaviours, significant physical limitations or significant functional impairment. Do not be afraid to make a judgment based on any obvious impairments that may be uncovered.
- **Examine qualitative and dynamic aspects of the testing** — When interpreting performance on a test, do not focus solely on the score but also consider qualitative dynamic information regarding how the patient performed the test, such as slowness,

hesitation, anxiety or panic attacks, impulsive or perseverative behaviour, lack of focus, multiple corrections, forgetting instructions or inability to understand the test. These may indicate other sources of impairment that may negatively influence driving safety.

- **Understand cut-off scores and apply trichotomization** — For many health care measures, there is substantial overlap between the scores of people who are “normal” and the scores of those who are “impaired.” This makes reliance on a single cut-off score challenging, if not impossible.

To help make a decision, the physician can answer the following 4 questions:
Given the results of my clinical assessment,

- would I get into a car with the patient driving?
- would I let a loved one get into a car with the patient driving?
- would I want to be crossing the street in front of a car with the patient driving?
- would I want to have a loved one cross the street in front of a car with the patient driving?

For each question, 3 answers are possible: “yes” (meaning there are no concerns that would trigger further testing), “uncertain” (meaning that more tests are needed), and “absolutely not” (meaning that the risk is clear and too high).

8.6.1 Use tests in the context of more detailed approaches

Test results do not stand alone but should be part of a more detailed assessment. Consider the following resources:

1. [An article in the November 2010 issue of Canadian Family Physician](http://www.cfp.ca/content/56/11/1123.full.pdf+html) (www.cfp.ca/content/56/11/1123.full.pdf+html), which described an approach to sorting through such complex situations in the context of underlying dementia.
2. [The Driving and Dementia Toolkit for Health Professionals](http://www.rgpeo.com/en/health-care-practitioners/resources/driving.aspx) (www.rgpeo.com/en/health-care-practitioners/resources/driving.aspx)
3. [BrainXchange](http://brainxchange.ca/Public/Resource-Centre-Topics-A-to-Z/Driving-and-dementia.aspx) (<http://brainxchange.ca/Public/Resource-Centre-Topics-A-to-Z/Driving-and-dementia.aspx>) driving and dementia resources

8.7 When fitness to drive remains unclear

Although physicians may volunteer their opinion of patients’ fitness to drive and whether they feel that road testing is merited, and although physicians may counsel patients not to drive when such advice is appropriate, it is not their responsibility to directly determine fitness to drive. Rather, it is the responsibility of physicians to provide accurate information to their respective licensing authorities, which have the responsibility to make the determination of fitness to drive or to decide if further evaluation (e.g., specialist evaluation, on-road testing) is needed.

Some provinces, including Quebec, offer ministry-funded on-road testing for patients with dementia. Others, including Ontario, do not provide ministry funding for on-road

testing of persons with dementia. In the latter provinces, the patient is required to pay for the comprehensive on-road test, which is performed by a ministry-approved private company (sometimes costing as much as \$800). Physicians should inform themselves regarding the particular arrangement in their respective jurisdictions.

8.8 Counselling patients with dementia who can still drive safely

If a patient with dementia is found to be still safe to drive, the patient and the family should be made aware that this is a temporary situation and that, in time, the patient will need to cease driving. This conversation regarding eventual retirement from driving should be held as early as possible. Patients and families should also be advised that if there is any significant worsening of cognition (including symptoms of delirium such as slow mentation, decreased attention and focus, fluctuation or hallucinations) the patient should stop driving immediately and should see his or her physician. When assisting a patient with dementia to plan for future driving cessation, physicians can consider providing the patient and family with a copy of the [Driving and Dementia Toolkit: For Patients and Caregivers](http://www.rgpeo.com/en/health-care-practitioners/resources/driving.aspx) (www.rgpeo.com/en/health-care-practitioners/resources/driving.aspx). The patient's fitness to drive should be reassessed every 6 to 12 months, or more frequently if the cognitive impairment progresses. For further information on driving cessation, see section 4.

8.9 Disclosure of unfitness to drive

When a patient is found to be unsafe to continue driving, the discussion between physicians and patients is a delicate one, fraught with opportunities to upset and traumatize patients, or, alternatively, to help them move through a difficult stage in life in a compassionate and supportive manner. Guidance regarding how best to approach this challenging dialogue can be found in a [case-based article](http://74.220.219.145/~canadjf9/wp-content/uploads/2016/11/Disclosing-a-Diagnosis-of-Dementia.pdf) (<http://74.220.219.145/~canadjf9/wp-content/uploads/2016/11/Disclosing-a-Diagnosis-of-Dementia.pdf>).

8.10 Follow-up after loss of licensure

Loss of a driver's licence has been associated with social isolation and depression. Therefore, after a person with dementia has had his or her license revoked, the physician should monitor for these problems in scheduled follow-up.

It is also important to enlist family members and obtain their help in creating a transportation plan for the patient.

8.11 Countermeasures

There is little data to support the safety of restricted licensing, co-piloting, or other countermeasures for persons with dementia (Iverson, 2010)*.

** Iverson DJ, Grosneth GS, Reger MA, et al: Practice parameter update: Evaluation and management of driving risk in dementia: Report of the Quality Standards Subcommittee of the American Academy of Neurology. Neurology 2010; 74:1316-132*

Sleep disorders

Alert

If a physician believes that a patient is likely to be at risk while driving because of a symptomatic sleep disorder and the patient refuses investigation by a sleep study or refuses appropriate treatment, that patient should not drive any class of motor vehicle.

9.1 Overview

Somnolence (sleepiness), with its associated reduction in vigilance, is an important contributor to driver error and motor vehicle crashes. Somnolence can be due to lifestyle issues, a sleep disorder or both.

The 2nd edition of the *International Classification of Sleep Disorders* outlines 8 categories of sleep disorders: insomnias, sleep-related breathing disorders, hypersomnias of central origin, circadian rhythm sleep disorders, parasomnias, sleep-related movement disorders, unclassified disorders and other sleep disorders.

The recommendations that follow relate primarily to obstructive sleep apnea (OSA) and narcolepsy, the 2 sleep disorders for which there is a reasonably clear association between the disorder and the risk of a motor vehicle crash.

9.2 Assessment

Patients reporting excessive somnolence should be questioned in detail about the adequacy and regularity of their sleep–wake cycle, as attention to this may improve symptoms and reduce driving risk.

The following are some risk factors for sleep-related crashes:

- holding multiple jobs
- working a night shift
- nighttime driving (between midnight and 6 am)
- less than 6 hours of nighttime sleep
- long-duration driving or driving after being awake for more than 15 hours
- past history of drowsy driving
- daytime sleepiness
- recent (within a year) at-fault motor vehicle crash.

Patients with various sleep disorders may also have 1 or more of these risk factors and, as a result, have varying levels of sleepiness. This may partly explain observed differences in

the risk associated with operating a motor vehicle. The appropriateness of and need for medical intervention in the management of these disorders also varies.

Patients with excessive daytime somnolence should be questioned about and examined for the following risk factors for OSA:

- chronic heavy snoring
- nocturnal snorting and gasping
- witnessed apnea
- uncontrolled hypertension
- significant cardiovascular disease
- morning headaches
- craniofacial abnormalities (e.g., macroglossia, retrognathia)
- large neck size (≥ 43 cm [17 in])
- obesity.

Men and patients over age 40 are also at increased risk of OSA.

Patients with excessive somnolence and 1 or more risk factors for OSA, as well as those with persistent sleepiness and a history consistent with another sleep disorder (e.g., narcolepsy), should be considered for assessment in a sleep laboratory. When sleep laboratory resources are not available, portable monitoring devices can be used to confirm a diagnosis of OSA if monitoring is performed and interpreted according to published guidelines.

9.3 Obstructive sleep apnea

OSA is characterized by repetitive upper airway obstruction during sleep, leading to recurrent episodes of hypoxemia and arousal from sleep and resulting in disturbed sleep patterns. The relative risk of motor vehicle crashes among patients with symptomatic OSA is about 2 to 3 times that of control groups. In severe cases of OSA, the risk of a motor vehicle crash may be increased as much as 10-fold. However, determining individual risk remains difficult because of individual variations in susceptibility to sleepiness, use of countermeasures or driving avoidance.

Treatment of OSA with continuous positive airway pressure (CPAP) has been successful in reducing crash risk to control levels. Reassessment of patients using CPAP, with a compliance-metering device on the CPAP unit, should be done 1 to 2 months after diagnosis. The effectiveness of upper airway surgery is less clear, and patients treated by this method may require re-evaluation by sleep study.

Some patients with mild cases of OSA may be treated through behavioural modification (e.g., weight reduction, modification of sleeping position, elimination of alcohol and sedatives before sleep) or through the use of oral appliances. These interventions may be sufficient, but patients require reassessment for efficacy of treatment before resumption of driving.

9.3.1 Driving recommendations for patients with OSA

The following recommendations should be made only when OSA has been diagnosed by physicians familiar with the interpretation of sleep studies and/or portable monitoring.

- Regardless of apnea severity, all patients with OSA are subject to sleep schedule irregularities and subsequent sleepiness. Because impairment from OSA, sleep restriction and irregular sleep schedules may be interactive, all patients should be advised about the dangers of driving when drowsy.
- Patients with mild OSA without daytime somnolence who report no difficulty with driving are at low risk for motor vehicle crashes and should be safe to drive any type of motor vehicle.
- Patients with OSA, documented by a sleep study, who are compliant with CPAP (defined as at least 4 hours per day of use on 70% of days over at least a 30-day period within the previous 90 days; Ayas et al., 2014) or who have had successful upper airway surgery should be safe to drive any type of motor vehicle.
- Patients with moderate to severe OSA, documented by a sleep study, who are not compliant with treatment and are considered at increased risk for motor vehicle crashes by the treating physician should not drive any type of motor vehicle.
- Patients with a high apnea–hypopnea index, especially if associated with right heart failure or excessive daytime somnolence, should be considered at high risk for motor vehicle crashes.
- Patients with OSA who are believed to be compliant with treatment but who are subsequently involved in a motor vehicle crash in which they were at fault should not drive for at least 1 month. During this period, their compliance with therapy must be reassessed. After the 1-month period, they may or may not drive depending on the results of the reassessment.

9.4 Narcolepsy

Narcolepsy is characterized by recurrent lapses into sleep that are often sudden and irresistible and that typically last 10–15 minutes. Narcolepsy may be accompanied by cataplexy (sudden bilateral loss of muscle tone) during wakefulness, sleep paralysis (generalized inability to move or to speak during the sleep–wake transition) and vivid hallucinations at sleep onset.

Although there is a clear association between crash risk and narcolepsy, this association is not as well studied as that between crash risk and OSA.

Up to 40% of people with narcolepsy may report sleep-related motor vehicle crashes. Their risk for crashes is about 4 times that of control groups. Patients with cataplexy and sleep paralysis are believed to be at greatest risk for crashes, based on the relative unpredictability of these symptoms. In a study of narcoleptic patients with cataplexy, 42% reported having experienced cataplexy while driving and 18% reported sleep paralysis while driving. There is little information on the effect of treatment on risk for crashes.

9.4.1 Driving recommendations for narcoleptic patients

- Patients with a diagnosis of narcolepsy supported by a sleep study and a Multiple Sleep Latency Test and with uncontrolled episodes of cataplexy during the past 12 months (with or without treatment) should not drive any type of motor vehicle.
- Patients with a diagnosis of narcolepsy supported by a sleep study and a Multiple Sleep Latency Test and with uncontrolled daytime sleep attacks or sleep paralysis in the past 12 months (with or without treatment) should not drive any type of motor vehicle.
- Generally, patients with narcolepsy should not drive commercial vehicles, as long-distance driving can be difficult for these patients to manage without significant hypersomnolence. However, people with narcolepsy who are able to maintain a regular sleep–wake cycle may be able to drive commercial vehicles during the day, over short routes.

9.5 Other sleep disorders

Although short- and long-term insomnia may be the most common category of sleep disorder, there are no data linking increased motor vehicle crashes with insomnia.

Circadian rhythm sleep disorders, which are related to sleep loss from disruption of the daily sleep cycle, as seen with shift work or the jet lag experienced with transmeridian flights, are common and might easily be associated with a large number of crashes. However, there are again no clear data linking them with crashes.

Accordingly, physicians can make only general recommendations about the hazards of drowsy driving due to these other sleep disorders.

Psychiatric disorders

Alert

Immediate contraindications to driving — a patient seen or reported to have any of the following problems should be advised not to drive until the condition has been evaluated and treated:

- acute psychosis
- condition relapses sufficient to impair perceptions, mood or thinking
- medication with potentially sedating effects initiated or dose increased
- lack of insight or lack of cooperation with treatment
- lack of compliance with any conditional licensing limitations imposed by motor vehicle licensing authority
- suicidal plan involving crashing a vehicle
- an intent to use a vehicle to harm others

Routine screening is recommended for all patients with an anxiety disorder, mood disorder or substance use disorder, using the Adult Attention Deficit/Hyperactivity Disorder (ADHD) Self-Report Scale (ASRS-v1.1), with appropriate follow-up if the case-finding is positive.

10.1 Overview

The term “psychiatric disorders” encompasses numerous cognitive, emotional and behavioural conditions. Determining fitness to drive in a patient with a psychiatric disorder is often complex. There is a great deal of individual variation among patients with psychiatric disorders, particularly in the critical area of insight, and multiple conditions often coexist. Many psychiatric disorders are chronic and subject to relapse; as a consequence, ongoing monitoring is required.

The adverse effects of treatment or medication may pose a hazard to driving ability (see section 6, Drugs). However, individuals with psychiatric disorder(s) may well be safer drivers with psychotropic drugs than without them.

Although driving-risk researchers have focused on the major clinical psychiatric disorders, physicians need also to consider substance use disorders (see section 5, Alcohol, and section 6, Drugs) and personality disorders, the effects of psychosocial stressors, and the patient’s functional capacity when assessing fitness to drive in a patient with a psychiatric disorder. Factors such as sleep deprivation, fatigue, stress or high trait anxiety may aggravate existing problems.

Any significant reduction in functional capacity, especially of a cognitive nature, should alert the physician that further assessment is needed.

In some cases, suicide has been attributed to the removal of driving privileges, usually in older men. This risk emphasizes the usefulness of social and educational programs that help those facing an unexpected transition arising from the loss of a driver's licence for medical reasons.

The American Psychiatric Association (APA) published the latest edition of its *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; dsm5.org) in May 2013. DSM-5 has substantial changes in content from the previous edition (DSM-IV) and is becoming the standard for insurance reports, independent medical examinations and medical expert testimony in court, in addition to its use in motor vehicle licensing decisions. The Canadian Council of Motor Transport Administrators (CCMTA), the body that formulates the national medical standards for drivers used by most Canadian jurisdictions, adopted DSM-5 in 2014.

DSM-5 measures the severity of a disorder, aligns diagnoses with the International Classification of Diseases, 10th revision (ICD-10) and incorporates some recent advances in neurosciences.

DSM-5 has been subject to considerable criticism but remains the best we have in progress toward a diagnostic system based on signs that represent neural circuit dysfunction rather than being based mainly on symptoms.

Each DSM edition is considerably longer than the previous one. A busy clinician looking for a brief, well-written practical reference to DSM-5 may wish to consider *The Pocket Guide to the DSM-5® Diagnostic Exam* (Nussbaum, 2013).

10.2 Functional impairment

Good cognitive ability is the foundation of competent driving. Cognitive ability refers to how a person selects, interprets, remembers and uses information to make judgments and decisions. Psychiatric illnesses may affect thinking, mood or perception (or any combination of these), resulting in a wide range of types and degrees of cognitive impairment.

Neuropsychological testing is the “gold standard” for assessing cognitive ability, but it is time-consuming, and the required resources are generally located only in urban areas. Furthermore, this type of testing is only predictive of driving ability when significant cognitive impairment is present (unsafe to drive) or no cognitive impairment is present (likely safe to drive).

In situations where minimal or mild impairment is found, further evaluation may be required. For simple cases, in-office cognitive screening is useful. Complex cases, or those that involve commercial drivers, may require the additional expertise of a [Certified Driver Rehabilitation Specialist](#) (usually an occupational therapist with specialized training), where such a specialist is available.

Insight is critical to enable drivers to drive within their limitations and to know how and when these limitations change. Poor insight in patients with psychiatric disorder(s) may be evidenced by non-adherence to treatment, trivialization of the driver's role in a crash, or repeated involuntary admissions to hospital (often as a result of discontinuing prescribed medication).

A driver's ability to be aware of any cognitive limitations should be assessed, along with his or her willingness to adapt his or her driving to these limitations.

10.3 Assessing fitness to drive

In general, drivers with a psychiatric illness are fit to drive if:

- the psychiatric condition is stable (not in the acute phase)
- cognitive impairment is assessed as minimal (adequate alertness, memory, attention and executive function abilities)
- the patient is adherent to treatment recommendations and consistently takes prescribed psychotropic medication
- the maintenance dose of medication does not cause noticeable sedation
- the patient has the insight to self-limit driving at times of symptom relapse and to seek assessment promptly
- the patient's family is supportive of his or her driving.

Consider further assessment if:

- a family member reports a concern
- an at-fault crash occurs
- there is uncertainty about the degree of cognitive impairment.

Freeman et al. (2011) advise that consideration be given to the frequent comorbidity of substance use disorders with psychiatric conditions, so that both are targeted in treatment.

10.4 Specific disorders

10.4.1 Schizophrenia

Some patients with a diagnosis of schizophrenia have slowed cognitive processing. They may also have a variable degree of distraction that will typically depend on the perceptual distortions present at the time. Edlund et al. (1989) concluded that individuals with schizophrenia who drove have double the risk of motor vehicle crashes per distance driven compared with age-matched controls. Many of the cognitive impairments associated with this condition have been shown to improve with treatment, somewhat more so with atypical than typical antipsychotic medications.

Cuesta et al. (2011) reported on the usefulness of 2 brief cognitive screening tools for determining the presence of cognitive impairment in patients with

schizophrenia or bipolar disorder: the [Brief Cognitive Assessment Tool for Schizophrenia \(B-CATS; http://schizophreniabulletin.oxfordjournals.org/content/37/3/538.full\)](http://schizophreniabulletin.oxfordjournals.org/content/37/3/538.full) and the [Screen for Cognitive Impairment in Psychiatry \(SCIP; http://bmcpsy psychiatry.biomedcentral.com/articles/10.1186/1471-244X-13-127\)](http://bmcpsy psychiatry.biomedcentral.com/articles/10.1186/1471-244X-13-127). Both brief testing instruments showed good to excellent concurrent validity, relative to a Global Cognitive Composite Score (GCCS) derived from a more comprehensive testing methodology, and seem to be reliable and promising tools, although not directly predictive of on- road driving performance.

As long as the patient is taking prescribed medication; is not actively hallucinating; and has no active delusions, thought disorder, cognitive or motor adverse effects from antipsychotic medication, he or she is generally fit to drive. If there is clinical reason to doubt fitness to drive, an on-road evaluation is recommended.

10.4.2 Personality disorders

Personality disorders (previously categorized as Axis II disorders under DSM-IV) constitute a more controversial area. The locus of distress is often with others, not with the individual who has been given the diagnosis. By definition, the behavioural pattern is considered persistent, and the diagnosis often has a pejorative or dismissive tone. This attitude is unfortunate, because there have been many advances in recent years that provide good evidence for the treatability, and sometimes cure, of conditions such as borderline personality disorder.

Some personality disorders, including antisocial, borderline, and narcissistic personality disorders, may be associated with behaviour such as aggression, egocentricity, impulsiveness, resentment of authority, intolerance and irresponsibility. Police reports, if available, or other reliable third-party observations, may assist the physician in making fitness-to-drive recommendations for patients with these conditions.

10.4.3 Depression and bipolar disorder

Some individuals with mood disorders, even when treated and achieving full remission, continue to have some residual cognitive dysfunction, affecting short-term memory, concentration or mental processing speed. The SCIP (described in section 10.4.1) is an appropriate screening tool to assess for the presence of cognitive impairment in patients with depression as well as in schizophrenia.

A manic episode is a contraindication to driving. Fitness to return to driving will depend on response to treatment and the patient's level of insight and of inter-episode functioning. If a patient with bipolar disorder is advised not to drive, consent should be sought to notify a family member, and any such communications should be documented. Non-compliance with medical advice not to drive should be reported to licensing authorities.

Most treatment of depression is with newer-generation drugs rather than the older tricyclic agents. Tricyclic antidepressants have been associated with an increased risk of motor vehicle crashes, especially at higher doses or if multiple agents are used. While, theoretically, selective serotonin reuptake inhibitors and other newer-generation antidepressants have a pharmacological profile associated with lower risk of cognitive impairment, the literature is less clear. Some epidemiological studies have suggested an increased risk of collision also associated with these newer medications, but interpretation of this research is limited by indication and channelling bias. The general principles outlined in this chapter and especially the alert box should be of foremost consideration.

Electroconvulsive therapy (ECT) may induce sustained confusion in 1 of every 200 patients. Those receiving outpatient ECT need to comply with standard guidelines for not driving after anesthesia and should take extra time to recover before returning to driving if they are experiencing any memory problems after ECT.

Rapid-rate transcranial magnetic stimulation (rTMS) is reported to produce no evidence of cognitive impairment when used for treatment of depression. In fact, Turriziani et al. (2012) reported greater memory improvement among patients with mild cognitive impairment relative to healthy controls after administration of rTMS to the dorsolateral prefrontal cortex.

Aduen et al. (2015) contrasted the driving risks associated with adult attention deficit/hyperactivity disorder (ADHD) and those associated with depression relative to those of a typical peer control group. Depression, but not ADHD, predicted increased risk for self-reported injury following collisions (OR = 2.4) (see also section 10.4.6, Attention deficit/hyperactivity disorder).

Because of very frequent comorbidity, patients diagnosed with mood or anxiety disorders should also be screened for ADHD.

10.4.4 Anxiety disorders

Anxiety disorders may cause motor vehicle crashes when the driver's level of anxiety interferes with concentration or causes "freezing" or perseverative errors.

Severe motor vehicle crashes commonly lead to the development of psychiatric disorders. When symptoms of post-traumatic stress disorder or phobic avoidance complicate the picture, crash survivors can get significant help in the healing process through counselling and from relevant books. Ehlers et al. (2007) described the [Driving Cognitions Questionnaire](http://www.sciencedirect.com/science/article/pii/S0887618506001186) (www.sciencedirect.com/science/article/pii/S0887618506001186), a screening tool for identifying drivers with significant phobia, which is common among the general population and more common after a motor vehicle crash. This 20-item scale measures 3 areas of driving-related concerns: panic-related, crash-related and social.

Benzodiazepines may increase the risk of motor vehicle crashes, although low-dose clonazepam, sometimes a useful adjunct in the maintenance treatment of panic disorder, is unlikely to do so.

10.4.5 Psychotic episodes

Psychotic episodes due to any psychiatric or general medical condition may be the most urgent psychiatric situation with regard to fitness to drive. An acute psychotic episode is incompatible with safe driving. Physicians should note that an acutely psychotic patient may be able to mask symptoms initially.

Any driver who has experienced an episode, including commercial drivers with Class 4 licences (e.g., taxi drivers), may be safe to return to driving once the acute episode has settled, if there are no impairing effects from maintenance medication and if there is sufficient insight to adhere to treatment and identify early indicators of relapse.

10.4.6 Attention deficit/hyperactivity disorder (ADHD)

The motor vehicle licensing authority, as well as the parents of an adolescent with a diagnosis of ADHD who qualifies for a driver's licence, should pay close attention to speeding, red light infractions and risk-taking behaviour. Online resources may help with practical advice about risk-reduction, including some novel technological monitoring approaches.

Although ADHD is now seen as a lifelong disorder, the prevalence decreases somewhat with age. It is unclear why this is the case and whether it may reflect learned adaptive strategies. In a contrasting view, Moffitt et al. (2015), from the results of a 4-decade longitudinal cohort study, raise the possibility that adults presenting with ADHD symptoms may not have a childhood-onset neurodevelopmental disorder.

For both children and adults, psychostimulant medication may have a useful role in controlling symptoms and improving performance on a number of tasks. Stimulants have the most evidence supporting their efficacy in reducing the risk of moving violations and crashes for drivers with ADHD, particularly in the first 5 years of driving. The long-acting preparations of psychostimulants provide medication coverage throughout both the day and early evening and are formulated in ways that make them less likely to be diverted for illicit use.

As summarized by Barkley (2015):

ADHD in teens and adults is consistently associated with less safe driving habits, deficient driving performance, and greater inattention and impulsivity while driving. The disorder is also linked to more adverse driving outcomes, such as a greater risk for traffic citations (especially for speeding) and more of such citations; license suspensions/revocations; and a greater risk for crashes, more crashes, more severe crashes; and being considered to be at fault in such crashes.

Some of these adverse outcomes are also linked to and exacerbated by comorbidity with oppositional defiant disorder, conduct disorder or antisocial personality disorder.

Recently, a multi-site study using large general population samples (Aduen et al., 2015) contrasted the driving risks associated with adult ADHD and with depression relative to those of a peer control group. Diagnoses of ADHD and depression were based on norm-referenced questionnaires, resulting in 275 adults identified with ADHD, 251 with depression, and a healthy control group of 1,828 adults. Primary outcomes included self-reported traffic collisions, moving violations, collision-related injuries and collision fault (in previous 3 years). Accounting for demographic differences, ADHD but not depression was associated with about twice the risk for multiple violations (OR = 2.3), multiple collisions (OR = 2.2), and collision fault (OR = 2.1). The authors concluded that adult ADHD is uniquely linked to increased adverse driving outcomes that are not evident in depression and are clearly greater than risks seen in general population healthy adults. Identification of the specific mechanisms underlying this risk will be critical to designing effective interventions to improve long-term functioning for drivers with psychiatric disorder(s) associated with a higher risk of collision.

Texting on cell phones while driving markedly worsens the driving performance of teens both with ADHD and without the disorder (Narad et al., 2013; Kingery et al., 2015; Llerena et al., 2015).

A case-control study (n = 205 + 200) conducted by Safiri et al. (2013) in Iran found an association between adult ADHD and motorcycle traffic injuries. ADHD scores in all 4 subscales of the DSM-IV diagnostic criteria were significantly higher in the case (motorcycle injury) than in the control study group (noting that many motorcycle crashes may result in death or brain injury and the role of ADHD will remain unknown). The authors recommend a role for psychological screening and, if required, consultation with respect to ADHD during the motorcycle licensing process.

Chang et al. (2014) studied the association between ADHD and the risk of serious motor vehicle collision (MVC) (identified as an emergency hospital visit or death due to MVC) and explored whether ADHD medication influences this risk among patients with ADHD. Through the Karolinska Institute, a total of 17,408 patients with a diagnosis of ADHD were observed from January 1, 2006, through December 31, 2009, for serious motor vehicle collisions documented in Swedish national registers. To study the effect of ADHD medication, the authors compared the risk of MVC during a period when medication was used with the risk during a period without medication among the same patients. Compared with individuals without ADHD, male and female patients with ADHD had an increased risk of MVC. In male patients with ADHD, medication was associated with a 58% risk reduction (hazard ratio, 0.42; 95% CI, 0.23 to 0.75), but there

was no statistically significant association in female patients. Estimates of the population-attributable fractions suggested that 41% to 49% of the MVCs in male patients with ADHD could have been avoided if they had been receiving treatment during the entire follow-up. The authors advised that clinicians should consider informing patients about the increased risk of motor vehicle collision associated with ADHD, as well as possible benefits of ADHD medication.

Screening for ADHD can be accomplished by use of [ADHD Rating Scales](http://www.adhdratingscales.com) (www.adhdratingscales.com). The Adult ADHD Self-Report Scale (ASRS v1.1) developed through collaboration between Harvard University and the World Health Organization has good sensitivity and selectivity but may give more false-positive scores for ADHD among patients with bipolar disorder (Perroud, 2014). The ASRS scale has been [translated into more than 20 languages](http://www.hcp.med.harvard.edu/ncs/asrs.php) (www.hcp.med.harvard.edu/ncs/asrs.php).

Those with a positive screening test result may benefit from assessment with the [Barkley Deficits in Executive Functioning Scale](http://www.guilford.com/books/Barkley-Deficits-Executive-Functioning-Scale-BDEFS-Adults/Russell-Barkley/9781606239346) (www.guilford.com/books/Barkley-Deficits-Executive-Functioning-Scale-BDEFS-Adults/Russell-Barkley/9781606239346; versions for adolescents and for adults). The objective measurements will help to target areas of deficits in executive functioning in order to customize treatment. In addition to the increasing range of psychostimulant and other medications for the treatment of ADHD, there have been excellent advances in evidence-based cognitive behavioural therapy (CBT) approaches such as Safren et al. (2005) [Mastering Your Adult ADHD](http://global.oup.com/academic/product/mastering-your-adult-adhd-9780195188189?cc=ca&lang=en) (global.oup.com/academic/product/mastering-your-adult-adhd-9780195188189?cc=ca&lang=en).

While there is, as yet, no evidence that CBT for ADHD has any impact on driving competence, it may help to diminish functional impairment in a number of domains.

Dr. Laurence Jerome of London, Ontario, has a [useful website devoted to ADHD and driving](http://www.adhddriving.com) (www.adhddriving.com) which includes a screening questionnaire (the Jerome Driving Questionnaire [JDQ]; www.caddra.ca/pdfs/caddraGuidelines2011JDQ.pdf) that is in the public domain as well as educational videos for use with patients and their families.

10.4.7 Aggressive driving

Law enforcement agencies are paying more attention to ticketing aggressive drivers as the hazards associated with “road rage” become more evident. Individuals with ADHD are more likely to manifest anger, hostility and aggression while driving, and such emotional dysregulation is also a factor in their crash risk (Barkley, 2015; Richards et al., 2002 and 2006). Such behaviour is not exclusive to those with a diagnosis of ADHD and may be associated with a range of diagnoses, including mood and personality disorders, alone or in combination with each other or with ADHD.

Redelmeier et al. (2010) conducted a population-based case–control study in Ontario to examine the amount of road trauma involving teenage male youth that might be explained by prior “disruptive behaviour disorders” (specifically, ADHD, conduct disorder and oppositional defiant disorder). A history of disruptive behaviour disorders was significantly more frequent among trauma patients than controls, equal to a one-third increase in the relative risk of road trauma. The risk explained about 1 in 20 crashes, was apparent years before the event, extended to those who died, and persisted among those injured as pedestrians.

With the present state of knowledge, it seems reasonable to refer aggressive drivers with insight for specialized CBT groups, where available. Those without insight will likely only be dealt with by court-ordered treatment and administrative prohibitions from driving, although motivational interviewing strategies may be of some benefit.

10.5 Psychoactive drugs

Psychoactive medications may impair ability to drive. See section 6.3.7, Antidepressants and antipsychotics.

Nervous system

Alert

- Any seizure is grounds for immediate cessation of all driving activities.
- Resumption of driving will depend on neurologic assessment of the patient and the nature of the driving activity that is involved.
- Driving after a seizure caused by use of a substance depends on complete abstinence from use of that substance.
- Lack of compliance, including forgotten doses of medications, is grounds for immediate cessation of all driving activities.

11.1 Overview

Safe driving requires concentration, a reasonable level of intelligence and maturity, complete control over all muscle movements and freedom from the distracting influence of severe pain. In addition, a safe driver must always be alert, fully conscious and capable of quickly appreciating and responding to changing traffic and road conditions.

A driver with a history of any type of seizures, due to epilepsy or any other cause, is generally fit to drive a private vehicle if there have been no seizures during the previous 6 months. For certain types of seizures that do not affect the level of consciousness and with symptoms that do not affect driving, the seizure-free period may be waived if the seizure pattern has remained constant for at least 12 months.

This section lists and discusses the most common neurologic conditions that can adversely affect driving ability.

11.2 Febrile or toxic seizures, benign childhood absence epilepsy and other age-related epilepsy syndromes

Where seizures are directly related to a toxic illness, either in childhood or in adult life, and the patient has fully recovered from the illness, the seizures are of no concern in evaluating a patient's later medical fitness to drive. Some benign childhood epilepsy syndromes remit. These would be of less concern than a current epileptic disorder. A neurologic evaluation should be obtained in all such cases.

11.3 Syncope

A single occurrence of syncope that is fully explained and, given the etiology, is unlikely to recur may require no more than close observation. However, patients with a history of

several fainting spells or repeated unexplained falls should not drive until the cause has been determined and successful corrective measures taken. See section 14.4, Syncope.

11.4 Seizures

As for all conditions, in all instances where a temporal recommendation is made, the time period should be considered a general guideline. Individual circumstances may warrant prolonging or reducing the time period suggested.

The recommendations for seizures are presented in both tabular (Table 2) and text format.

11.4.1 Single, unprovoked seizure before a diagnosis

Private drivers: These patients should not drive for at least 3 months and not before a complete neurologic evaluation — including electroencephalography (EEG) with waking and sleep recording and appropriate neurologic imaging, preferably magnetic resonance imaging (MRI) — has been carried out to determine the cause.

Commercial drivers: Commercial drivers should be told to stop driving all classes of vehicles at once. For these drivers, there is a need for even greater certainty that another seizure will not occur while they are driving. At a minimum, commercial drivers should follow the private driver guideline and not drive private vehicles for at least 3 months after a single unprovoked seizure. If a complete neurologic evaluation, including waking and sleep EEG and appropriate neurologic imaging, preferably MRI, does not suggest a diagnosis of epilepsy or some other condition that precludes driving, it is safe to recommend a return to commercial driving after the patient has been seizure free for 12 months.

TABLE 2: Recommendations for drivers who have experienced seizure

Single, unprovoked seizure before a diagnosis	<ul style="list-style-type: none">• No driving for at least 3 months and• Neurologic assessment, preferably including EEG (awake and asleep) and appropriate imaging	<ul style="list-style-type: none">• No driving private vehicles for at least 3 months• Neurologic assessment, including EEG (awake and asleep) and appropriate imaging• If no epilepsy diagnosis, resume professional driving if seizure free for 12 months
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After diagnosis of epilepsy	<p>Drive if</p> <ul style="list-style-type: none"> • 6 months seizure free* on medication • Physician has insight into patient compliance • Physician cautions against fatigue, alcohol 	<ul style="list-style-type: none"> • Resume driving if 5 years seizure free (Recommendations for individual patients may differ on an exceptional basis.)
After surgery to prevent epileptic seizures	<ul style="list-style-type: none"> • Resume driving if 12 months seizure free after surgery with therapeutic drug levels (Recommendations for individual patients may differ on an exceptional basis.) 	<ul style="list-style-type: none"> • Resume driving if 5 years seizure free (Recommendations for individual patients may differ on an exceptional basis.)
Seizures only in sleep or immediately on waking	<ul style="list-style-type: none"> • Drive after 1 year from initial seizure if drug levels are therapeutic 	<ul style="list-style-type: none"> • No driving commercial vehicles for at least 5 years
Medication withdrawal or change:		
Initial withdrawal or change	<ul style="list-style-type: none"> • No driving for 3 months from the time medication is discontinued or changed 	<ul style="list-style-type: none"> • No driving for 6 months from the time medication is discontinued or changed
If seizures recur after withdrawal or change	<ul style="list-style-type: none"> • Resume driving if seizure free for 3 months 	<ul style="list-style-type: none"> • Resume driving if seizure free for 6 months (Recommendations for individual patients may differ on an exceptional basis.)
Long-term withdrawal and discontinuation of medication	<ul style="list-style-type: none"> • Drive any vehicle if seizure free off medication for 5 years with no epileptiform activity within previous 6 months on waking and sleep EEG 	
Auras (simple partial seizures)	<p>Drive if:</p> <ul style="list-style-type: none"> • Seizures are unchanged for at least 12 months • No generalized seizures • Neurologist approves • No impairment in level of consciousness or cognition • No head or eye deviation with seizures 	<p>Drive if:</p> <ul style="list-style-type: none"> • Seizures remain benign for at least 3 years • No generalized seizures • Neurologist approves • No impairment in level of consciousness or cognition • No head or eye deviation with seizures

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Alcohol-withdrawal-induced seizures	Drive if: <ul style="list-style-type: none">• Remain alcohol free and seizure free for 6 months• Complete a recognized rehabilitation program for substance dependence• Compliant with treatment
Post-traumatic seizures (single, not epilepsy)	<ul style="list-style-type: none">• Same as for single, unprovoked seizure
Juvenile myoclonic epilepsy (Janz syndrome)	<ul style="list-style-type: none">• No driving of any class of vehicle unless taking appropriate anti-seizure medication

**Or 12 months seizure free if seizures associated with altered awareness have occurred in previous 2 years (see text).*

Note: EEG = electroencephalography; MRI = magnetic resonance imaging

11.4.2 After a diagnosis of epilepsy

Patients may drive any class of vehicle if they have been seizure free for 5 years, with or without anticonvulsive medication. However, patients with juvenile myoclonic epilepsy (Janz syndrome) may not drive any class of vehicle unless they are taking appropriate antiseizure medication.

Private drivers: Patients with epilepsy who are taking antiseizure medication should not be recommended for Class 5 or 6 licensing until the following conditions are met:

- **Seizure-free period:** The patient should be seizure free on medication for not less than 6 months. With certain types of epilepsy, this period may be reduced to not less than 3 months on the recommendation of a neurologist, provided the neurologist has stated the reasons for this recommendation. The seizure-free period is necessary to establish a drug level that prevents further seizures without side effects that could affect the patient's ability to drive safely. The antiseizure medication should have no evident effect on alertness or muscular coordination.
- **Patient compliance with medication and instructions:** The attending physician should feel confident that the patient is conscientious and reliable and will continue to take the prescribed antiseizure medication as directed, carefully follow the physician's instructions and promptly report any further seizures. Medication compliance and dose appropriateness should be supported by measurement of drug levels whenever reasonably possible.
- **Cautions:** Physicians should advise patients with epilepsy that they should not drive for long hours without rest, nor should they drive when fatigued.

Patients who require antiseizure medication and who are known to drink alcohol to excess should not drive until they have been alcohol free and seizure free for at least 6 months. These patients often neglect to take their medication while drinking. As well, alcohol withdrawal is known to precipitate seizures, and the use of even moderate amounts of alcohol may lead to greater impairment in the presence of antiseizure medication. Patients taking these drugs should be advised not to consume more than 1 unit of alcohol per 24 hours.

A patient who stops taking antiseizure medication against medical advice should not be recommended for driving. This prohibition on driving may change if the physician feels confident that the formerly non-adherent patient, who is again taking antiseizure medication as prescribed, will conscientiously do so in the future and if compliance is corroborated by therapeutic drug levels, when available.

Commercial drivers: It can be unsafe for commercial drivers who must take antiseizure medication to operate passenger-carrying or commercial transport vehicles (Classes 1–4). For these drivers, there is a need for even greater certainty that another seizure will not occur while they are driving. Commercial drivers are often unable to avoid driving for long periods of time, frequently under extremely adverse conditions or in highly stressful and fatiguing situations that could precipitate another seizure. Unfortunately, seizures do sometimes recur even after many years of successful treatment.

11.4.3 After surgery to prevent epileptic seizures

Private drivers: These patients should be seizure free for 12 months after the surgery and taking antiseizure medication before being recommended for driving any type of motor vehicle. This period may be reduced to 6 months on the recommendation of a neurologist.

Commercial drivers: Before resuming driving, commercial drivers should be seizure free for 5 years, with or without medication. However, in certain types of epilepsy, this period may be reduced to 3 years on the recommendation of a neurologist.

11.4.4 Seizures only while asleep or on wakening

Private drivers: Patients with epilepsy with seizures that only occur while they are asleep or immediately after wakening can be recommended for a private vehicle licence (Class 5 or 6) if the seizure pattern is consistent for at least 12 months after the initial seizure or if they are seizure-free for at least 6 months.

Commercial drivers: Commercial drivers with this type of seizure and with therapeutic drug levels should not drive passenger-carrying vehicles or commercial trucks (Classes 1–4) for at least 5 years. Recommendations for individual patients may differ on an exceptional basis. There should be no prolonged post-ictal impairment in wakefulness.

11.4.5 Withdrawal of seizure medication or medication change

The following recommendations do not apply to voluntary cessation of antiseizure medication by the patient or instances of missed doses of prescribed medication.

Initial withdrawal or change: Some patients with fully controlled seizures whose antiseizure medication is withdrawn or changed have a recurrence of their seizures. Because the relapse rate with drug withdrawal is at least 30%–40%, patients must not drive for 3 months from the time their medication is discontinued or changed. Such patients should always be cautioned that they could have further seizures and should be counselled as to the risk factors for seizure recurrence.

The same concerns and conditions apply to commercial drivers as to private drivers. However, the period of observation before resuming driving is 6 months, and a normal EEG, preferably both awake and asleep, should be obtained during this time. If the evaluation is being done in the context of medication withdrawal, the EEG should be done when serum drug levels are non-measurable.

If seizures recur: If seizures recur after a physician has ordered discontinuation of or a change in antiseizure medication, patients can resume driving, provided they take the previously effective medication according to the physician's instructions. Private drivers must be seizure free for 3 months and commercial drivers for 6 months before resuming driving.

Long-term withdrawal or discontinuation: Patients with epilepsy whose anticonvulsant medication has been discontinued may drive any class of vehicle once they have been seizure free off medication for 5 years, with no epileptiform activity being recorded during a waking and sleep EEG obtained in the 6 months before resumption of driving.

11.4.6 Auras (simple partial seizures)

Private drivers: Patients with auras involving somatosensory symptoms, special sensory symptoms or non-disabling focal motor seizures in a single limb without head or eye deviation may be eligible for a Class 5 or 6 licence, provided there is no impairment in their level of consciousness or cognition, their seizures are unchanged for more than 1 year, or they are seizure-free for at least 6 months, and they have the approval of a neurologist to resume driving.

Commercial drivers: Patients with auras involving somatosensory symptoms, special sensory symptoms or non-disabling focal motor seizures in a single limb without head or eye deviation may be eligible to drive commercial vehicles, including passenger-carrying commercial vehicles (Classes 1–4), provided there is no impairment in their level of consciousness, the seizure pattern has

remained benign for at least 3 years and has never been generalized, and they have the approval of a neurologist to resume driving.

11.4.7 Seizures induced by alcohol withdrawal

As a result of chronic alcohol abuse or after a bout of heavy drinking, alcohol withdrawal can cause seizures in both epileptic and non-epileptic patients. Patients who have had alcohol-withdrawal seizures should not drive any type of motor vehicle. For these patients, investigation is required to exclude an underlying epileptic disorder. Before they can resume driving, these patients must complete a recognized rehabilitation program for substance dependence and must remain both alcohol free and seizure free for 6 months. A patient who does not have epilepsy who experiences a seizure induced by alcohol withdrawal does not usually require antiseizure medication.

11.5 Disorders affecting coordination, muscle strength and control

Loss of muscle strength or coordination occurs in a wide variety of disorders, each of which poses a special problem. These conditions include weakness, altered muscle tone, involuntary movements or reduced coordination due to poliomyelitis, Parkinson's disease, multiple sclerosis, cerebral palsy, the muscular dystrophies, myasthenia gravis, tumours of the brain or spinal cord, spinal stenosis, spina bifida, organic brain damage following a head injury or stroke, Tourette's syndrome, Huntington's chorea and ataxias.

In the early stages of some of these conditions, driving restrictions may be unnecessary. However, in serious cases, it will be immediately obvious that the applicant is unable to drive safely. Drivers with Class 5 licences who have mild loss of muscle strength or control may have special controls added to their cars. The motor vehicle licensing authorities are aware of the types of controls available and where they can be obtained. After the controls have been installed, the driver must undergo a road test and satisfy an examiner that he or she can drive safely.

If the disorder is not progressive, 1 medical examination and road test will usually suffice. However, if the condition is progressive or there are multiple medical conditions, the patient must be followed closely and driving must be discontinued when the disability reaches the point at which driving becomes unsafe. In such conditions, the physician should recommend a functional evaluation if the patient wishes to resume driving.

If the condition is characterized by or accompanied by cognitive impairment or impairment of memory, judgment or behaviour, or it is liable to lead to a loss of consciousness, the patient should be advised to stop driving. Any sign of cognitive impairment should trigger further evaluation of fitness to drive (see section 8, Dementia and mild cognitive impairment).

In most instances, these disorders preclude holding a Class 6 licence. Patients with peripheral neuropathy causing sensory or motor symptoms should be evaluated further by a specialist.

11.6 Severe pain

Severe pain from such causes as migraine headache, trigeminal neuralgia or lesions of the cervical or lumbar spine can decrease concentration or limit freedom of movement to a degree that makes driving extremely hazardous. This is a particular concern for commercial drivers, whose responsibilities or working conditions may prevent them from stopping work even if the pain becomes disabling.

In addition, prescription and over-the-counter painkillers may interfere with a person's ability to drive safely. However, some patients may be rendered capable of driving despite their pain by the use of these medications. Patients who experience frequent, chronic and incapacitating pain should be advised to avoid driving while incapacitated.

The underlying condition causing the pain may affect the person's fitness to drive, and a functional evaluation may be indicated.

11.7 Head injury and seizures

Drivers who have had a recent head injury should always be examined with particular care to determine whether there is any evidence of confusion or other symptoms that would make them temporarily unfit to drive. Although a minor head injury usually does not impair driving for more than a few hours, a more serious injury that results in even minimal residual brain damage or concussion should be fully evaluated before driving is resumed.

See also section 16, Traumatic brain injury.

11.7.1 Post-traumatic seizure

Under certain conditions, a patient with a head injury may resume driving after a single post-traumatic seizure.

Private drivers: A patient with a single post-traumatic seizure should not drive for at least 3 months and not until a complete neurologic evaluation, including EEG with sleep recording and appropriate brain imaging, has been carried out.

Commercial drivers: A patient with a single post-traumatic seizure should not drive for at least 12 months and not until a complete neurologic evaluation, including EEG with sleep recording and appropriate brain imaging, has been carried out.

11.7.2 Post-traumatic epilepsy

The guidelines for private and commercial drivers after a diagnosis of epilepsy (section 11.4.2) should be applied to those with post-traumatic epilepsy.

11.8 Intracranial tumours

A patient who wishes to resume private or commercial driving after removal of an intracranial tumour must be evaluated regularly for recovery of neurologic function and absence of seizure activity.

11.8.1 Benign tumours

If a patient's cognitive function, judgment, coordination, visual fields, sense of balance, motor power and reflexes are all found to be normal after removal of a benign intracranial tumour, there is usually no reason to recommend any permanent driving restrictions.

If a seizure has occurred either before or after removal of the tumour, the patient should be seizure free for at least 12 months, with or without medication, before resuming driving.

11.8.2 Malignant tumours

No general recommendation can be made about driving after removal of a malignant or metastatic brain tumour. The opinions of the consulting neurologist and the surgeon who removed the tumour should always be sought and each case evaluated individually. Seizures related to a brain tumour are discussed above. If there is a possibility that the tumour could recur, the physician should always fully explain to the patient the nature of the condition before sending a medical report to the motor vehicle licensing authority.

11.9 Parkinson's disease and parkinsonism

During the early stages, Parkinson's disease affects only fine coordination and therefore should not affect fitness to drive. With progression, impairment of the speed of gross movements and of reaction time may begin to make driving unsafe. The situation can be worsened by any associated cognitive impairment, side effects of medications (e.g., somnolence, involuntary movements, hallucinations) and an increasingly unpredictable response to medication leading to "wearing off" and other motor function fluctuations. The main concern is a delay in reaction time in response to complex traffic situations, which increases the risk of collision. Periodic assessment of cognitive processing speed will help in determining changes in reaction time. The Montreal Cognitive Assessment (MoCA®; mocatest.org) may be useful in this regard, followed by an on-road test.

Vision

Alert

Immediate contraindications to driving — a patient with any of these problems should be advised not to drive until the medical condition has been evaluated and treated:

- Visual acuity: For private drivers, corrected vision less than 20/50 (6/15) with both eyes open and examined together; for commercial drivers, refer to visual acuity standards.
- Visual field: For private drivers, field less than 120°* along the horizontal meridian and 15° continuous above and below fixation, with both eyes open and examined together; for commercial drivers, refer to visual field standards.
- Diplopia within the central 40° of the visual field (i.e., 20° to the left, right, above and below fixation).
- Recent functional change from binocular to monocular vision, including temporary patching of an eye.

**Some jurisdictions (e.g., Quebec) have different requirements for private drivers (i.e., field less than 100° along the horizontal meridian and 10° continuous above and 20° below fixation, with at least 30° on each side of the vertical meridian, with both eyes open and examined together).*

12.1 Overview

The following recommendations are based in large part on the work of the Canadian Ophthalmological Society's expert working group on driving and vision standards.

When a patient is visually impaired, the physician should inform the patient of the nature and extent of the visual defect and, if required, report the problem to the appropriate authorities.

When minor visual defects are not accompanied by cognitive defects or neglect, most drivers are capable of compensating for the defects. For example, most people adapt to the loss of an eye within a period of several months. Recent studies indicate that experienced drivers can compensate for a loss of visual acuity if they are in familiar surroundings and they limit their speed. In these circumstances, functional assessments are indicated.

This section presents information about the recommended visual acuity and visual field needed for safe driving (section 12.2, Recommended visual functions). Actual standards for these functions are set by provincial or territorial licensing authorities and may vary among jurisdictions, as well as differing from the recommendations in this section,

which are based on expert opinion. The section also presents information about other important visual functions that should be taken into consideration in determining fitness to drive (section 12.3, Other important visual functions for driving) and recommendations for exceptional cases that require individual assessment (section 12.4, Exceptional cases). It also provides further detail on recommended testing procedures (Addendum 1), a list of medical conditions with increased risk for vision problems and a discussion of the use of vision aids in driving (Addendum 2).

12.2 Recommended visual functions

12.2.1 Visual acuity (corrected)

A driver’s visual acuity must allow him or her time to detect and react to obstacles, pedestrians, other vehicles and signs while moving at the maximum posted speed, both in daylight and in darkness. Greater levels of visual acuity are required for some classes of licence to ensure public safety. Road signs should be designed to be easily legible at a safe distance for all individuals who meet the minimum visual acuity standard. (See Addendum 1 for testing procedures.)

Class of licence	Recommended visual acuity
Private (Classes 5, 6)	Not less than 20/50 (6/15) with both eyes open and examined together
Commercial (Classes 1–4)	Not less than 20/30 (6/9) with both eyes open and examined together. Worse eye not less than 20/400 (6/120)*

**Some jurisdictions require an acuity higher than 20/400 (6/120) in the worse eye. For example, some jurisdictions have a standard of 20/100 (6/30) or better in the worse eye for commercial licences. Other jurisdictions, such as Quebec, no longer have requirements for the worse eye.*

12.2.2 Visual field

An adequate continuous field of vision is important to safe driving. Any significant scotoma or restriction in the binocular visual field can make driving dangerous. Conditions often associated with loss of visual field are described in Addendum 2 of this section. If a visual field defect is suspected (on the basis of a medical condition, subjective report or confrontation field assessment), the patient should be referred to an ophthalmologist or optometrist for further testing. (See Addendum 1 for testing procedures.)

Class of licence	Recommended visual field
Private (Classes 5, 6)	120° continuous along the horizontal meridian and 15° continuous above and below fixation with both eyes open and examined together
Commercial (Classes 1–4)	150° continuous along the horizontal meridian and 20° continuous above and below fixation with both eyes open and examined together

12.2.3 Diplopia

Diplopia (double vision) within the central 40° (i.e., 20° to the left, right, above and below fixation) of primary gaze is incompatible with safe driving for all classes of licence. Individuals who have uncorrected diplopia within the central 40° of primary gaze should be referred to an ophthalmologist or optometrist for further assessment. If the diplopia can be completely corrected with a patch or prisms to meet the appropriate standards for visual acuity and visual field, the individual may be eligible to drive. Before resuming driving with a patch, there should be an adjustment period of 3 months or a period sufficient to satisfy the treating ophthalmologist or optometrist that adequate adjustment has occurred.

12.3 Other important visual functions for driving

12.3.1 Colour vision

Individuals should be made aware of any abnormality of colour vision to allow them to compensate for this difference in their vision. Although no standards exist for colour vision, all drivers should be able to discriminate among traffic lights. (See Addendum 1 for testing procedures.)

12.3.2 Contrast sensitivity

Individuals with reduced contrast sensitivity may experience difficulty with driving, especially at night or during bad weather, in spite of having adequate visual acuity. However, it is unclear at this time what level of reduction in contrast sensitivity represents an unacceptable risk for driving. Loss of contrast sensitivity can be associated with increased age, cataract, refractive surgery and other ocular disorders. Individuals should be made aware of any significant reduction in contrast sensitivity.

12.3.3 Depth perception

Motor vehicle crashes sometimes occur because of the driver's inability to judge distances accurately. However, judging distance is a skill that can be learned, even by people with monocular vision. Monocular judgments of depth can be made on the basis of such cues as the relative size or interposition of objects, clearness of details and analysis of shadows and contrast effects. A more refined form of distance judgment, called stereopsis, is based on information coming from both eyes.

A driver who has recently lost sight in an eye or has lost the use of stereopsis may require a few months to recover the ability to judge distance accurately.

12.3.4 Dark adaptation and glare recovery

The ability to adapt to decreased illumination and to recover rapidly from exposure to glaring headlights is of great importance for night driving. The partial loss of these functions in elderly people, particularly those with

cataracts or macular disease, may in some cases justify limiting driving to daylight hours.

12.3.5 Useful field of view

Processing of visual information while driving is very complex, and the visual field test evaluates only the capacity of a non-moving eye to see a stimulus. The useful field of view is a specialized visual field that evaluates the processing speed of centrally presented stimuli, as well as the selective and divided attention a driver needs to identify central and peripheral stimuli presented simultaneously while ignoring distracting stimuli. Although it is not part of the current regulations, physicians must be aware of this new tool and of the importance and complexity of the visual information processing on safe driving.

12.4 Exceptional cases

The loss of some visual functions can be compensated for adequately, particularly in cases of longstanding or congenital impairments. When a driver becomes visually impaired, the capacity to drive safely varies with the driver's 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 of fitness to drive. The decision regarding fitness to drive can only be made by the appropriate licensing authorities. However, examining physicians may take the following information into consideration when making recommendations to a patient or to the licensing authorities:

- favourable reports from the ophthalmologist or optometrist
- good driving record
- stability of the condition
- absence of other significant medical contraindications
- other references (e.g., professional, employment)
- assessment by a specialist at a recognized rehabilitation or occupational therapy centre for driver training.

In some cases it may be reasonable to recommend that an individual be granted a restricted or conditional licence to ensure safe driving. It may also be appropriate to make such permits exclusive to a single class of vehicles.

Addendum 1: Testing procedures

A1.1 Visual acuity

The visual acuity of applicants 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) or monocular conditions, as required by the relevant standard. It is recommended that visual acuity be assessed using a Snellen chart or equivalent at the distance appropriate for the chart under bright photopic lighting conditions of 275–375 lux (or greater than 80 candelas/m²). Charts that are designed to be used at 3 m (9.8 ft) or greater are recommended.

Visual field: When a confrontational field assessment is carried out to screen for visual field defects, the following procedure is recommended, at a minimum:

1. The examiner is standing or seated approximately 0.6 m (2 ft) 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 individual should be referred to an ophthalmologist or optometrist for a full assessment.

When a full assessment is required, the binocular visual field should be assessed using a III/4e Goldmann-type target or the closest equivalent. The Esterman functional vision test on the Humphrey visual field analyzer or kinetic perimetry with static exploration for scotomata on the Goldmann perimeter is recommended. When binocular assessments are not possible, monocular assessments will be considered.

Some automated testing devices used in driver testing centres have a procedure for assessing visual field. However, these tests are often insensitive to many types of visual field defect, and none tests greater than 140° in the horizontal median. Thus, they may not be adequate for screening purposes.

Diplopia: Anyone reporting double vision should be referred to an ophthalmologist or optometrist for further assessment.

Contrast sensitivity: Assessment of contrast sensitivity is recommended for those who are 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 chart visual acuity. Increased use of this test is encouraged as a supplement to visual acuity assessment.

Contrast sensitivity can be measured with a number of commercially available tools. Examples* include 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 and the

VisTech contrast sensitivity test. The testing procedures and conditions recommended for the specific test used should be followed.

Colour vision: Any test that requires the discrimination of red, green and yellow can be used to assess colour vision for driving.

Depth perception: No clinical tests are available for assessing depth perception, other than those used for stereopsis. If stereopsis assessment is required, the Titmus test can be used.

Dark adaptation and glare recovery: Currently there are no standardized tests or procedures that can be recommended for assessing these functions.

Addendum 2: Medical conditions and vision aids for driving

Some medical conditions have a greater risk of associated vision problems. Examples include

- Corneal scarring
- Eye movement disorders
- Refractive surgery
- Strabismus
- Cataract
- Stroke
- Diabetic eye disease
- Brain tumour and surgery
- Retinal disease
- Head trauma
- Optic nerve disorders
- Neurologic disorders
- Glaucoma
- Multiple sclerosis

** This list may not be exhaustive and does not constitute an endorsement.*

There are many other conditions that may cause vision problems. If a vision problem is suspected as a result of a medical condition, it is recommended that the individual be referred to an ophthalmologist or optometrist for further assessment of visual function.

Night driving: When assessing a driver's ability to drive at night, the following factors should be considered: mesopic visual acuity, glare sensitivity, contrast sensitivity and the presence of pathology such as cataracts, retinitis pigmentosa, corneal scarring and retinal diseases.

Vision aids and driving: Telescopic spectacles (bioptic devices), hemianopia aids and other low-vision aids may enhance visual function. The problems associated with their use while driving can include loss of visual field, magnification causing apparent motion and the illusion of nearness. Although expert opinion does not support their use by low-vision drivers, recent Canadian legal decisions oblige licensing authorities to evaluate their use on an individual basis for drivers whose vision does not meet the established standards.

These aids cannot be used to enable the user to meet the visual standards for testing by the licensing authority. Consequently, a driver must demonstrate that the use of the low-vision aid permits him to drive safely despite failure to meet the established visual standard. An on-road test is the usual means of functional assessment in these cases. It should be noted that drivers using telescopic lenses look through the lenses only 5%–10% of the time that they are driving. Consequently, some jurisdictions assess the driver without the lenses to evaluate fitness to drive under the conditions that will prevail for 90% of the time behind the wheel.

Auditory and vestibular disorders

Alert

- There are no hearing standards for private drivers in Canada.
- In certain circumstances, standards of hearing are recommended for some commercial drivers.

13.1 Overview

There are few data to indicate that hearing impairment affects driving ability. In certain circumstances, meeting certain standards of hearing is recommended. Vestibular dysfunction causing vertigo may affect ability to drive.

To date there is no conclusive evidence linking drivers' hearing loss with an increased risk of motor vehicle crashes. However, people with severe hearing loss will have limited ability to detect emergency sirens and other roadside sounds (e.g., train horns and crossings) and, where applicable, should be encouraged to wear hearing assistive devices while driving.

13.2 Hearing

13.2.1 Standards

There are no hearing standards for private drivers in Canada.

The following standards, as applied to the person's better ear, are recommended for commercial drivers.

If a hearing-impaired person drives a Class 2 or 4 vehicle, he or she should first undergo audiography performed by an audiologist or otolaryngologist. Drivers with Class 2 or 4 licences should have a corrected hearing loss of no more than 40 dB averaged at 500, 1000 and 2000 Hz and a corrected word recognition score of at least 50%–60%.

Drivers of Class 1 and 3 vehicles who wish to drive in the United States must meet the same standards as outlined above for drivers of Class 2 and 4 vehicles. Although no hearing standards apply for holders of Class 1, 3, 5 or 6 licences in Canada, drivers transporting dangerous goods, regardless of the class of vehicle, should meet the standards for Class 2 and 4 licences as noted in the previous paragraph.

13.2.2 Hearing assistive devices

Hearing aids and cochlear implants amplify ambient noise. This may cause

fatigue or annoyance. If not functioning properly, they may mask warning sounds that the driver should be able to hear.

13.3 Vestibular disorders

There are three basic types of vestibular disorders, all of which can seriously affect driving ability.

13.3.1 Acute unilateral vestibular dysfunction — single prolonged episode

Patients with acute unilateral vestibular disorders, such as labyrinthitis or vestibular neuronitis, should be advised not to drive until their condition has subsided and the acute symptoms have resolved.

13.3.2 Recurrent unilateral vestibular dysfunction

- Patients with Meniere's disease or other recurrent vestibulopathies should be advised to pull off the road at the first sign of an acute attack, until their symptoms subside. Those prone to severe, prolonged attacks may wish to avoid driving long distances alone.
- Patients experiencing acute episodes without warning symptoms, particularly those with Tumarkin's (non-syncopal drop) attacks, should not drive until their symptoms have been controlled or have abated for at least six months.
- Patients with benign paroxysmal positional vertigo are usually safe to drive unless they are sensitive to horizontal head movements, in which case they should be advised not to drive until their condition has subsided or responded to treatment.

13.3.3 Chronic bilateral vestibular hypofunction

Most patients with fixed vestibular hypofunction are safe to drive because they have no acute attacks of vertigo. Because they rely more on vision and proprioception for spatial cues, those with near complete or complete bilateral absence of vestibular function may have more difficulty driving, particularly during evening hours or on bumpy roads, and may not be safe to drive. In some such cases, a driver's road test may be the best indicator of driving ability and safety.

Cardiovascular diseases

Alert

Unstable cardiac patients who require admission to hospital or intensified follow-up should cease driving immediately until they can be shown to be at an acceptably low risk.

14.1 Overview

These recommendations are based on the report of the Canadian Cardiovascular Society's 2003 Consensus Conference, Assessment of the Cardiac Patient for Fitness to Drive and Fly. They are intended to assist decision-makers in assessing the fitness of cardiac patients to drive and are not intended to diminish the role of the physician's clinical judgment in individual cases.

Recommendations are presented in tabular form. For definition of terms, see section 14.10. Details regarding these and other recommendations can be found in the full report.*

Please note:

- There are no prospective, controlled studies in which patients have been randomly chosen to be permitted or proscribed the driving privilege, nor are there any studies in which patients have been randomly chosen to receive or not to receive physician advice not to drive.
- The defined standard of risk (see the "risk of harm" formula, Appendix F), while sensibly derived, is arbitrary and is not based on any evidence other than what has been acceptable historically.
- Given that all recommendations for driving eligibility are based on comparison with this arbitrary standard, they are based on expert opinion only.
- Application of the "risk of harm" formula throughout this section creates internal consistency among recommendations based on cardiovascular disorders, but does not imply consistency with recommendations based on other conditions or disorders, either in this guide or elsewhere.
- Wherever possible, best evidence was used to calculate the risks of driving, but the evidence itself does not support or deny licence restrictions for cardiac patients nor the mandatory reporting of such patients by their physicians.

*Assessment of the cardiac patient for fitness to drive and fly: final report. Ottawa : Société canadienne de cardiologie; 2003. Available: https://www.ccs.ca/images/Guidelines/Guidelines_POS_Library/DF_CC_2003_ES.pdf (accessed May 4th, 2017).

14.2 Coronary artery disease

Most patients with coronary artery disease (CAD) pose a low risk to other road users while driving. However, certain conditions require careful evaluation and judgment. It seems fair to conclude on both clinical and physiologic grounds that the cardiovascular workload imposed by driving a vehicle is very light, and the risk that driving will provoke a recurrent acute coronary syndrome incident causing incapacitation is extremely small. Although a small percentage of acute coronary syndromes will present with sudden cardiac incapacitation, it is not possible with contemporary risk stratification to select these patients in a meaningful way.

14.2.1 Acute coronary syndromes

	Private driving	Commercial driving
ST elevation MI	1 month after discharge	3 months after discharge
Non-ST elevation MI with significant LV damage*	1 month after discharge	3 months after discharge
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

**Minor LV damage is classified as an MI defined only by elevated troponin with or without ECG changes and in the absence of a new wall motion abnormality. Significant LV damage is defined as any MI that is not classified as minor.*

Note: ECG = electrocardiogram; LV = left ventricle; MI = myocardial infarction; PCI = percutaneous coronary intervention.

Notwithstanding any of the above recommendations, angiographic demonstration of 50% or greater reduction in the diameter of the left main coronary artery should disqualify the patient from commercial driving, and 70% or greater should disqualify the patient from private driving, unless treated with revascularization.

14.2.2 Stable coronary artery disease

	Private driving	Commercial driving
Stable angina	No restrictions	No restrictions
Asymptomatic CAD	No restrictions	No restrictions
PCI	48 hours after PCI	7 days after PCI

Note: CAD = coronary artery disease; PCI = percutaneous coronary intervention.

14.2.3 Cardiac surgery for coronary artery disease

	Private driving	Commercial driving
CABG surgery	1 month after discharge	3 months after discharge

Note: CABG = coronary artery bypass graft.

14.3 Cardiac rhythm, arrhythmia devices and procedures

The general trend away from electrophysiology-study-guided risk stratification and toward risk stratification based on left ventricular function is reflected in the [2003 guidelines](#), as the majority of implantable cardioverter defibrillator trials have identified left ventricular function as one of the most important determinants of risk.

14.3.1 Ventricular arrhythmias

	Private driving	Commercial driving
VF (no reversible cause)	6 months after event	Disqualified
Hemodynamically unstable VT	6 months after event	Disqualified
VT or VF due to a reversible cause*	No driving until/unless successful treatment of underlying condition	
Sustained VT with no associated impairment of consciousness; LVEF < 35%	3 months after event	Disqualified
Sustained VT with no impairment of consciousness; LVEF ≥ 35%; ICD has not been recommended	4 weeks after event satisfactory control	3 months after event satisfactory control
Nonsustained VT with no associated impairment of consciousness	No restriction	No restriction

*Examples include, but are not limited to, VF within 24 hours of myocardial infarction, VF during coronary angiography, VF with electrocution, VF secondary to drug toxicity. Reversible cause VF recommendations overrule the VF recommendations if the reversible cause is treated successfully and the VF does not recur.

Note: ICD = implantable cardioverter defibrillator; LVEF = left ventricular ejection fraction; VF = ventricular fibrillation; VT = ventricular tachycardia.

14.3.2 Paroxysmal supraventricular tachycardia, atrial fibrillation or atrial flutter

	Private driving	Commercial driving
With impaired level of consciousness	Satisfactory control	Satisfactory control
Without impaired level of consciousness	No restrictions	No restrictions

Drivers should receive chronic anticoagulation if clinically indicated (i.e., in presence of atrial fibrillation or atrial flutter).

14.3.3 Persistent or permanent atrial fibrillation or atrial flutter

	Private driving	Commercial driving
Adequate ventricular rate control; no impaired level of consciousness	No restriction; chronic anticoagulation if clinically indicated	

14.3.4 Sinus node dysfunction

	Private driving	Commercial driving
No associated symptoms	No restriction	No restriction
Associated symptoms (sick sinus syndrome)	Disqualified until successful treatment	

14.3.5 Atrioventricular and intraventricular block

	Private driving	Commercial driving
Isolated first degree AV block	No restriction	
Isolated RBBB		
Isolated left anterior fascicular block		
Isolated left posterior fascicular block		

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LBBB Bifascicular block Second degree AV block; Mobitz I First degree AV block + bifascicular block	Fit to drive if no associated impairment of level of consciousness	Fit to drive if no associated impairment of level of consciousness; and no higher grade AV block on an annual 24-hour Holter
Second degree AV block; Mobitz II (distal AV block) Alternating LBBB and RBBB Acquired third degree AV block	Disqualified	
Congenital third degree AV block	Fit to drive if no associated impairment of level of consciousness	Fit to drive if no associated impairment of level of consciousness; QRS duration ≤ 110 ms and no documented pauses ≥ 3 seconds on an annual 24-hour Holter

Note: AV = atrioventricular; LBBB = left bundle branch block; RBBB = right bundle branch block.

If a permanent pacemaker is implanted, the recommendations in section 14.3.6 prevail.

14.3.6 Permanent pacemakers

	Private driving	Commercial driving
All patients with a permanent pacemaker	<ul style="list-style-type: none"> • Waiting period 1 week after implant • No impaired level of consciousness after implant • Normal sensing and capture on ECG • No evidence of pacemaker malfunction at regular 	

Note: ECG = electrocardiogram.

14.3.7 Implantable cardioverter defibrillators

	Private driving	Commercial driving
Primary prophylaxis; NYHA Classes I–III	4 weeks after implant	Disqualified*
A primary prophylaxis ICD has been recommended but declined by the patient	No restriction	Disqualified*
Secondary prophylaxis for VF or VT with decreased level of consciousness; NYHA Classes I–III	6 months after event†	Disqualified*
Secondary prophylaxis for sustained VT with no associated impairment of consciousness; NYHA Classes I–III	1 week post implant, in addition to the appropriate waiting period for the VT (see section 14.3.1)	Disqualified*
Any event resulting in device therapies being delivered (shock or ATP), in which level of consciousness was impaired or the therapy(ies) delivered by the device was/were disabling	Additional 6-month restriction	Disqualified*

*ICDs 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.

†The 6-month period begins not at the time of ICD implant, but rather at the time of the last documented episode of sustained symptomatic VT, or syncope judged to be likely due to VT or cardiac arrest.

Note: ATP = antitachycardia pacing; ICD = implantable cardioverter defibrillator; NYHA = New York Heart Association; VF = ventricular fibrillation; VT = ventricular tachycardia.

For patients who have a bradycardia indication for pacing as well, the additional criteria under section 14.3.6 also apply.

All patients must be followed from a technical standpoint in a device clinic with appropriate expertise.

14.3.8 Other

	Private driving	Commercial driving
Brugada's syndrome; long QT syndrome; arrhythmogenic right ventricular cardiomyopathy (ARVC)	<ul style="list-style-type: none"> • Appropriate investigation and treatment guided by a cardiologist • 6 months after any event causing impaired level of consciousness 	Disqualified*
Catheter ablation procedure	48 hours after discharge	1 week after discharge
EPS with no inducible sustained ventricular arrhythmias	48 hours after discharge	1 week after discharge

**Inherited heart diseases may sometimes be identified to pose a very low risk to patients. Individual cases may be made for allowing a commercial driver to continue driving despite the diagnosis of one of these diseases, provided the annual risk of sudden incapacitation is felt to be 1% or less.*

Note: EPS = electrophysiology study.

14.4 Syncope

Most episodes of syncope represent vasovagal syncope, which can usually be diagnosed by history and do not warrant further investigation. When syncope is unexplained, further testing is necessary to arrive at a diagnosis and direct possible therapy. Because there is a small risk of recurrence and incapacitation during driving, consideration of restriction of privileges is intuitive, to protect both the patient and the public.

A patient with structural heart disease (reduced ejection fraction, previous myocardial infarction, significant congenital heart disease) is potentially at high risk and should undergo driving restriction pending clarification of underlying heart disease and etiology of syncope. It is well known that syncope, a previous aborted cardiac arrest, one or more episodes of sustained ventricular tachycardia (VT) and a history of sudden death in young family members are strong indicators of a high risk of sudden death.

	Private driving	Commercial driving
Single episode of typical vasovagal syncope*	No restriction	
Diagnosed and treated cause (e.g., permanent pacemaker for bradycardia)	Wait 1 week	Wait 1 month
Reversible cause (e.g., hemorrhage, dehydration)	Successful treatment of underlying condition	

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Situational syncope with avoidable trigger (e.g., micturition syncope, defecation syncope)	Wait 1 week	
<ul style="list-style-type: none"> • Single episode of unexplained syncope • Recurrent vasovagal syncope (within 12 months) 	Wait 1 week	Wait 12 months
Recurrent episode of unexplained syncope (within 12 months)	Wait 3 months	Wait 12 months
Syncope due to documented tachyarrhythmia, or inducible tachyarrhythmia at EPS	Refer to section 14.3.1	

**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.*

Note: EPS = electrophysiology study.

14.5 Valvular heart disease

Valvular heart disease can range from mild to severe. In general, the risk posed to the public by a driver with valvular disease depends largely on

- symptomatic status
- echocardiography data that quantify both the valvular lesion and the left ventricular dimensions

14.5.1 Medically treated valvular heart disease

	Private driving	Commercial driving
Aortic stenosis	<ul style="list-style-type: none"> • NYHA Class I or II • No episodes of impaired level of consciousness 	<ul style="list-style-type: none"> • Asymptomatic • NYHA Class I • AVA $\geq 1.0\text{cm}^2$ • EF $\geq 35\%$

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Aortic regurgitation	<ul style="list-style-type: none"> • No episodes of impaired level of consciousness • NYHA Class I or II 	<ul style="list-style-type: none"> • No episodes of impaired level of consciousness • NYHA Class I • EF \geq 35%
Mitral stenosis		
Mitral regurgitation		

Note: AVA = aortic valve area; EF = ejection fraction; NYHA = New York Heart Association.

14.5.2 Surgically treated valvular heart disease

	Private driving	Commercial driving
Mechanical prostheses	<ul style="list-style-type: none"> • 6 weeks after discharge • No thromboembolic complications • On anticoagulant therapy 	<ul style="list-style-type: none"> • 3 months after discharge • No thromboembolic complications • Anticoagulant therapy • NYHA Class I • EF \geq 35%
Mitral bioprotheses with non-sinus rhythm		
Mitral valve repair with non-sinus rhythm		
Aortic regurgitation	<ul style="list-style-type: none"> • 6 weeks after discharge • No thromboembolic complications 	<ul style="list-style-type: none"> • 3 months after discharge • No thromboembolic complications • NYHA Class I • EF \geq 35%
Mitral regurgitation sinus rhythm		
Mitral valve repair with sinus rhythm		

Note: EF = ejection fraction; NYHA = New York Heart Association.

14.6 Congestive heart failure, left ventricular dysfunction, cardiomyopathy, transplantation

Patients with cardiomyopathy, with or without a history of heart failure, potentially pose a risk on the roads. Functional status is a major determinant of fitness, as is the left ventricular ejection fraction. Because sudden death is so common in this group, physicians are encouraged to cross-reference this section with section 14.3, Cardiac rhythm, arrhythmia devices and procedures. In the event of a conflict, the more restrictive recommendation applies.

	Private driving	Commercial driving
NYHA Class I	No restriction	EF \geq 35%
NYHA Class II	No restriction	EF \geq 35%
NYHA Class III	No restriction	Disqualified
NYHA Class IV Receiving intermittent outpatient or home inotropes	Disqualified	
Heart transplant	<ul style="list-style-type: none"> • 6 weeks after discharge • NYHA Class I or II • On stable immunotherapy • Annual assessment 	<ul style="list-style-type: none"> • 6 months after discharge • Annual assessment • EF \geq 35% • NYHA Class I • Annual non-invasive test of ischemic burden showing no evidence of active ischemia

Note: EF = ejection fraction; NYHA = New York Heart Association.

14.7 Hypertrophic cardiomyopathy

	Private driving	Commercial driving
All patients with hypertrophic cardiomyopathy	No episodes of impaired level of consciousness	<ul style="list-style-type: none"> • LV wall thickness < 30 mm • No history of syncope • No NSVT on annual Holter • No family history of sudden death at a young age • No BP decrease with exercise

Note: BP = blood pressure; LV = left ventricle; NSVT = nonsustained ventricular tachycardia.

14.8 Cardiac rehabilitation programs

Cardiac rehabilitation programs are uniquely positioned to evaluate patients with respect to symptom status and fitness to drive.

Patients within cardiac rehabilitation programs include those with

- coronary artery disease including people with angina and a history of mechanical revascularization (coronary artery bypass surgery or percutaneous coronary interventions)
- cardiac rhythm disturbances
- pacemakers
- syncope
- valvular heart disease
- congenital heart disease
- hypertrophic cardiomyopathy
- left ventricular systolic dysfunction, congestive heart failure or both
- previous cardiac transplantation.

14.9 Implantation of Left Ventricular Assist Device (LVAD)

Patients with a continuous flow, NYHA class I-III, LVAD that are stable 2 months post LVAD implantation qualify for private driving only and are disqualified from commercial driving. (Where more than one set of circumstances or conditions coexist, the more restrictive recommendation prevails unless stated otherwise.) [CCS Focused Position Statement Update on Assessment of the Cardiac Patient for Fitness to Drive: Fitness Following Left Ventricular Assist Device Implantation](http://www.onlinecjc.ca/article/S0828-282X(11)01426-7/fulltext) at [http://www.onlinecjc.ca/article/S0828-282X\(11\)01426-7/fulltext](http://www.onlinecjc.ca/article/S0828-282X(11)01426-7/fulltext)

14.10 Definitions

NYHA functional classification:

- **Class I:** Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea or anginal pain.
- **Class II:** Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea or anginal pain.
- **Class III:** Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea or anginal pain.
- **Class IV:** Patients with cardiac disease resulting in inability to carry on any physical

activity without discomfort. Symptoms of heart failure or anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort increases.

Waiting period: The time interval following onset of a disqualifying cardiac condition, initiation of a stable program of medical therapy or performance of a therapeutic procedure (whichever is applicable) during which driving should generally be disallowed for medical reasons.

- Recurrence of the disqualifying condition or circumstance during this time resets the waiting period.
- If more than one waiting period would apply, the longer one should be used, except where stated otherwise.

Satisfactory control (for supraventricular tachycardia, atrial fibrillation or atrial flutter, which are associated with cerebral ischemia):

- **Supraventricular tachycardia** — Successful radiofrequency ablation of the substrate, plus an appropriate waiting period (see section 14.3.2), or a 3-month waiting period on medical therapy with no recurrence of SVT associated with cerebral ischemia during this time.
- **Atrial fibrillation or atrial flutter** — A 3-month waiting period after appropriate treatment during which there are no recurrences of symptoms associated with cerebral ischemia. If atrial fibrillation is treated with AV node ablation and pacemaker implantation, or if atrial flutter is treated successfully with an isthmus ablation (with proven establishment of bidirectional isthmus block), then the waiting periods in section 14.3.2 apply.
- **Sustained ventricular tachycardia with a left ventricular ejection fraction greater than or equal to 40% and no associated cerebral ischemia** — Successful ablation of the substrate plus a 1-week waiting period, or pharmacologic treatment plus the waiting period specified in section 14.3.1.

Sustained ventricular tachycardia: Ventricular tachycardia having a cycle length of 500 ms or less and lasting 30 seconds or more or causing hemodynamic collapse.

Nonsustained ventricular tachycardia: Ventricular tachycardia ≥ 3 beats, having a cycle length of 500 ms or less and lasting less than 30 seconds, without hemodynamic collapse.

14.11 Abnormal blood pressure

14.11.1 Hypertension

Hypertension, other than uncontrolled malignant hypertension, is not by itself a contraindication to the operation of any class of motor vehicle, although the complications that can arise from increased blood pressure such as cardiac, ocular or renal damage may well preclude safe driving. Sustained hypertension above 170/110 mmHg is, however, often accompanied by complications that make driving dangerous and these patients must be evaluated carefully.

Higher standards are required of commercial drivers than of private drivers. If a commercial driver is found to have a blood pressure of 170/110 mmHg or higher, the investigation must include an electrocardiogram, chest radiography, fundoscopic examination and measurement of blood urea nitrogen (BUN). If there is a marked deviation from norm, the patient should be referred to an internist for an opinion.

The long-term risks associated with sustained hypertension (over 170/110 mmHg) are such that patients who are unable to reduce their blood pressure to a level below this figure should not be recommended for licensing as commercial drivers.

14.11.2 Hypotension

Hypotension is not a contraindication to the operation of any type of motor vehicle unless it has caused episodes of syncope. If syncope has occurred, the patient should discontinue driving. If it is possible to prevent further attacks by treatment, it is then safe to resume driving a private vehicle, but not heavy transport or commercial vehicles.

14.12 Anticoagulants

Although the use of anticoagulant drugs is not by itself a contraindication to driving any class of motor vehicle, the underlying condition that led to prescribing the anticoagulant may be incompatible with safe driving.

Cerebrovascular diseases (including stroke)

Alert

Patients who have experienced either a single or recurrent transient ischemic attack or are experiencing residual symptoms from a probable stroke should not drive a motor vehicle until a medical assessment is completed.

15.1 Overview

Cerebrovascular disease can cause physical, visuospatial or cognitive symptoms that can lead to unsafe driving. A detailed history and thorough physical examination, including an assessment of cognition, insight and judgment, are important. If a problem that may affect driving is suspected, a comprehensive driver evaluation is the most practical method of determining fitness to drive.

Where resources are available, assessment by a trained occupational therapist would be optimal. An on-road test administered by the motor vehicle licensing authority can also be helpful in assessing functional capacity to drive; however, such testing cannot always be relied upon to reveal the true extent of the disability, given the examiner's inability to evaluate all potentially related physical (e.g., hemiparesis), visuospatial (e.g., visual field deficits) and cognitive (e.g., dementia) issues.

15.2 Transient ischemic attacks

The abrupt onset of a partial loss of neurologic function during a transient ischemic attack (TIA), even if the loss of function persists for less than 24 hours and clears without residual signs, should not be ignored in anyone who drives a motor vehicle, as it raises the possibility of a later stroke. After a TIA, patients' risk of a stroke within the first 2 days is 4%–10%. The risk is generally accepted as 10% (absolute) for the group as a whole and can be as high as 30% for some patients, according to clinical and imaging indicators. Patients who have experienced either a single or recurrent TIA or are experiencing residual symptoms from a probable stroke should not be allowed to drive any type of motor vehicle until a medical assessment and appropriate investigations are completed. They may resume driving if the neurologic assessment discloses no residual loss of functional ability and any underlying cause has been addressed with appropriate treatment.

15.3 Cerebrovascular accident (stroke)

15.3.1 Brain aneurysm

Symptomatic cerebral aneurysms that have not been surgically repaired are an absolute contraindication to driving any class of motor vehicle. Following successful treatment, the patient may drive a private vehicle after a symptom-

free period of 3 months, and will be eligible to drive commercial vehicles after being symptom free for 6 months. This guideline is, however, empirically based and cases should be considered on an individual basis. Any significant residual physical, psychologic or cognitive symptoms should be fully evaluated; patients with significant residual impairments that may affect driving need to be cautioned not to drive and the condition reported to the licensing authority. The recommendations for patients with cerebral aneurysm are summarized in Table 3.

TABLE 3: Recommendations for patients with symptomatic cerebral aneurysm

Patient condition	Private driving	Commercial driving
Untreated cerebral aneurysm	Disqualified	Commercial driving
After surgical treatment	Symptom free for 3 months*	Symptom free for 6 months*

**With the caveat that each case must be considered on an individual basis.*

15.3.2 Stroke

Patients who have had a stroke should not drive for at least 1 month. During this time, they require assessment by their regular physician. They may resume driving if

- the physician notes no clinically significant motor, cognitive, perceptual or vision deficits during the general and neurologic examinations
- any underlying cause has been addressed with appropriate treatment
- a seizure has not occurred in the interim.

Any available information from the patient's treating nurse, occupational therapist, psychologist, physiotherapist, speech pathologist or social worker should be reviewed to assist with the determination of deficits that may not be visible or detected during an office visit.

Where there is a residual loss of motor power, a driving evaluation at a designated driver assessment centre may be required (Appendix E). The driver assessment centre can make recommendations for driving equipment or vehicle modification strategies, such as use of a steering wheel "spinner knob" or left-foot accelerator. Training in the safe use of the equipment should be provided.

The physician should take particular care to note any changes in personality, alertness, insight (executive functions), and decision-making ability, however subtle and inconsistent, in patients who have had a stroke as these types of changes could significantly affect driving ability. The physician may be assisted by reports from reliable family members in discerning whether the patient's judgment and awareness are altered in day-to-day activities.

Patients with a right-brain stroke are usually verbally intact but very much impaired with regard to their insight, judgment and perceptual skills. Such

patients may pass a standard on-road test, as such testing does not challenge their deficits. Patients with a left-brain stroke frequently present with some degree of aphasia. Although aphasia is not an absolute contraindication to safe driving, it requires the physician's attention and further evaluation.

Patients with a visual field deficit from the stroke require a visual field study, which is completed by an optometrist or ophthalmologist. The report should be sent to the motor vehicle licensing authority. All changes in visual field must be reported to the licensing authority, which will then provide direction to the driver as to what steps he or she will need to take. Although a visual field deficit is no longer considered an absolute contraindication to safe driving, each jurisdiction has its own particular assessment to further evaluate this condition.

Patients who have had a stroke and subsequently resume driving should remain under regular medical supervision, as the episode may be the forerunner of a gradual decline in their thinking processes (e.g., multi-infarct dementia or vascular cognitive impairment due to microvascular disease). In some provinces, licence restrictions, such as denial of expressway or high-speed driving privileges or limitation of driving to areas familiar to the driver, are available at the discretion of the licensing authorities. The aim of this restricted licensing is to bring the level of driving difficulty into alignment with driving ability; however, evidence to support this intervention remains limited.

15.4 Counselling

Support and counselling should be offered to patients who are unsafe to drive or who resist giving up driving or being tested. Patients may find it difficult to deal with the loss of their perceived independence. In addition, obtaining alternative transportation may be challenging and time-consuming. The physician should point out to patients that they may place themselves and others at risk for injury by driving. Referral to social services will help patients to identify and apply for community resources. Stroke survivors with physical disabilities may require door-to-door van service, for which medical justification may be needed, and the physician should expect requests for documentation when patients apply for such assistance.

15.5 Summary

Driving after stroke is possible, but patients must recognize that it is a privilege, not a right. Evaluation of the patient must take into account any possible residual physical, cognitive or perceptual impairment that might affect safe driving.

In general, if there is uncertainty about the patient's ability to drive, a formal driving evaluation, including an on-road assessment, should be performed.

Better screening tools and training methods to allow a return to driving after a stroke are being developed, but they do not supplant the need for a comprehensive medical evaluation.

Traumatic brain injury

Alert

- Patients who have experienced a significant traumatic brain injury/concussion should be strongly encouraged to have adequate physical and cognitive rest to promote recovery. Such patients should not drive a motor vehicle until their symptoms have fully resolved and a medical assessment has been completed.
- At the first encounter, the physician should screen the patient for post-traumatic amnesic state (PTA), to avoid unknowingly discharging the patient in this state. Unless this condition is clearly evident through an interview, use of a standardized screening test is advised — for example, [Abbreviated Westmead PTA scale](http://www.psy.mq.edu.au/GCS) (online training available at www.psy.mq.edu.au/GCS or http://scale-library.com/pdf/Galveston_Orientation_Amnesia_Test.pdf)

16.1 Overview

In cases of traumatic brain injury (TBI), the apparent severity of the original event may not correlate with the degree of persisting cognitive dysfunction. There is also often great variability in recovery: people with severe injury may have minor persisting deficits, whereas those with apparently mild brain injury may have significant persisting deficits. Although the term “mild traumatic brain injury” is clearly defined and widely used in the medical literature, recent knowledge suggests that there is nothing mild about TBI, in terms of its prevalence, the lack of adequate clinical attention it receives and, sometimes, its enduring effects on functional capacity. Multiple cognitive and physical impairments, including changes in reaction time and visual-motor processing, commonly occur after TBI and can impair the ability to drive. The same is true for acquired brain injuries resulting from anoxia, encephalitis, the effects of tumours or other cerebral insults. Common causes of concussion may target frontal lobe areas that are involved in insight, decision-making and impulse control.

Even with the increasing number of published articles on mild TBI and concussion, there is very little evidence-based material on which to base recommendations. A comprehensive effort to improve this situation includes 71 specific recommendations for the assessment and treatment of patients with persisting symptoms after a brain injury (Marshall et al., 2012).

Internationally, efforts are under way to develop a better understanding of and care for patients “with our most complex disease in our most complex organ” while recognizing the limitations of randomized controlled trials’ contribution to the research methodology used (Tenovuo et al., 2012).

For patients experiencing post-traumatic seizures, see section 11.7.1.

16.2 Initial assessment after concussion or mild TBI

Knowledge about the effects of TBI, a detailed history, information from the family or other reliable informants and additional cognitive screening will help the physician make the best decisions about a patient's fitness to drive. If cognitive or significant physical deficits are found, the physician should consider referral for rehabilitation assessment.

To drive safely, TBI survivors require insight into their disability, as well as the following characteristics:

- adequate reaction times
- adequate ability to coordinate visual-motor function (for steering)
- adequate leg function for braking (or ability to use adaptive technology)
- adequate ability to divide attention to perform multiple simultaneous tasks
- enough responsibility to comply reliably with the rules of the road and to drive within any conditions set by licensing authorities.

Generally, patients with moderate to severe TBI (score < 13 on the [Glasgow Coma Scale](#) [a clinical tool developed for neurosurgical triage] or requirement for admission to hospital for treatment of the TBI) will receive more comprehensive assessment and often may be reported to licensing authorities as having a condition that could render them unfit to drive, at least until they have completed successful driving rehabilitation.

The majority of people with less severe injuries (as measured by the Glasgow Coma Scale) recover spontaneously. They should, however, be monitored for symptoms. A significant proportion (10%–15%) may require further assessment. Implications for driving should be considered routinely. The importance of adequate physical and cognitive rest (i.e., complete rest for 1 or 2 days) to promote recovery after concussion cannot be overemphasized. After that, any return of symptoms during exercise-induced elevation in heart rate (e.g., while exercising on a stationary bicycle) or during cognitively demanding tasks indicates that more rest and evaluation are needed.

Post-concussion symptoms may peak in the 48 hours after the injury or later, which may be more likely in those with inadequate rest after concussion. [Having initial moderate or greater SCAT2 \(Sport Concussion Assessment Tool, version 2\) \(\[www.bjsm.bmj.com/content/43/Suppl_1/i85.full.pdf\]\(http://www.bjsm.bmj.com/content/43/Suppl_1/i85.full.pdf\)\) scores on more than 1 of the following 4 symptoms — headache, dizziness, noise sensitivity and memory problems — may be a predictor of slower recovery \(Iverson, 2012\).](#)

For all patients over the age of 16 who have had a TBI, a brief driving history should be obtained and included as part of the medical record. The history should include answers to the following questions:

- Does the patient have a valid licence? (if so, include registration number and expiry date)

- What classification and conditions are attached to the licence?
- Were alcohol, drugs or prescription medications a contributing factor to the injury?

Third-party observer information about the patient:

- Was the patient agitated or combative just after the crash?
- Was he or she staring or showing a delayed response during conversation with others?
- Is there a difference between the family's and the injured person's observations about his or her behaviour since the crash?

If there were observations of the patient appearing confused immediately after the crash, even if only for a brief period, or if other symptoms of concussion are evident, the patient should be advised not to drive until medically cleared to do so.

With the patient's consent, a family member should also be notified. It is preferable to document the name of the physician who will be responsible for any follow-up review, and when such follow-up is advised to occur.

If screening for post-traumatic amnesia is positive ([Abbreviated Westmead PTA scale \(online training\)](#) available at www.psy.mq.edu.au/GCS or [Galveston Orientation and Amnesia Test](#) at <http://psy.mq.edu.au/GCS/>) it is essential to notify a family member or trusted friend of the patient, as any opinion and instructions given directly to the patient will not be remembered, including advice not to drive.

If alcohol, drugs or prescription medications were a factor in the crash, the evidence supports screening for a substance use disorder (see also sections 5 and 6).

16.3 Follow-up assessment for moderate and severe TBI (also relevant to concussion with persistent symptoms)

16.3.1 Symptoms

The following symptoms, when they occur shortly after the trauma, and then persist, may indicate residual disability:

- becoming fatigued easily
- disordered sleep (with or without nightmares)
- headache
- vertigo, dizziness or balance problems
- unprovoked irritability or aggression
- anxiety, depression or affective lability
- changes in personality
- apathy or lack of spontaneity
- short-term memory impairment
- executive function changes (e.g., difficulty planning and performing complex tasks)

- decreased tolerance for stress and adverse effects of medications
- decreased sense of smell (anosmia), often experienced as not being able to enjoy the taste of food and indicating a greater likelihood of damage to the frontal lobe; use Q-SIT, an inexpensive evidence-based test, to screen for anosmia (www.onlinelibrary.wiley.com/doi/10.1097/01.mlg.0000183194.17484.bb/abstract)
- increased sensitivity to light (photophobia) or sound (phonophobia)
- trouble reading others' emotions
- difficulty recognizing humour.

Visual field perceptual problems that may follow TBI include brain-injury induced sensory processing problems such as hemispatial neglect (see www.emedicine.medscape.com/article/1136474-overview for definition of hemispatial neglect). A history of the patient bumping into things on one side may be the first sign of an undiagnosed homonymous hemianopsia, which may occur in the absence of loss of consciousness at the time of the brain injury.

16.3.2 History and physical

The TBI survivor often has poor insight and awareness of acquired deficits. The role of self-awareness of deficits is central in determining whether an individual with residual deficits may be able to drive safely. A collateral history is essential, as the patient who has had TBI accompanied by post-traumatic amnesia or significant frontal lobe injury may be unable to provide valid self-reports. Appearing confused immediately after the crash or injury, or any period of amnesia confirmed by observers, represents a risk factor for persistent cognitive disability, even if the Glasgow Coma Scale score in the emergency department is 15/15. Because of the complexities of brain function and the specialized function of some areas, one cognitive skill may be spared by the injury, while another is impaired or lost.

Standard neurologic examination cannot be relied upon to determine the presence or absence of cognitive dysfunction after TBI. In these cases, additional objective information is useful to support the physician's opinion.

In addition to the standard visual acuity requirements, a minimal assessment should include the following:

- referral for visual field testing
- cognitive screening to assess memory, attention, reaction time, visual perception and visual-motor skills.

16.3.3 Investigations

Although it may be possible to confirm the presence of diffuse axonal injury with specialized magnetic resonance imaging (MRI), it is important to realize that full functional recovery may follow clearly abnormal computed tomography or MRI scans. Conversely, persistent cognitive dysfunction is seen in some individuals after apparently normal neuroimaging.

16.4 Functional impairment

Medical assessment alone is often insufficient to determine a patient's fitness to drive, and further evaluation by medical specialists, neuropsychologic testing or formal comprehensive driving assessment may be needed to give a more accurate evaluation and to help in developing a better understanding of specific driving problems.

Individuals with TBI are slower to anticipate traffic hazards than age-matched uninjured controls. This finding signifies the need for hazard perception testing and training as part of driving rehabilitation after TBI. *Driver-ZED*, a DVD produced by the American Automobile Association Foundation for Traffic Safety, is a useful resource for this type of training.

A collaborative group developed the Acquired Brain Injury Knowledge Uptake Strategy (ABIKUS C) Guideline (2007) which was designed to provide evidence-based recommendations for rehabilitation of moderate to severe acquired brain injury (ABI) in the post-acute period (see Appendix A for link to guidelines).

The recommendations of the ABIKUS C guideline for driving after moderate to severe ABI are as follows (see Part III, section 12.2 of guideline):

- For all patients with a moderate to severe ABI, including adolescents, a physician with experience of brain injury should screen patients who wish to drive, in accordance with legislation, where appropriate in liaison with the multidisciplinary team
- If members of the interdisciplinary rehabilitation team during assessment or treatment determine that the person's ability to operate a motor vehicle safely may be affected, then they should:
 - Advise the patient and/or their advocate that they are obliged by law (if applicable) to inform the relevant government body that the individual has suffered a neurological or other impairment and to provide the relevant information on its effects
 - Provide information about the law and driving after brain injury
 - Provide clear guidance for the physician, other treating health professionals and family/caregivers, as well as the patient, about any concerns about driving, and reinforce the need for disclosure and assessment in the event that return to driving is sought late post-injury
- If the patient's fitness to drive is unclear, a comprehensive assessment of capacity to drive should be undertaken at an approved driving assessment centre.

A practical limitation of these comprehensive and evidence-based recommendations is the accessibility of "a physician with experience of brain injury to screen patients who wish to drive," particularly in locations more distant from urban centres.

Even when comprehensive rehabilitation facilities are not readily available, there are some things that the treating physician can do. For example, the physician can use a standardized screening questionnaire for the assessment of concussion, such as those used widely in sports medicine.

The SCAT2 was developed by a group of international experts at the Third International Consensus meeting on Concussion in Sport held in Zurich, Switzerland, in November 2008 and published in the *British Journal of Sports Medicine*. Marshall et al. (2012) identified some limitations to the SCAT2 but were not opposed to its use.

When using the SCAT2 for assessment, the physician may wish to video-record the three balance tests (each of 20 seconds' duration) to provide a baseline for future reference. Smart phones make such recording an easy task and allow provision of copies to the patient and the physician who will be providing follow-up care. Such a recording also allows for subsequent review to assist in ensuring the accuracy of balance scoring.

The Mini-Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA®) are screening tools that provide limited cognitive information. The Trail-Making Test B tool and the clock-drawing test are other pen-and-pencil tests that can be administered in the office setting. Abnormal scores are red flags indicating that further assessment is warranted.

However, test results must be interpreted with caution, as the patient's educational and cultural background will influence performance.

16.5 Counselling

Support and counselling should be offered to patients who are unsafe to drive or who resist giving up driving or being tested. Finding alternative transportation may be challenging and time consuming. TBI is often complicated by comorbid depression, and the loss of driving privileges may contribute to the risk of depression. The physician should advise patients that they may place themselves, family and others at risk for injury by driving.

16.6 Summary

Driving after brain injury may be possible. Evaluation of the patient must take into account any residual physical, cognitive or perceptual impairment to safe driving. Reporting requirements will vary according to the jurisdiction where the physician practises.

In general, if there is uncertainty about a patient's ability to drive, a formal driving evaluation, including an on-road assessment by a professional experienced in driving rehabilitation, should be performed.

It is anticipated that baseline cognitive screening and periodic re-testing will become more widespread. Having such objective information will assist physicians in dealing with these complex situations while more research is being done to inform guidelines for clinical care and rehabilitation.

Better screening tools and training methods to allow a return to driving after TBI or ABI are being developed, but they do not supplant the need for a comprehensive medical evaluation.

Vascular diseases

Alert

Immediate contraindications to driving — a patient with either of these problems should be advised not to drive until the medical condition has been evaluated and treated:

- aortic aneurysm at the stage of imminent rupture, as determined by size, location or recent change
- acute deep venous thrombosis not yet treated.

17.1 Overview

The presence of an aortic aneurysm or deep venous thrombosis is the main concern with respect to fitness to drive.

17.2 Arterial aneurysm

An arterial aneurysm is potentially dangerous if it is expanding and there is a possibility of sudden rupture, which could cause fainting or collapse and loss of vehicle control. The physician should document maximum aneurysm diameter using an appropriate test when completing a medical examination report for the motor vehicle licensing authority. An abdominal ultrasound examination or computed tomography scan will reliably indicate the size of the aneurysm. Only the anterior–posterior or transverse diameter is predictive of rupture; the length of the aneurysm has no relation to rupture. Ongoing review of the patient is required. A patient with an aortic aneurysm should have the benefit of the opinion of a vascular surgeon.

Currently, it is generally accepted that aneurysms smaller than 5.5 cm in anterior–posterior or transverse diameter have a lower than 1% annual risk of rupture. For men, there is no survival advantage with endovascular or open repair of abdominal aortic aneurysm (AAA) if the size is less than 5.5 cm. For AAAs greater than 6 cm, the risk of rupture exceeds 10% in 1 year if left untreated. Currently, men with AAAs of 5.5 cm or larger are evaluated for repair and frequently undergo surgery, depending on comorbid conditions and the risk associated with the procedure. For women, in whom aneurysms rupture at smaller sizes, AAA repair is considered for those with an aneurysm of 5 cm or larger in diameter.

Thus, the decision to license drivers with aneurysms larger than the currently accepted thresholds for repair should take into consideration aneurysm size and the patient's comorbid conditions that would influence the risk of repair. In selected cases, the comorbid conditions and the threat of aneurysm rupture secondary to size (larger than 6 cm in men and 5.5 cm in women) may preclude driving until the aneurysm is repaired.

Following successful endovascular or open AAA repair, the patient may drive once he or she has recovered, assuming that no other medical contraindication exists.

Thoracic and thoracoabdominal aneurysm rupture is also related to aneurysm size. Prospective data comparing early surgery with conservative follow-up are not available. The threshold for repair of thoracic and thoracoabdominal aneurysms is influenced by size, extent and location of these aneurysms. Therefore, definitive recommendations await prospective data.

17.3 Peripheral arterial vascular diseases

Raynaud's phenomenon, Buerger's disease and peripheral arterial disease (atherosclerotic lower limb disease) of sufficient severity to cause symptoms all require evaluation. These conditions rarely preclude driving unless they cause functional limitations, but ongoing surveillance is required. Those with amputations related to these conditions may require appropriate hand controls for driving.

17.4 Diseases of the veins

Patients with acute episodes of deep venous thrombosis are at risk of pulmonary embolization. Physicians should advise patients with acute deep venous thrombosis to refrain from driving until the institution of appropriate treatment. Then, the patient may safely resume driving a motor vehicle.

Respiratory diseases

Alert

Immediate contraindication to driving*:

- any condition resulting in insufficient cerebral oxygenation or hypercapnia causing psychomotor slowness — for example, symptomatic decompensated chronic obstructive pulmonary disease.

**A patient with this problem should be advised not to drive until the medical condition is evaluated and has been treated or has resolved.*

18.1 Overview

Some respiratory diseases may, if severe enough, interfere with the safe operation of a motor vehicle. A decrease in the provision of oxygen to the brain could impair judgment, reduce concentration and slow response times. Marked dyspnea may also limit physical ability to operate a motor vehicle. It is important to note that suboptimal oxygenation could destabilize respiratory illness, and the resulting insufficient cerebral oxygenation could compromise driver fitness. Advanced respiratory disease, as well as morbid obesity, may lead to decreased ventilation, and the resulting hypercapnia could lead to psychomotor symptoms that may affect fitness to drive.

18.2 Assessment

Impairment associated with dyspnea can be characterized as

- Mild — 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.
- Moderate — Shortness of breath when walking for a few minutes or after 100 m walking on level ground.
- Severe — Too breathless to leave the house, breathless when dressing; presence of untreated respiratory failure.

18.3 Chronic obstructive pulmonary disease (COPD) and other chronic respiratory diseases

Driving could be dangerous for a patient with untreated chronic hypoxia. Many patients with chronic respiratory diseases, such as COPD, drive safely and regularly, even when oxygen use is required. A driving assessment, road test or both are recommended if the

physician has any doubt. Oxygen equipment must be safely secured in the vehicle. Please refer to Table 4 for recommendations for patients with chronic respiratory disease.

TABLE 4: Recommendations for patients with chronic respiratory disease

Level of impairment	Private driving	Commercial driving
None or mild	No restrictions	No restrictions
Moderate	No restrictions	Depends on the nature of the activities. May require road testing.
Moderate or severe, plus supplemental oxygen at rest	Road test, while using supplemental oxygen. Equipment must be secured safely. Annual clinical assessment required.	Disqualified

18.4 Permanent tracheostomy

A person with a permanent tracheostomy who has no difficulty keeping the opening clear of mucus should be able to drive any class of motor vehicle, provided that the medical condition making the tracheostomy necessary does not preclude driving. See also section 25.3, under Motorcycles and off-road vehicles.

Endocrine and metabolic disorders

Alert

- In severe cases, many endocrine and metabolic diseases, treated or untreated, may impair judgment, motor skills or level of consciousness. In addition, metabolic or electrolyte abnormalities may occur. If these factors are present or are likely to occur, then the patient should be advised not to drive until the medical condition is stabilized.
- In an individual with diabetes who is using insulin or insulin secretagogues, the occurrence of symptoms of hypoglycemia severe enough to cause lack of judgment or loss of consciousness, or to require the intervention of a third party, is an immediate contraindication to driving.

19.1 Overview

Disturbances in the functioning of the endocrine glands may be the source of many symptoms with a wide range of severity. Patients with suspected or confirmed endocrine disorders should always be carefully evaluated to make certain that their symptoms do not make them unsafe drivers. The endocrine and metabolic conditions discussed below are among the most common ones that physicians may be called on to assess because of their potential for interfering with driving safety. Fitness to drive must be assessed on a case-by-case basis, as the range of signs and symptoms is highly variable.

19.2 Diabetes mellitus

Advances in treatment, medical technology and self-monitoring have increased the ability of patients with diabetes to control their disease and operate a motor vehicle safely. Fitness of these patients to drive must be assessed on a case-by-case basis. Patients with diabetes should be encouraged to take an active role in assessing their ability to drive by maintaining personal health records and accurate blood-glucose monitoring logs. Patients should have information concerning avoidance, recognition and appropriate therapeutic intervention for hypoglycemia.

The annual medical examination of a driver with diabetes should always include a full review of possible complications to exclude eye disease, renal disease, neuropathy (autonomic, sensory, motor), cardiovascular disease and cerebrovascular disease of a degree that would preclude issuing the class of licence requested. Cumulative diabetic complications may cause functional impairment requiring evaluation above and beyond what might be required for any specific level of complication or level of glycemic control. In general, a patient is considered fit to drive if it can be demonstrated that he or she (1)

is fastidious and knowledgeable about controlling his or her blood-glucose levels, (2) able to avoid severe hypoglycemic episodes, and (3) has no complications of diabetes that would affect safe driving.

For recommendations pertaining to private or commercial drivers treated with nutritional therapy alone or antihyperglycemic agents with minimal risk of severe hypoglycemia or treated with insulin secretagogues or insulin, please review the recommendations provided in “Diabetes and Driving: 2015 Canadian Diabetes Association Updated Recommendations for Private and Commercial Drivers” (Houlden et al. 2015). Noted amendments for commercial drivers are provided here:

- Reinstatement of a commercial license may be considered for persons with diabetes being treated with insulin secretagogues with a suspended commercial licence owing to severe hypoglycemia or hypoglycemia unawareness if in the past 6 months (as opposed to 12 months) there are no episodes of severe hypoglycemia and no evidence of hypoglycemia unawareness.
- Drivers with diabetes who are taking insulin should be excluded from obtaining or maintaining a commercial license if in the past 6 months (as opposed to 12 months) they have had any episode of severe hypoglycemia while awake or any hypoglycemia unawareness.
- Reinstatement of a commercial license may be considered for persons with diabetes treated with insulin with a suspended commercial licence owing to severe hypoglycemia or hypoglycemia unawareness if in the past 6 months (as opposed to 12 months) there are no episodes of severe hypoglycemia and no evidence of hypoglycemia unawareness.

The full guideline can be accessed online at <https://www.diabetes.ca/getmedia/b960981b-a494-497e-ae5a-37c73d3261ab/2015-cda-recommendations-for-private-and-commercial-drivers.pdf.aspx>.

The Canadian national medical standards published by the Canadian Council of Motor Transport Administrators require commercial drivers with diabetes treated with insulin to maintain HbA1c below 12%. (see http://ccmta.ca/images/publications/pdf/CCMTA_Medical_Standards_Dec_1_2015_final_clean_copy.pdf)

19.3 Non-diabetic renal glycosuria

Patients with non-diabetic renal glycosuria can safely drive any type of motor vehicle.

19.4 Non-diabetic hypoglycemia

Patients who become faint or unconscious from spontaneous episodes of hypoglycemia that is unrelated to diabetes cannot drive any type of vehicle safely and require immediate, accurate diagnosis and treatment of the condition. Those with milder symptoms, who have never lost consciousness or the ability to respond normally to external stimuli, can operate private vehicles without excessive risk. They should not drive passenger-carrying or commercial vehicles until this problem has been controlled.

19.5 Thyroid disease

Patients with hyperthyroidism complicated by significant visual, cardiac, neurologic or muscular symptoms and patients with symptomatic hypothyroidism that impairs judgment or motor skills should not drive any type of motor vehicle until the condition has been controlled.

19.6 Parathyroid disease and other calcium disorders

Patients with severe hypercalcemia or hypocalcemia with significant neurologic, cardiac conduction abnormalities or muscular symptoms should not drive. If their symptoms respond well to treatment, they should be able to resume driving all vehicles without undue risk.

19.7 Pituitary disease

19.7.1 Posterior deficiency

Patients with diabetes insipidus should not drive commercial or passenger-carrying vehicles until their condition has been stabilized with treatment. It is safe for them to drive private motor vehicles under close medical supervision, unless disabling central nervous system symptoms or other significant symptoms develop.

19.7.2 Anterior deficiency

Patients with panhypopituitarism or other anterior pituitary hormone deficiencies may experience a number of symptoms that may impair their ability to drive a motor vehicle safely. They should not drive until their medical condition has been assessed and treated. Patients with pituitary tumours or other space-occupying lesions should be regularly assessed for visual field defects.

19.7.3 Acromegaly

Patients with acromegaly who have started to develop muscle weakness, pain, easy fatiguing, significant neurologic symptoms, visual disturbances, cardiac enlargement, sleep disorders or intractable headaches should discontinue all driving. After treatment, and if vision is satisfactory and other symptoms do not significantly affect function, they should be able to resume all driving safely.

19.7.4 Pituitary tumour

Any mass in the sella (e.g., pituitary tumour, craniopharyngioma) may abut the optic chiasm and lead to visual field defects. If a patient is known to have such a tumour abutting the optic chiasm, then visual fields may require monitoring every 6–12 months (or more often), depending upon how stable the tumour is thought to be. Refer to section 12, Vision, for more information.

19.8 Adrenal disease

19.8.1 Cushing's syndrome

Patients with Cushing's syndrome (adrenal cortical hyperfunction) in whom muscle weakness has developed should be advised to stop driving. If they improve after treatment, they may resume driving all vehicles, but must remain under close medical supervision.

19.8.2 Addison's disease

A patient with Addison's disease (adrenal cortical hypofunction) may drive all vehicles, provided the condition has been successfully treated and controlled and the patient remains under close medical supervision.

19.8.3 Pheochromocytoma

Hyperfunction of the adrenal medulla due to the development of a pheochromocytoma with headache, dizziness, tachycardia or blurred vision is a contraindication to the operation of any type of motor vehicle, unless these symptoms are significantly relieved by treatment.

Renal diseases

Alert

- A substantial proportion of dialysis patients may be unfit to drive or may have episodes when they are temporarily unfit to drive (especially after dialysis treatments).
- Screening questionnaires are available that may help to identify patients who are at risk for being unfit to drive and who might benefit from more detailed evaluation. However, evidence is insufficient to mandate the routine use of these questionnaires in clinical practice.
- Dialysis patients who are concerned about their ability to drive should be encouraged to speak to a physician and avoid driving until their concern has been addressed.
- Medical and paramedical personnel should consider seat-belt pressure points when implanting invasive medical devices (e.g., central venous catheters or peritoneal dialysis catheters).

20.1 Overview

This section reviews issues associated with dialysis and renal transplantation. Patients with end-stage renal disease may be treated with facility-based or home hemodialysis or with home peritoneal dialysis. Most patients can continue to drive safely after adjusting to a stable dialysis regimen.

Patients on dialysis often develop concurrent medical problems or general debility that can lead to a temporary or permanent inability to drive safely. The attending physician should counsel the patient appropriately if any problems arise that could make driving hazardous, including a potentially short-term but serious change in health status, such as a systemic infection, significant electrolyte abnormality, ischemic coronary event or symptoms such as weakness or hypotension that occur while adjusting to a new dialysis regimen.

20.2 Dialysis

Patients with end-stage renal disease maintained on hemodialysis or peritoneal dialysis can drive any class of motor vehicle, provided they possess adequate cognitive and sensorimotor ability.

Drivers considering trips must take into account their access to dialysis treatments and supplies.

All commercial drivers must be under the supervision of a nephrologist or an internist and have an annual medical review. Commercial drivers must be able to receive appropriate dialysis therapy while performing their work. For patients undergoing peritoneal dialysis, adequate supplies and an appropriate physical environment for exchanges must always be available. Hemodialysis is generally not a feasible treatment modality for a long-distance driver. If a commercial driver is planning to travel significant distances from home, unexpected delays due to weather, highway conditions or demands of their work must be considered to ensure that dialysis treatments are not missed.

20.2.1 Hemodialysis

Patients undergoing facility-based hemodialysis may have multiple cardiovascular and diabetic comorbidities. In assessing their fitness to drive, physicians should evaluate these patients individually for the presence of relevant comorbidities, medications and adverse symptoms associated with their treatments.

Few studies provide clinicians with validated tools to identify dialysis patients who may not be fit to drive. A study of 186 patients receiving dialysis in the United States (87% hemodialysis, 12% peritoneal dialysis) revealed that 40% of surveyed patients were “not comfortable driving” (Vats and Duffy, 2010). However, 42% of this group still drove, with 48% reporting accidents. Approximately three-quarters of patients who admitted to feeling uncomfortable driving reported 1 or more symptoms of weakness, dizziness or difficulty with coordination after a hemodialysis session.

Varela et al. (2015) analyzed the accuracy of an instrument developed by the American Automobile Association and the American Medical Association to assess the safety of geriatric drivers, as applied specifically to 106 dialysis patients (72% hemodialysis, 34% peritoneal dialysis). The “Am I a Safe Driver?” checklist asks patients to answer 24 specific questions (1 was omitted). The authors concluded that answering “YES” to 2 or more questions on the checklist was potentially useful for identifying patients at high risk for driving impairment (84% sensitivity, 58% specificity) but required confirmation by other methods, as nearly half of “screen-positive” patients may still be considered safe to drive.

These studies suggest that (1) a substantial proportion of patients receiving dialysis (especially hemodialysis) may have episodes when they are not fit to drive, especially after dialysis sessions; and (2) the “Am I a Safe Driver?” checklist may be useful for identifying patients who require further evaluation. However, data are insufficient to mandate regular screening of dialysis patients with this instrument or available alternatives.

Dialysis staff may consider asking patients how they plan to return home in the event of a highly symptomatic hemodialysis session and discussing alternative arrangements for patients who had planned to drive but do not appear well enough.

Hemodialysis patients should not drive more than 1 or 2 days from their home without making arrangements for dialysis at another centre. If a longer road trip is planned, such patients should consult with their local dialysis unit, which will have access to lists of dialysis centres in Canada and the United States that will accept travelling patients. The patient's overall health and stability on dialysis should be evaluated by his or her attending nephrologist before making travel plans.

20.2.2 Peritoneal dialysis

Similar fitness-to-drive issues apply to peritoneal dialysis and hemodialysis patients. However, peritoneal dialysis is associated with slower, more continuous fluid removal, and thus symptoms relating to intravascular fluid shifts and hemodynamics are less of a problem than with hemodialysis.

20.3 Renal transplant

Drivers who have had a successful renal transplant and who have fully recovered from surgery can drive a motor vehicle.

Musculoskeletal disabilities

Alert

- A patient with any permanent musculoskeletal disability should be advised not to drive until his or her ability to drive safely has been evaluated. Some adaptations may then be mandatory. It is also recommended to advise the motor vehicle licensing authority of any inability to drive.
- A patient with any temporary musculoskeletal disability that interferes with safe driving should be advised not to drive until the medical condition is evaluated and has been treated or has resolved.

21.1 Overview

Musculoskeletal injury or disability can often have an impact on a patient's driving ability. In assessing a patient, it is important to establish from the start whether the patient drives a vehicle with manual or automatic transmission and whether the injury or disability is temporary or permanent.

All jurisdictions have established procedures to evaluate drivers whose medical condition is incompatible with medical standards, but who claim to be able to compensate and drive safely despite their condition. In addition to adapting one's driving technique (e.g., by lowering speed or keeping a greater distance between vehicles), there are many ways to adapt a vehicle for various types of physical disability. A driver in this situation, who is able to demonstrate that his or her driving remains safe, may be granted an exemption by the licensing authority. Periodic checks may be required by the licensing authority to validate the driver's maintenance of the ability to drive safely. A change in the driver's medical condition may necessitate a new evaluation.

21.2 Assessment

Musculoskeletal conditions differ in etiology and the severity of physical impairment. However, all can have an impact on physical function, which may in turn have a negative impact on driving.

Safe driving requires both hands to be firmly on the steering wheel, except as required to operate other controls, and the ability to solidly grip the manual gear shift, when and where applicable. It also requires the ability to use the lower right leg to operate the accelerator pedal appropriately and to operate the brake pedal with sufficient speed and force to brake in an emergency, and the lower left leg to the same degree to operate the clutch, in the case of a vehicle with manual transmission.

Few studies have investigated the relation between specific musculoskeletal conditions and the risk of motor vehicle crashes or their impact on driving ability. Most of these

studies have concentrated on the lower leg in simulated driving situations. Slower brake reaction times appear to be the possible barrier to safe driving.

If there is any question that a physical impairment might affect the driver's ability to perform the required movements swiftly, accurately and repeatedly without undue pain, especially if the person plans to drive a passenger-carrying or commercial transport vehicle, the musculoskeletal system must be thoroughly and carefully assessed.

21.2.1 Injury to or immobilization of a limb

Immobilization refers to placement of any rigid material (e.g., plaster, rigid brace, external fixation) that blocks the movement of a given joint. Physicians should be aware that any immobilization (even temporary) may affect a patient's ability to drive. Any immobilization of a lower limb will have an obvious effect on the driver's operation of the pedals, especially in a vehicle with manual transmission. Similarly, upper-limb immobilization can detract from the operation of the hand controls, especially the steering wheel. Some provinces have enacted regulations stipulating that any immobilization of a limb is inherently incompatible with safe driving. The physician is therefore advised to be aware of the relevant regulations in his or her province and to take these regulations into consideration when making a decision about a patient's fitness to drive.

Experimental studies have shown the following effects of immobilization:

- Brachial/antebrachial immobilization is incompatible with safe driving (Kalamaras et al., 2006).
- Although brachial immobilization may interfere with the ability to firmly grip the steering wheel, an occupational therapy assessment may show that the person is able to drive safely (Kalamaras et al., 2006).
- Immobilization of a finger does not preclude safe driving (Kalamaras et al., 2006).
- Cruropedal (thigh–leg) immobilization is incompatible with safe driving (Orr et al., 2010).
- Although some simulated driving studies appear to have shown no significant differences in brake reaction times (Tremblay et al., 2009), anyone whose right leg is immobilized below the knee should refrain from driving (Waton et al., 2011), particularly if weight bearing is prohibited.
- Immobilization of all or part of the left leg precludes driving a vehicle with manual transmission.

After removal of an immobilization device from a lower limb, resumption of driving may be delayed for some weeks if there is pain, incomplete weight-bearing ability or residual stiffness (Egol et al., 2008).

Immobilization of any limb or joint is incompatible with driving a motorcycle or scooter.

21.2.2 Loss of limbs, deformities and prostheses

Amputation and deformities of the upper limb: Although no serious study has been done on the subject, it appears at first glance that there are acceptable modifications for all types of amputations and deformities of the upper limb (Veteran Health Initiative: Traumatic Amputations and Prosthetics, 2002). In addition, in most people who have had an upper-limb amputation, the impairment affects 1 or several fingers, not the entire limb, so they will not necessarily need such adaptive devices ([NHTSA Driver Fitness Medical Guidelines](#), p. 15).

An individual assessment is advised. Any person with upper-limb amputation whose ability to drive safely may be questioned should be directed to an accredited agency to assess his or her driving ability. It is up to each person to demonstrate his or her ability to drive, according to the type of impairment and various adaptive devices available.

Because of these various adaptive devices, a rehabilitation period is also advised before resuming highway driving.

Amputation and deformities of the lower limb: According to various studies, 45%–87% of people with lower-limb amputations resume driving afterward (Boulias et al., 2006; Meikle et al., 2006; Engkasan et al., 2012). Factors that support resumption of driving are age 55 or less, male sex and frequency of driving before the event. The importance of addressing the concerns of family and friends about the patient resuming driving has also been demonstrated (Engkasan et al., 2012).

Most cases of lower-limb amputation involve one or more toes and generally do not preclude driving ([NHTSA Driver Fitness Medical Guidelines](#), p. 15). People with below-the-knee amputation of one or both legs are usually able to drive any class of motor vehicle safely, provided they have full strength and movement in their back, hips and knee joints and a properly fitted prosthesis or prostheses. No modification is needed in the case of a left-side amputation if the person drives a vehicle with automatic transmission.

As with amputations or deformities of an upper limb, individual assessment is advised. Any person with lower-limb amputation whose ability to drive safely may be questioned should be directed to an accredited agency to assess his or her driving ability. It is up to each person to demonstrate his or her ability to drive, according to the type of impairment and various adaptive devices available.

Two-foot driving (i.e., operating the accelerator pedal with the prosthesis and the brake pedal with the left foot) is not recommended ([NHTSA Driver Fitness Medical Guidelines](#), p. 15; Meikle et al., 2006).

21.2.3 Arthritis, other musculoskeletal pain and ankylosis

Degenerative or inflammatory arthritis can result in pain, as well as loss of muscle strength, range of motion and function of the involved joints (NHTSA Driver Fitness Medical Guidelines, p. 18; Charlton et al., 2010). People with arthritis may have difficulty turning their heads to perform safety checks because of pain and stiffness of the cervical and thoracolumbar spine. Inflammatory arthritis can result in persistent pain and reduced range of movement in multiple joints, including knees, ankles, hips, shoulders, elbows, wrists and joints of the hands.

A patient should be restricted from driving if pain adversely affects his or her ability to drive safely or if he or she lacks range of movement or strength to execute the coordinated activities required. However, most difficulties of this type can be overcome by simple modifications to the vehicle or adjustment of driving technique. If there are concerns, the individual should be required to demonstrate his or her ability to a driver examiner.

Patients with painful conditions who are taking strong medicine for pain relief may also fail to drive safely (see Section 6.3.3).

21.2.4 Injury to or immobilization of the spine

Cervical: Some degree of loss of movement of the head and neck may be permitted, but the driver should then be restricted to driving vehicles equipped with panoramic mirrors, which may alleviate the need to do shoulder checks. Although no study has shown a link between wearing a neck brace and the risk of a crash, people wearing a brace, cervical collar or halo vest should refrain from driving. The same restriction applies to anyone with severe neck pain or very limited range of motion (see also section 21.2.3). This restriction should remain in place until the pain is no longer debilitating or until the limitation of movement has been mitigated by adaptive devices. Experimental studies will eventually help determine whether, once a person has gone beyond a certain degree of loss of cervical mobility, adaptive mirrors can provide better visibility and safer driving.

Thoracic: People with a marked deformity or painful restriction of motion in the thoracic vertebrae are not able to drive large commercial transport or passenger-carrying vehicles safely. Their ability to drive private vehicles can best be determined by a driver examiner. Patients wearing braces or body casts must be evaluated on the basis of their ability to move without pain, to operate the controls and to observe approaching vehicles.

Lumbar: Applicants for a licence to drive a passenger-carrying or heavy commercial vehicle should be free of lumbar pain that limits movement, attention or judgment. Less stringent standards may be applied to private-vehicle drivers. However, this group may need to be restricted to driving vehicles with power-assisted brakes.

Paraplegia and quadriplegia: On the basis of a favourable recommendation from a medical specialist in physical medicine and rehabilitation, patients with new paraplegia or quadriplegia may obtain a learner's permit. With the permit, these patients may then take driving lessons in an adapted vehicle fitted with specially modified controls. Furthermore, people with lumbar radiculopathy have slower reaction times compared with a control group. This was especially true after a selective nerve block (Al-khayer et al., 2008).

21.2.5 Post-orthopedic surgery

To date, all experimental studies involving patients who have undergone orthopedic surgery have been conducted on driving simulators and therefore have tested only for emergency braking reaction times. Consequently, little attention has been paid to other possible related factors, such as pain, limited mobility, reduced strength, and the effects of analgesics, age and comorbidities.

As for many other conditions, it must be underscored that the driver is responsible for driving safely. The following paragraphs list timelines for safely resuming driving after orthopedic surgery, as reported by some studies. These timelines are provided for information only. Patients should seek the advice of their physicians about other related factors that could interfere with safe driving.

Arthroplasties: Current literature covers only some aspects of hip and knee replacements. At the time of writing, no articles could be found mentioning driving a car after arthroplasty of the shoulder, elbow, wrist, fingers, ankle or toes.

According to experimental studies, the following timelines have been reported for safe resumption of driving, in the absence of other limiting factors such as pain, limited mobility, reduced strength, the effects of analgesics, age and comorbidities:

- for right hip arthroplasty, 6 weeks (Ganz et al., 2003) to 8 weeks (MacDonald et al., 1988; Abbas et al., 2011)
- for left hip arthroplasty, 2 weeks (Ganz et al., 2003), longer if the person is driving a small car, in which the knees will be higher than the hips.

Although 81% (105/130) of the participants in 1 study (Abbas et al., 2011) were able to resume driving between 6 and 8 weeks, and an additional 17% (22) were able to resume driving in 12 weeks, 2% (3) still lacked the confidence to drive at 12 weeks or more.

- for right knee arthroplasty, 2 weeks (Liebensteiner et al., 2010); 4 weeks (Marques et al., 2008; Dalury et al., 2011), 6 weeks (Pierson et al., 2003) or 8 weeks (Spalding et al., 1994)
- for left knee arthroplasty, 10 days (for vehicles with automatic transmission) (Marques et al., 2008); 2 weeks (Liebensteiner et al., 2010); 4 weeks (Dalury et al., 2011); or 6 weeks (Spalding et al., 1994; Pierson et al., 2003).

Given this high variability, a clinical assessment is essential before safe driving can be resumed. In particular, the physician must confirm that, in an emergency, the driver will be able to apply the brakes without pain.

Anterior cruciate ligament (ACL): Six weeks after reconstructive surgery of the right ACL, patients' brake reaction times were comparable to those of matched controls (Gotlin et al., 2000; Nguyen et al., 2000). As with hip arthroplasty, patients may drive 2 weeks after reconstructive surgery of the left knee if they have no problem with the clutch, in the case of manual transmission.

Right knee arthroscopy: Although a recent survey showed that patients resumed driving between day 1 and week 3 after knee arthroscopy (Lewis et al., 2011), experimental studies of emergency brake reaction times (Hau et al., 2000) have shown that safe driving is not possible any earlier than the start of week 2.

Fixation of displaced ankle fracture: In patients who underwent fixation of a displaced right ankle fracture, normal braking function returned after 9 weeks (Egol et al., 2003).

First metatarsal osteotomy (hallux valgus): At week 6 following osteotomy of the first metatarsus to correct hallux valgus, emergency brake reaction times were comparable to those of a healthy population (Holt et al., 2008).

Spinal surgery: Although it has been reported that patients who underwent lumbar fusion surgery were able to drive upon discharge from hospital (Liebensteiner et al., 2010), data are too limited to make that recommendation.

In all the above situations, even after the prescribed timeline has elapsed, other limiting factors, such as pain, consumption of analgesics, absence of full weight-bearing capacity, failure to comply with post-operative instructions or comorbidities, may still impede safe driving. Therefore, evaluation of these factors and discussion with the patient's surgeon are recommended before advising the patient that it is safe to resume driving.

Miscellaneous conditions that may affect fitness to drive

**Alert**

Fitness to drive of any patient must be assessed on an individual basis.

22.1 Overview

There are a number of medical conditions that may influence driver fitness that have not been discussed in detail in previous sections of this guide. This section lists some of these conditions meriting special attention.

22.2 Obesity

Although most patients with obesity will be able to continue driving, morbid obesity may be incompatible with driving certain vehicles. For example, a professional truck or bus driver must perform certain tasks associated with the vehicle's security that may involve clambering on or under the vehicle, tasks that a person with morbid obesity will be unable to accomplish.

Many patients with obesity report that they are unable to wear seat belts; however, most vehicles can accommodate seat belt extensions. For patients with severe obesity, it may be necessary to consider deactivating the airbags to avoid inadvertently deploying the airbag and thereby causing injury.

22.3 Delirium

Delirium, a rapid-onset change in cognition, may be associated with many of the conditions reviewed elsewhere in this guide. Delirium can present with obvious symptoms, such as hallucinations, and altered level of consciousness, often of fluctuating degree. Delirium can also present with more subtle subsyndromal symptoms, such as poor concentration and slow mentation. As patients recover from the obvious symptoms of delirium, they may temporarily experience a phase of more subtle symptoms that may still be pertinent to their ability to resume driving. The hypoactive subtype of delirium is commoner than the hyperactive type and is often overlooked.

For more information on the criteria on delirium see the article by David K. Conn and Susan Lieff. [Diagnosing and managing delirium in the elderly](#). Canadian Family Physician, January 2001. Available: www.ncbi.nlm.nih.gov/pmc/articles/PMC2014716/

To screen for delirium, some clinicians employ the [Confusion Assessment Method](#) <https://consultgeri.org/try-this/general-assessment/issue-13.pdf>.

For patients who have experienced an episode of in-hospital delirium, the treating physician should determine whether there are residual signs of cognitive impairment or specific signs of delirium at the time of discharge. If such signs exist, the physician should ask the patient not to drive until he or she has been re-evaluated by the family physician after a length of time judged by the discharging physician as adequate for recovery. It is important to communicate concerns about impairment and any relevant findings to the physician who will perform the follow-up assessment.

If the delirium is detected by the family physician, the patient should be advised not to drive until he or she has been seen in a follow-up appointment to determine if there has been a response to treatment of the condition that triggered the delirium.

If the physician is uncertain regarding whether it is safe for the patient to resume driving, it is recommended that the physician extend the period during which the patient should not drive and then arrange to see the patient in follow-up. If follow-up evaluations do not demonstrate complete recovery, and concerns remain regarding fitness to drive, then referral to a driving assessment centre is appropriate. If the physician is concerned that the delirium has unmasked dementia or a mental health problem, then treatment and/or referral to the appropriate specialists is reasonable.

Please refer to the bibliography (Appendix A) for links to practical screening and assessment tools.

22.4 General debility

“General debility” describes a decline in the capacity to lead a normal life, caused by the person’s state of health. It is defined as the sequelae of multiple medical conditions and syndromes that produce the specific and general symptoms of pain, fatigue, cachexia and physical disability, as well as cognitive symptoms of attention, concentration, memory and developmental and/or learning deficits. An exhaustive list of the conditions causing general debility, both common and rare, exceeds the scope of this guide, but examples include eating disorders, hepatic encephalopathy, rheumatoid arthritis and chronic fatigue syndrome. Medications used to combat the actual disease process, as well as its signs and symptoms, may also produce effects that contribute to the state of general debility (see section 6, Drugs). With the expansion of medical knowledge and of medication therapies, this category becomes wider and its relevance to the issue of safety in driving becomes more important.

22.5 Common conditions may merit special consideration

Driving is such an integral part of daily living in Canada that it is easy to forget that many patients, no matter how old they are, contract medical conditions that can influence their driving fitness and continue to go about their daily activities to the best of their abilities. In fact, many look upon being able to continue their lives as normally as possible to be a challenge. Even the most common conditions may affect their performance behind the wheel.

Consequently, it is important for physicians and allied health care professionals to include counselling on driving in their routine advice to such patients. This is especially true for chronic conditions such as diabetes mellitus, where continuing to live a relatively normal life is possible, if reasonable precautions are observed. Unfortunately, unless patients are counselled on how to compensate for their condition, they may engage in behaviour that is incompatible with safe driving.

More generally, physicians are reminded that an evaluation of fitness to drive (in accordance with the principles discussed in section 2, Functional assessment — emerging emphasis) is essential for any patient, regardless of age, who is manifesting difficulty in maintaining activities that were part of the daily routine before the medical condition arose. In this context, the physician should consider not only the standard activities of daily living but also additional activities that the patient previously enjoyed and has abandoned because of the medical condition, such as model making, reading, embroidery and knitting.

Anesthesia and surgery

**Alert**

Any advice to the patient with respect to driving should be noted in the medical record.

23.1 Overview

Both anesthesia and surgery can have a significant, although temporary, effect on driving ability.

23.2 Outpatient surgery

Patients having outpatient surgery under general anesthesia should not drive for at least 24 hours. The pain and discomfort following even minor surgical procedures may extend this prohibition period to several days.

23.3 Procedures

Any outpatient surgical or diagnostic procedure may render patients temporarily unfit to drive. Instructions to patients should include the necessity to provide a means to return home and the advisability of avoiding driving until all the effects of the procedure have resolved. Patients who do not have a means to return home should not undergo the planned procedure until arrangements have been made.

23.4 Major surgery

After major surgery, it is necessary to evaluate recovery individually. Any lingering or permanent effects of anesthesia should be subject to functional evaluation.

23.5 Conscious sedation

Anyone undergoing conscious sedation should be counselled to avoid driving for 24 hours.

Seat belts and airbags

Alert

There are no medical circumstances that justify exemption from wearing a seat belt.

24.1 Overview

All provinces and territories have legislation that requires every occupant of a vehicle to wear a seat belt. All children (including infants) must be secured in appropriate child seats.

Airbags are safety devices that supplement the protection provided by seat belts. They are installed in the steering wheel and front passenger console of most newer-model cars, although there are still vehicles without them. If airbags are present in a vehicle, infants and children age 12 and under should sit only in the back seat of the vehicle. In cars without airbags, the back seat is still safest in the event of a crash, as it is likely to be furthest from the point of impact.

A consumer can choose to have the airbag(s) in a vehicle deactivated if the consumer, or a user of the vehicle, is in one of the circumstances listed in section 24.3. Physician documentation of the circumstance is not required. The applicant must indicate on the form that he or she has read the airbag deactivation brochure and understands the benefits and risks of deactivating the airbag. An application form for deactivation of airbag(s) is available from Transport Canada (see “How to obtain a ‘[Declaration of Requirement for Air Bag Deactivation](http://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/13-0140_BO_PD)’ Form” at http://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/13-0140_BO_PD).

24.2 Seat belts

Some provincial legislation allows for medical exemptions from using a seat belt. However, there are no medical circumstances that justify exemption from wearing a seat belt.

Drivers who are uncomfortable wearing a seat belt should be encouraged to use devices such as belt extenders, adjustable seats, adjustable seat belts and padding to make the seat belt more comfortable.

Correct positioning of the seat belts, techniques such as the “pregnant woman technique” and coaching by occupational therapists and other interveners may facilitate the wearing of seat belts. Medical and paramedical personnel should consider seat belt pressure points when implanting invasive medical devices (e.g., medication pumps, cardiac pacemakers, vagal nerve stimulators and intravenous entries).

24.3 Airbags

The one fact that is common to those seriously injured as a result of airbag deployment is not their height, weight, sex or age. It is the fact that they were too close to the airbag when it started to deploy. Infants and children age 12 years and under are vulnerable to serious injury by an airbag. Hence, children should be placed in the back seat.

Deactivating the airbag(s) may be reasonable in the following circumstances:

Drivers:

- A safe sitting distance (25 cm between sternum and the steering wheel) or position cannot be maintained because of scoliosis, achondroplasia, short legs or an unusual medical condition because of which the physician has informed the person that airbags pose a special risk.

Passengers:

- A safe sitting distance (25 cm between sternum and console) or position cannot be maintained because of scoliosis, Down syndrome with atlantoaxial instability or an unusual medical condition, because of which the physician has informed the person that airbags pose a special risk.
- The passenger is an infant or child with a medical condition that requires him or her to ride in the front seat for monitoring.
- The passenger is an infant or child and the vehicle does not have back seats.

24.4 Literature

The literature on the use of seat belts and airbags is vast. Research establishing the beneficial effects of seat belts was conducted mainly over the period 1970–1985. Airbag research is more recent but has followed the same progression. The benefits of restraint systems for vehicle occupants is now taken for granted, and current research is oriented toward improving the restraints and persuading non-users to buckle up (“click it or ticket” initiatives). For further information, contact: Road and Motor Vehicle Safety, Transport Canada. www.tc.gc.ca/roadsafety

Motorcycles and off-road vehicles

**Alert**

Alcohol intoxication is the cause of most crashes involving off-road vehicles.

25.1 Overview

Operating a motorcycle (Class 6) or an off-road vehicle, including a snowmobile, demands a higher level of physical fitness and different driving skills than driving a private passenger vehicle.

As long as off-road vehicles are not driven on provincial roads, they do not need licence plates, and their use is not subject to any regulation.

Nevertheless, drivers of motorcycles and off-road vehicles should be advised to wear protective helmets at all times. There are no valid medical reasons for a driver or a passenger not to wear a helmet. A person who is incapable of wearing a helmet should be encouraged to find another mode of transportation.

25.2 General

Motorcycle operators should be expected to meet the medical standards for private vehicle (Class 5) drivers in every respect. Medical disabilities that might be safely overlooked for a private vehicle driver may be incompatible with the safe operation of a motorcycle.

Driving a motorcycle requires the full use of all 4 limbs and good balance. A motorcycle driver must be able to maintain a strong grip with both hands, as this is required for the use of handlebar controls. A driver must keep both hands on the handlebars.

25.3 Specific

- Angina: Exposure to cold and cold winds can trigger an angina attack in susceptible patients.
- Asthma: Exposure to cold and cold winds may trigger “cold” anaphylaxis and bronchoconstriction.
- Carotid sinus sensitivity: This condition is dangerous because the tight restraining straps on most protective headgear may place pressure on the carotid sinus.
- Cervical spine: Motorcycle drivers with a history of cervical spine injuries or instability should be assessed for the ability to maintain a safe riding posture without neurologic compromise.
- Permanent tracheostomy: Drivers with a permanent tracheostomy should have some form of protection from the effects of the air stream.

Aviation*

Alert

Physicians are required by law to report to regional aviation medical officers of Transport Canada any pilots, air traffic controllers or flight engineers with a medical condition that could affect flight safety. Common conditions requiring mandatory reporting are listed in this section.

26.1 Overview

For the purpose of this guide, all references to “pilots” will apply equally to air traffic controllers and flight engineers, unless otherwise stated. As well, “pilots” includes airline transport pilots, commercial pilots, private pilots, student pilots, recreational pilots, etc. The types of aircraft they may fly include fixed-wing planes (jet and propeller-driven), helicopters, balloons, gliders, ultra-lights and gyroplanes.

Pilots are all holders of Canadian aviation documents that impose standards of medical fitness. Regulation of pilots is under federal legislation (not provincial, as is the case for motor vehicle drivers).

Periodic examinations of pilots are performed by physicians (civil aviation medical examiners) appointed by the minister of transport. Episodic care of pilots is often by community physicians.

Before being examined, all pilots must inform the physician that they hold an aviation licence or permit. When pilots are informed that they have a condition (or are prescribed treatment) that might make it unsafe for them to perform their duties, they must “ground” themselves temporarily.

A physician diagnosing a condition that might affect flight safety must report the condition to the medical advisors of Transport Canada.

26.2 Aeronautics Act

Section 6.5 of the Aeronautics Act describes the responsibilities of physicians with regard to pilots as follows:

1. Where a physician or an optometrist believes on reasonable grounds that a patient is a flight crew member, an air traffic controller or other holder of a Canadian aviation document that imposes standards of medical or optometric fitness, the physician or optometrist shall, if in his or her opinion the patient has a medical or optometric condition that is likely to constitute a hazard to aviation

**Prepared by Transport Canada*

safety, inform a medical adviser designated by the Minister forthwith of that opinion and the reasons therefor.

2. The holder of a Canadian aviation document that imposes standards of medical or optometric fitness shall, prior to any medical or optometric examination of his/her person by a physician or optometrist, advise the physician or optometrist that he/she is the holder of such a document.
3. The Minister may make such use of any information provided pursuant to subsection (1) as he considers necessary in the interests of aviation safety.
4. No legal, disciplinary or other proceedings lie against a physician or optometrist for anything done by him in good faith in compliance with this section.
5. Notwithstanding subsection (3), information provided pursuant to subsection (1) is privileged and no person shall be required to disclose it or give evidence relating to it in any legal, disciplinary or other proceedings and the information so provided shall not be used in any such proceedings.
6. The holder of a Canadian aviation document that imposes standards of medical or optometric fitness shall be deemed, for the purposes of this section, to have consented to the giving of information to a medical adviser designated by the Minister under subsection (1) in the circumstances referred to in that subsection.

The relevant section of the Aeronautics Act (R.S.C., 1985, c. A-2) is “[Medical and Optometric Information](http://www.laws-lois.justice.gc.ca/eng/acts/A-2/page-20.html#h-25),” available online at: www.laws-lois.justice.gc.ca/eng/acts/A-2/page-20.html#h-25

26.3 Reporting

If uncertain whether a condition might affect flight safety, the physician can discuss the case with a regional aviation medical officer (RAMO), as listed in section 26.20. At this stage, the physician need not identify the pilot.

If certain that a condition might affect flight safety, the physician must

- Advise the pilot.
- Report by phone to a RAMO at a civil aviation medicine regional office (see section 26.20). The report will be confidential, physician-to-physician and privileged.
- Confirm information in writing (by facsimile). This report is confidential and privileged.

Once a report under section 6.5 of the Aeronautics Act has been made, it is the RAMO’s responsibility to take further action. Although Transport Canada may use the reported information as necessary to ensure aviation safety, the report itself cannot be used as evidence in any legal, disciplinary or other proceedings.

Physicians may wish to contact the CMPA for advice should they have questions about their reporting obligation.

26.4 Medical conditions

This section is not intended to replace a textbook on aviation medicine. It is simply to alert community physicians to aspects of medical fitness that are of unique importance to aircrew and lists common reportable conditions.

Any condition or treatment that, in the treating physician's opinion, may interfere with flight safety, but is not found in this listing, should still be reported. If uncertain, the treating physician can contact his or her RAMO for guidance (see section 26.3, Reporting).

Further information on specific medical conditions may be obtained from the [Civil Aviation Medicine branch of Transport Canada \(www.tc.gc.ca/CivilAviation/Cam/\)](http://www.tc.gc.ca/CivilAviation/Cam/).

26.5 General conditions

26.5.1 Hypoxia

Any condition that leads to a decrease in the supply of oxygen, its carriage in the blood or delivery to the tissues may worsen with increased altitude. Although individual tolerance varies, smoking, lung conditions, cardiac disease, anemia, alcohol and some drugs can increase the effects of hypoxia.

26.5.2 Gas expansion

Expansion of gas trapped in body cavities, such as the sinuses, the middle ear or the bowel, can be extremely uncomfortable and distracting. At high altitude, a small pneumothorax may be disabling.

26.5.3 Decompression illness

The recent use of compressed air in scuba diving can give rise to symptoms of decompression sickness even at the cabin altitudes common to pressurized aircraft.

26.5.4 Tolerance to increased acceleration

Pilots may be exposed to brief episodes of increased acceleration while in turbulence or during rapid manoeuvres to recover from unusual flight conditions. There is considerable individual variation in tolerance, but poor physical conditioning, illness, low blood pressure or the effects of medication may all lower the threshold for momentary loss of vision or loss of consciousness with increased acceleration stress.

26.5.5 Spatial disorientation

In flight, spatial orientation is maintained mainly by vision and vestibular balance organs. Any medical condition affecting balance organs or vision may induce or exaggerate dangerous spatial disorientation.

26.6 Vision

Conditions where visual impairment is temporary or vision is temporarily affected by the use of medications need not be reported. Pilots should be warned not to fly until normal vision has returned.

Reporting the following conditions is mandatory:

- diplopia
- monocularity
- visual fields — including partial loss of a visual field or significant scotomata
- eye injuries or retinal detachment
- cataract surgery
- surgical correction of myopia following radial keratotomy, photorefractive keratectomy, laser-assisted in-situ keratomileusis or other refractive eye surgery.

26.7 Ear, nose and throat

Significant deterioration in hearing must be reported. For the pilot, a normally functioning vestibular system is of the utmost importance, and any condition affecting balance or spatial orientation must be reported.

Reporting the following conditions is mandatory:

- hearing — sudden loss of hearing or conditions significantly affecting hearing
- middle-ear conditions — damage to the tympanic membranes or the eustachian tubes
- inner-ear conditions — any condition affecting or impinging on the inner ear or the vestibular (balance) organs
- stapedectomy and other ear surgery
- surgery affecting the nasal passages, sinuses or eustachian tubes
- conditions leading to voice distortion or inaudibility.

26.8 Cardiovascular conditions

The appearance of cardiovascular signs or symptoms is of great concern and must be discussed with the RAMO.

Detailed information on the assessment of particular cardiovascular conditions is available in the [Handbook for Civil Aviation Medical Examiners — Cardiovascular](https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#cardiovascular) (available online at <https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#cardiovascular>).

Reporting the following conditions is mandatory:

- cardiac inflammation and infection
- acute ischemic syndromes

- angina pectoris — chest pain typical or atypical of angina pectoris
- myocardial infarction
- revascularization surgery or angioplasty (including stent insertion)
- cardiomyopathy
- cardiac transplantation.

26.8.1 Blood pressure

Medications with side effects of postural hypotension, arrhythmias or effects on the central nervous system are unacceptable.

Reporting the following conditions is mandatory:

- initial treatment of hypertension with medication
- symptomatic hypotension.

26.8.2 Valvular heart disease

Reporting the following conditions is mandatory:

- presence of significant heart disease
- development of new heart murmurs
- requirement for treatment
- repair or replacement of heart valves with prosthetic appliances.

In view of the risk of thromboembolism, associated cardiac dysfunction, valve failure and bleeding secondary to anticoagulation, prosthetic valvular replacement candidates must be assessed individually by Civil Aviation Medicine.

26.8.3 Congenital heart disease (CHD)

Reporting the following conditions is mandatory:

- new diagnosis of CHD
- development of symptoms in a pilot with known CHD.

26.8.4 Cardiac arrhythmia

Even benign arrhythmias can cause distraction, which, during critical phases of flight, may cause an incident or accident. A physician evaluating any pilot with an arrhythmia should bear the following points in mind: How disabled is the pilot when the arrhythmia occurs? Is structural heart disease present? Serious consideration should be given to reporting any arrhythmia.

Reporting the following conditions is mandatory:

- premature atrial or ventricular contraction — when these are symptomatic or require medication for control
- paroxysmal tachyarrhythmias — all tachyarrhythmias, even if they appear to be asymptomatic
- atrial fibrillation and flutter — at their onset and when any change in treatment is required

- sinus node dysfunction or sick sinus syndrome — symptomatic bradycardia or sinus node dysfunction
- heart block and bundle branch blocks — second- or third-degree heart block or the development of a new right or left bundle branch block
- pacemakers — pilots requiring a pacemaker or automatic implantable defibrillation devices.

26.9 Cerebrovascular disorders

Pilots who show any evidence of memory loss, poor concentration or diminished alertness must be reported.

Reporting of the following is mandatory:

- transient ischemic attacks or cerebral artery stenosis that has led to confusion, disturbance of vision, attacks of vertigo or loss of consciousness
- stroke — completed stroke or any other cerebrovascular accident
- carotid endarterectomy
- asymptomatic carotid bruits — where investigation indicates significant carotid obstruction (more than 50%).

26.10 Other vascular disorders

Superficial thrombophlebitis without complications need not be reported.

Reporting of the following is mandatory:

- aortic aneurysms
- symptomatic or enlarging thoracic aneurysm or abdominal aneurysm 5 cm in diameter or greater
- recent surgical repair of an aneurysm
- deep venous thrombosis.

26.11 Nervous system

Disorders of the central nervous system can be a potent source of occult incapacitation. Lapses of consciousness or memory in the aviation environment can be fatal.

Detailed information on assessment of particular neurological conditions is available in the [Handbook for Civil Aviation Medical Examiners — Neurology](https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#neurology) (available online at <https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#neurology>).

Reporting of the following is mandatory:

- syncope — unexplained loss of consciousness, whatever the cause
- seizure disorders

- head injuries — any significant head injury, particularly if it is associated with unconsciousness or post-traumatic amnesia
- sleep disorders of any type
- vestibular disorders — spatial disorientation is a significant cause of aviation accidents and is a contributing cause in 30% of fatal accidents; any condition that interferes even temporarily with balance or coordination must be reported
- headache — migraine with aura; may include visual loss, cognitive impairment and other neurological deficits; any type of severe or prolonged headache requiring medications that may produce unacceptable side effects
- disorders of coordination and muscular control — any condition affecting coordination and muscular control.

26.12 Respiratory diseases

Gradual deterioration of the respiratory system over years may not be obvious, particularly if the pilot does not complain or is using bronchodilator medications. Physicians treating pilots must remain alert to the risk of hypoxia and trapped gas expansion (e.g., pneumothorax) when deciding on treatment.

Reporting of the following is mandatory:

- chronic obstructive pulmonary disease — significant decreases in pulmonary function, decreased arterial oxygen saturation, increasing hypercapnia or recurrent infections
- asthma — increasing requirement for inhaled bronchodilators or steroids; use of medications containing aminophylline; detailed information is available in the [Handbook for Civil Aviation Medical Examiners — Asthma](http://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-asthma-menu-2332.htm) (available online at www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-asthma-menu-2332.htm)
- pneumothorax — spontaneous pneumothorax, pleural blebs, lung cysts or other conditions that may lead to problems with trapped gas expansion (this may be of less significance in air traffic controllers)
- pulmonary embolism
- sarcoidosis.

26.13 Endocrine and metabolic disorders

Detailed information on particular diabetic conditions is available in the [Handbook for Civil Aviation Medical Examiners — Diabetes](http://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-diabetes-menu-2155.htm) (available online at www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-diabetes-menu-2155.htm).

Reporting of the following is mandatory:

- diabetes mellitus
 - type 1 diabetes — when first diagnosed; pilots and air traffic controllers with type 1 diabetes are considered on an individual basis

- type 2 diabetes — treated with oral or injected hypoglycemic drugs and/or insulin therapy; changes in type or dose of medication; hypoglycemic attacks requiring treatment
- thyroid and parathyroid disease — initial diagnosis of these conditions; once the condition is stable, only significant changes in treatment
- pituitary disease — initial diagnosis and investigation; any mass compromising the optic chiasm must be reported
- adrenal disease — initial diagnosis and investigation
- anabolic steroids.

26.14 Renal system

Reporting of the following is mandatory:

- renal colic or the discovery of kidney or bladder stones
- developing renal failure or undergoing renal dialysis
- requirement for renal transplantation; after successful transplantation, only significant changes in treatment.

26.15 Musculoskeletal system

Reporting of the following is mandatory:

- recent amputation of a limb or part of a limb
- arthritis — symptomatic patients whose mobility becomes restricted; those with side effects from required medications (e.g., non-steroidal anti-inflammatory drugs); those requiring second- or third-stage medications (e.g., gold, azathioprine).

26.16 Psychiatric disorders

In an occupation as potentially hazardous as flying, the level of tolerance for psychiatric disorders or disease is small. Even when symptoms are effectively treated, the side effects of psychoactive drugs, such as selective serotonin reuptake inhibitors (SSRIs), are usually unacceptable.

Pilots with emotional disorders may be reluctant to discuss their condition with a civil aviation medical examiner and will more likely seek advice and treatment from a community physician. Physicians are strongly urged to discuss such cases with the RAMO. Detailed information on particular psychiatric conditions is available in the [Handbook for Civil Aviation Medical Examiners — Psychiatry \(SSRIs\)](https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#psychiatry-ssris) (available online at <https://www.tc.gc.ca/eng/civilaviation/publications/tp13312-2-menu-2331.htm#psychiatry-ssris>).

Reporting of the following is mandatory:

- cognitive disorders — dementia, as soon as suspected or diagnosed

- psychosis —this includes bipolar affective disorder
- emotional disorders — these conditions may be temporary and stress induced; when they require drug therapy or may interfere with judgment, decision-making or reaction time, they must be reported.

26.17 Tumours

Reporting of the following is mandatory:

- any tumour that limits the ability of a pilot to perform safely
- tumours that may metastasize to the brain.

26.18 HIV infection and AIDS

Detailed information on HIV-seropositive conditions is available in the [Handbook for Civil Aviation Medical Examiners — Guidance for the Aviation Medical Certification of HIV Seropositive Persons](http://www.tc.gc.ca/eng/civilaviation/opssvs/cam-guide-1176.htm) (available online at www.tc.gc.ca/eng/civilaviation/opssvs/cam-guide-1176.htm).

Reporting of the following is mandatory:

- positive test for HIV
- diagnosis of AIDS.

26.19 Drugs

- Substance abuse: Pilots who abuse or are addicted to alcohol or other chemical substances must be reported.
- Alcohol: By law, no one may function as a crew member of an aircraft (or work as an air traffic controller) if he or she has consumed alcohol within the previous 8 hours. After heavy drinking, even this interval will be too short because alcohol can affect balance and orientation for up to 48 hours.
- Illicit drugs: Marijuana and other illicit drugs impair judgment and coordination; the effects may last for prolonged periods.
- Prescription drugs: Discuss in detail the side effects of any medication that is prescribed or recommended to pilots. For example, minor side effects on visual accommodation, muscular coordination, the gastrointestinal tract or tolerance to acceleration (increased gravity) may be more serious when they occur in flight. If in doubt, the physician should discuss the medication with the RAMO.
- Over-the-counter drugs: Generally, pilots are advised to avoid taking any medication within 12 hours (or, if longer-acting, within about 5 half-lives) before flight if pharmacologic effects may affect flying. Although there are exceptions to this rule, caution is advised.
- Anesthetics (general and local): There is no general rule about how long a pilot should be grounded after receiving a general anesthetic. It depends on the type of surgery,

premedication and the anesthetic agent. Physicians should be aware that the effect of some anesthetics may take days to wear off, and caution is recommended. A RAMO can answer enquiries on this subject.

In cases where local anesthetics have been used for extensive procedures, flying should be restricted for a minimum of 24 hours.

26.20 Contacts

Civil Aviation Medicine headquarters

Civil Aviation Medicine

Transport Canada

330 Sparks St.

Place de Ville, Tower C, Room 617

Ottawa ON K1A 0N8

Tel 613-990-1311

Toll free: 800-305-2059

Fax 613-990-6623

www.tc.gc.ca/CivilAviation/Cam/

Civil Aviation Medicine Branch offices (Regional aviation medical officers RAMO)

See <https://tc.gc.ca/eng/civilaviation/opssvs/regions-139.htm> for complete list of branch offices and current contact information.

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Railway*

Alert

- “Railway” includes national passenger and freight trains, as well as commuter and privately owned trains.
- Railway employees in Safety Critical Positions operate or control the movement of trains.
- Physicians are required by law to notify the railway company’s chief medical officer if a person in a Safety Critical Position has a medical condition that could affect railway safety.
- Railway Medical Guidelines to determine medical fitness for duty are available at www.railcan.ca/publications/rule_handbook

27.1 Overview

This section concerns assessing medical fitness for duty of a person occupying a Safety Critical Position on a railway. These employees operate or control the movement of trains. They are required to meet the medical fitness standards of the Railway Medical Guidelines. Assessments regarding fitness for duty, as well as episodic medical care, are usually done by community physicians.

A person in a Safety Critical Position must identify himself or herself as such to a physician before any examination.

The occupations designated as Safety Critical Positions may vary between railways, but typically include

- locomotive engineer
- conductor
- assistant conductor (brakeperson)
- yard foreman or yardperson
- rail traffic controller (train dispatcher).

In addition, any employee or contractor who is required to perform any of these functions is considered to occupy a Safety Critical Position.

**Prepared by the Medical Advisory Group of the Railway Association of Canada to facilitate public safety in rail freight and passenger train operations across Canada.*

27.2 Railway Safety Act

The Railway Safety Act (RSA) is federal legislation that gives the Minister of Transport jurisdiction over railway safety matters. It is regulated by Transport Canada and covers railway safety, security and the environment. Section 35 of the RSA mandates regular medical examinations for all persons occupying Safety Critical Positions.

The RSA

- requires that physicians and optometrists notify the railway company's chief medical officer if a person occupying a Safety Critical Position has a medical condition that could be a threat to safe railway operations and that the physician or optometrist send a copy of this notice without delay to the patient
- makes it the responsibility of the patient to inform the physician or optometrist that he or she holds a designated Safety Critical Position at the time of any examination
- allows the railway company to use the information provided by the physician or optometrist in the interests of safe railway operations
- prohibits any legal, disciplinary or other proceedings against a physician or optometrist for such information given in good faith
- prohibits further disclosure, or use as evidence, of such medical information, except with the permission of the patient.

27.3 Reporting

According to the Railway Safety Act, a physician must notify a railway company's chief medical officer if a person occupying a Safety Critical Position has a medical condition that could be a threat to safe railway operations. Contact information is listed in section 27.8, Contacts.

Physicians may wish to contact the CMPA for advice should they have questions about their reporting obligation.

27.4 Medical fitness

Railway Medical Rules were developed by the Railway Association of Canada and approved by the Minister of Transport. These Rules include the frequency of medical assessments and include a Railway Medical Guidelines section.

The chief medical officer of each railway company may increase the frequency of medical assessments, restrict a person from occupying a Safety Critical Position, apply restrictions on the performance of certain tasks or require the use of corrective devices or other medical aids.

27.5 General considerations

Capabilities that must be reviewed when considering medical fitness for duty of any person in a railway Safety Critical Position include, but are not limited to

- Cognition. The person must have normal function in terms of
 - alertness
 - judgment
 - concentration
 - comprehension of concurrent written, verbal and signal-based communication
 - awareness of the environment and other members of the work crew
 - vigilance for prolonged periods.
- Special senses
 - Vision, including colour perception, must meet railway industry standards. Individuals not meeting colour vision testing standards are required to undergo further assessment by a specific test developed by the railway industry.
 - Hearing must meet railway industry standards. Despite noisy environments, railway workers must be able to receive, comprehend and transmit communications via a variety of means (e.g., radio, telephone, face to face).
 - Ability to tolerate and function in a stressful work environment, which includes a highly variable work shift.
 - Must not be subject to sudden impairment of physical or mental capabilities.
- Medical fitness for duty also takes into consideration medical conditions including treatment and medications, both past and present, that could result in
 - sudden or gradual impairment of cognitive function including alertness, judgment, insight, memory and concentration
 - impairment of senses
 - significant impairment of musculoskeletal function
 - other impairment that is likely to constitute a threat to safe railway operations.

Note: Railway Medical Guidelines (see section 27.7, Resources) include the following conditions to assist physicians regarding Safety Critical Positions:

- cardiovascular disorders
- diabetes
- epilepsy or other epileptic seizures
- hearing
- mental disorders
- severe sleep apnea
- substance use disorders
- therapeutic opioids
- vision.

Medical conditions not currently covered by a specific guideline are governed by accepted medical practice.

27.6 Specific issues

Medical fitness requirements must also be assessed for specific capabilities associated with the following safety critical positions:

Locomotive Engineer

- Must be able to walk, climb and very occasionally lift 36 kg (80 lb) from floor to waist level.
- May have to walk extended distances in variable weather conditions and on uneven terrain.

Conductor, Brakeperson, Yardperson

- Must be able to walk, climb and occasionally lift 36 kg (80 lb) from floor to waist level.
- Must be able to walk in variable weather conditions and on uneven terrain.
- Good strength and endurance are required in the arms, shoulders and upper back. For example, performing track-switching duties requires
 - 17–19 kg (37–41 lb) of force to lift switch lever
 - 18–27 kg (40–60 lb) of force to pull switch over
 - 17–19 kg (37–41 lb) of force to lock switch lever back in place.
- A good sense of balance is required, as these tasks are performed outdoors where terrain may be uneven and slippery, wet, icy or snow-covered.

Railway Traffic Controller

- Must be able to sit for prolonged periods. Limited physical demands.
- Must have the ability to use a keyboard to enter instructions.
- Must be able to concentrate for prolonged periods while viewing a computer screen and listening and reacting to communications simultaneously.

27.7 Resources

A copy of the *Canadian Railway Medical Rules Handbook* (which includes the current Railway Medical Guidelines) is available on the [Railway Association of Canada website](http://www.railcan.ca/publications/rule_handbook) (www.railcan.ca/publications/rule_handbook).

27.8 Contacts

Railway Association of Canada

Tel 613-564-8088

Class 1 Railways

Canadian Pacific

Tel 866-876-0879 (toll free)

CN

Tel 514-399-5690

Other Railways

VIA Rail Canada

Tel 888-842-7245

Contact numbers for BNSF and other Regional Short Line Railroads can be obtained from the Railway Association of Canada.

Tel 613-564-8088

Appendix A

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National Highway Traffic Safety Administration (US). [Research note: further analysis of motorcycle helmet effectiveness using CODES linked data](#). Washington (DC): Department of Transportation (US); 1998. Available: ntl.bts.gov/lib/000/200/269/00269.pdf (accessed 2016 Apr. 8).

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Appendix B

Fitness to drive issues and risk management

Message from the Canadian Medical Protective Association (Revised 2012)*

Most Canadians depend on their vehicles and their ability to drive to assist them with the many activities in their lives. Telling patients that their medical condition may make it too dangerous for them to drive is a difficult conversation for physicians to have, and one that is equally difficult for patients to hear.

A report from a physician that results in the loss of the right to operate a vehicle can provoke strong feelings and have serious personal and financial consequences for the individuals involved. Physicians need to carefully consider the variety of issues associated with reporting (or not reporting) a patient with a medical condition to a motor vehicle licensing authority. The final decision can have implications, some of them serious, for both the physician and patient.

In most jurisdictions, legislation requires physicians to report any patient who, in their opinion, has a medical condition that may make it dangerous for the patient to drive. In a few jurisdictions, reporting is discretionary. The ultimate decision whether to restrict driving privileges is always made by the provincial or territorial motor vehicle licensing authority, not by the physician. All jurisdictions include statutory protection from liability in civil actions for making a report in good faith.

The Canadian Medical Protective Association regularly reviews its experience in assisting members in matters related to fitness to drive. These reviews have identified 3 principal themes. The first is allegations in legal actions that a physician failed to report a patient as unfit to drive because of a medical condition. The second is complaints from a patient that a report has been made to a motor vehicle licensing authority. The third relates to patient complaints about the physician's refusal to support an application to restore driving privileges.

Failure to report

Following a motor vehicle accident caused by an unfit driver, the allegation may be that the physician failed to advise the patient not to drive, and/or failed to make a necessary report to the motor vehicle licensing authority. In these cases, the injured party may initiate a civil legal action against the patient (driver), the physician, or both. Physicians have sometimes been found liable for damages under these circumstances.

Physicians should be familiar with the legislative criteria for reporting in their jurisdiction and assess the patient's condition in light of those statutory parameters.

* Used with the permission of the Canadian Medical Protective Association (CMPA)

Clinical guidelines are available to assist physicians in making these determinations. Physicians should talk openly with their patients about any medical conditions that may make it dangerous for them to drive and counsel them appropriately. All assessments and examinations conducted, discussions with the patient, and grounds for the reporting decision should be detailed in the medical record.

Complaints about reporting

Not surprisingly, some patients do not believe a report should have been made to the motor vehicle licensing authority about their fitness to drive. Patients tend to be particularly upset if the physician has not in advance alerted them that a report has been made to the motor vehicle licensing authority. Patients may challenge the accuracy of the diagnosis, or its relevance to driving, or claim that the report breaches confidentiality.

To help minimize medico-legal risk, patients should be informed of medical conditions that give rise to a duty to report. Physicians may also want to explain the nature and intent of any report to the motor vehicle licensing authority, including the fact that any decision to restrict driving privileges is made by the motor vehicle licensing authority. Patients who are deemed unfit to drive should be advised not to drive until the motor vehicle licensing authority has communicated its decision. Physicians should always document in the medical record discussions with patients about their fitness to drive and any actions taken (e.g., report to the motor vehicle licensing authority).

The CMPA has found that, in the vast majority of cases, the medical regulatory authorities (Colleges) have been supportive of the physician's decision to report.

Licence reinstatement

In some cases, patients who have had their license suspended may complain that their physician did not assist in their request to have their license reinstated. Prior to assisting patients with such requests, physicians should carefully evaluate whether there has been significant change in the patient's clinical condition that led to the original report. Physicians should only support a patient's application for license reinstatement if they feel able to comment based on the available information and their own expertise. It may be helpful in some cases to consult with a colleague or obtain a functional assessment.

Physicians should document their clinical reassessments in the medical record and, where appropriate, document and explain to the patient why they are unable to support the patient's request for license reinstatement.

Summary of risk management considerations

Physicians should consider the following suggestions to help reduce the medico-legal risks associated with reporting patients with medical conditions affecting their fitness to drive.

- Familiarize yourself and comply with the relevant legislation in your jurisdiction.
- The decision whether to report should be made in the circumstances of each case

based on the clinical assessment of risk posed by the patient. Consult with colleagues and/or obtain functional assessments, if appropriate.

- In keeping with confidentiality and privacy obligations, limit the report to the information prescribed by the legislation and that necessary to complete the report.
- It is usually beneficial to discuss your decision to report with the patient, including the rationale for reporting, the nature of the report and the legal obligation to report. Talk to the patient about your findings and try to help the patient understand the safety reasons for your report.
- Irrespective of the duty to report, physicians should advise the patient not to drive while permanently or temporarily disabled.
- Document your discussions, warnings, and advice to the patient, as well as your decision about whether or not to make a fitness to drive report.
- Prior to supporting a request to help reinstate a patient's licence, carry out careful clinical reassessments, and document your findings and recommendations in the medical record. Physicians should not feel compelled, and should refrain from, providing information they do not feel qualified or able to comment on. Consult with colleagues and/or obtain functional assessments, if appropriate.

The CMPA recommends physicians consult its publications related to reporting on fitness to drive: "Reporting patients with medical conditions affecting their fitness to drive" and "When the loss of independence can save a life!", which are both available on the CMPA website (www.cmpa-acpm.ca). CMPA members are also encouraged to contact the Association for advice and guidance from experienced medical officers on their reporting duties.

Appendix C

CAGE questionnaire

Alert

GE questionnaire

- Have you ever felt you should Cut down on your drinking?
- Have people Annoyed you by criticizing your drinking?
- Have you ever felt bad or Guilty about your drinking?
- Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (Eye opener)?

Scoring

Item responses on the CAGE are scored 0 or 1, for a total score of 0–4. A patient with a score of 1 or more requires further assessment. A total score of 2 or greater is considered clinically significant for having an alcohol use disorder.

Developed by Dr. John Ewing, founding director of the Bowles Center for Alcohol Studies, University of North Carolina at Chapel Hill, CAGE is an internationally used assessment instrument for identifying alcoholics. It is particularly popular with primary caregivers. CAGE has been translated into several languages, and its robustness makes it a practical tool for screening for problems related to drug use and other addictive behaviours.

The CAGE questions can be used in the clinical setting using informal phrasing. It has been demonstrated that they are most effective when used as part of a general health history and should NOT be preceded by questions about how much or how frequently the patient drinks (see DL Steinweg and H Worth. Alcoholism: the keys to the CAGE. American Journal of Medicine 1993;94:520–3). The exact wording that can be used in research studies can be found in JA Ewing. Detecting alcoholism: the CAGE questionnaire. JAMA 1984;252:1905–7.

Appendix D

Alcohol use disorders identification test: Interview Version (AUDIT)*

Read questions as written. Record answers carefully. Begin the AUDIT by saying, “Now I am going to ask you some questions about your use of alcoholic beverages during the past year.” Explain what is meant by “alcoholic beverages” using local examples of beer, wine, vodka, etc. Code answers in terms of “standard drinks.” Place the correct answer number in the box at the right.

1. How often do you have a drink containing alcohol?
 - (0) Never [Skip to questions 9 and 10]
 - (1) Monthly or less
 - (2) 2 to 4 times a month
 - (3) 2 to 3 times a week
 - (4) 4 or more times a week

2. How many drinks containing alcohol do you have on a typical day when you are drinking?
 - (1) 1 or 2
 - (2) 3 or 4
 - (3) 5 or 6
 - (4) 7, 8 or 9
 - (5) 10 or more

3. How often do you have six or more drinks on one occasion?
 - (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily

Skip to questions 9 and 10 if total score for questions 2 and 3 = 0

*Babor TF, Higgins-Biddle JC, Sanders JB, Monteiro MG. AUDIT — alcohol use disorders identification test: guidelines for use in primary care. Geneva: World Health Organization. Geneva; 2001. WHO/MSD/MSB/01.6a. Reprinted with permission.

4. How often during the last year have you found that you were not able to stop drinking once you had started?
 - (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?
 - (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily

6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?
 - (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?
 - (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily

8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
- (0) Never
 - (1) Less than monthly
 - (2) Monthly
 - (3) Weekly
 - (4) Daily or almost daily
9. Have you or someone else been injured as the result of your drinking?
- (0) No
 - (2) Yes, but not in the last year
 - (4) Yes, during the last year
10. Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?
- (0) No
 - (2) Yes, but not in the last year
 - (4) Yes, during the last year
- Record total of items here _____

If total is greater than recommended cut-off, consult User's Manual available at:

http://www.talkingalcohol.com/files/pdfs/WHO_audit.pdf

Appendix E

Provincial/territorial contact information for reporting potentially unfit drivers*

Driver assessment centres and rehabilitation resources can also be located in your area by contacting these offices.

ALBERTA

Driver Fitness and Monitoring Branch
Infrastructure and Transportation
Government of Alberta
Main Floor, Twin Atria Building
4999–98 Avenue
Edmonton AB T6B 2X3
Tel (780) 427-8230 (toll free in Alberta 310-0000)
Fax (780) 422-6612
www.transportation.alberta.ca/2567.htm

BRITISH COLUMBIA

Office of the Superintendent of Motor Vehicles
RoadSafetyBC
PO Box 9254, Stn Prov Gov
Victoria BC V8W 9J2
Tel (250) 387-7747
Toll free (855) 387-7747
Fax (250) 387-4891
www2.gov.bc.ca/gov/content/transportation/driving-and-cycling/driver-medical/driver-medical-fitness

**As of June 24–29, 2015*

Manitoba Public Insurance

Medical Records

Cityplace Service Centre

234 Donald Street

Box 6300

Winnipeg MB R3C 4A4

Tel (204) 985-1900

Toll free (866) 617-6676

Fax (204) 953-4992

www.mpi.mb.ca/en/DL/DL/Outlets/Pages/other-outlets.aspx

NEW BRUNSWICK

Registrar of Motor Vehicles

Department of Public Safety

Motor Vehicle Branch

364 Argyle Street

PO Box 6000

Fredericton NB E3B 5H1

Tel (506) 453-2410

Fax (506) 453-7455

http://www2.gnb.ca/content/gnb/en/services/services_renderer.200814.Motor_Vehicle_Registration.html

NEWFOUNDLAND AND LABRADOR

Medical Review Officer

Motor Registration Division

Service Newfoundland and Labrador

149 Smallwood Drive

St. John's NL A1N 1B5

Tel (877) 636-6867

Fax (709) 729-1843

http://www.servicenl.gov.nl.ca/departments/drivers_contact.html#mrd

NORTHWEST TERRITORIES

Road Licensing and Safety Division
Department of Transportation
Government of the Northwest Territories
Box 1320
Yellowknife NT X1A 2L9
Tel (867) 767-9088 ext. 31169
Fax (867) 873-0120
<http://www.dot.gov.nt.ca/About/Contact>

NOVA SCOTIA

Transportation and Infrastructure Renewal, Road Safety Programs
1505 Barrington Street, 9th floor
North Halifax, NS B3J 3K5
Tel (902) 424-5732
Fax (902) 424-0772
novascotia.ca/sns/rmv/licence/medicals.asp

NUNAVUT

Motor Vehicles Division
Department of Economic Development and Transportation
Government of Nunavut
PO Box 10
Gjoa Haven NU X0B 1J0
Tel (867) 360-4615
Fax (867) 360-4619
gov.nu.ca/edt/faq/where-can-i-get-drivers-licence

ONTARIO

Driver Improvement Office

Medical Review Section

Ministry of Transportation

77 Wellesley Street

Box 589

Toronto ON M7A 1N3

Tel (416) 235-1773

Toll free (800) 268-1481

Fax (416) 235-3400 or (800) 304-7889

Email: DriverImprovementOffice@ontario.ca

www.mto.gov.on.ca/english/dandv/driver/medical-review/physicians.shtml

PRINCE EDWARD ISLAND

Department of Transportation, Infrastructure and Energy

Registrar of Motor Vehicles

Highway Safety Division

Box 2000

Charlottetown PE C1A 7N8

Tel (902) 368-5210 or (902) 368-5234

Fax (902) 368-5236

www.gov.pe.ca/forms/pdf/2682.pdf

QUEBEC

Service de l'évaluation médicale et du suivi du comportement

Société de l'assurance automobile du Québec

333, boul. Jean-Lesage

CP 19600

Québec QC G1K 8J6

Tel (418) 643-5506; outside Quebec (800) 561-2858

Fax (418) 643-4840

www.saaq.gouv.qc.ca

SASKATCHEWAN

Saskatchewan Government Insurance

Medical Review Unit

2260–11th Avenue, 3rd floor

Regina SK S4P 2N7

Tel (306) 775-6176

Toll free (800) 667-8015 x 6176

Fax (306) 347-2577 or (866) 274-4417

Email: mrinquiries@sgi.sk.ca

www.sgi.sk.ca/individuals/medical/index.html

YUKON

Driver Sanctions Coordinator

Government of Yukon

Motor Vehicles Branch (W-22)

Department of Highways and Public
Works

Box 2703

Whitehorse YT Y1A 2C6

Tel (867) 667-3563

Fax (867) 393-6220

Email: motor.vehicles@gov.yk.ca

www.hp.w.gov.yk.ca/mv/

Appendix F

Canadian Cardiovascular Society's risk of harm formula*

The risk of harm (RH) to other road users posed by the driver with heart disease is assumed to be directly proportional to the following:

- time spent behind the wheel or distance driven in a given time period (TD)
- type of vehicle driven (V)
- risk of sudden cardiac incapacitation (SCI)
- the probability that such an event will result in a fatal or injury-producing accident (Ac).

Expressing this statement as Formula 1:

$$RH = TD \times V \times SCI \times Ac$$

Fewer than 2% of reported incidents of driver sudden death or loss of consciousness have resulted in injury or death to other road users or bystanders.^{1–4} In Formula 1, therefore, $Ac = 0.02$ for all drivers.

There is evidence that loss of control of a heavy truck or passenger-carrying vehicle results in a more devastating accident than loss of control of a private automobile⁵. Truckers are involved in only about 2% of all road accidents but in approximately 7.2% of all fatal accidents.⁵ In Formula 1, if $V = 1$ for a commercial driver, then $V = 0.28$ for a private driver.

There is no published standard or definition of what level of risk is considered acceptable in Canada even though this is crucial in the formulation of guidelines based on the probability of some event occurring in a defined time period. It was necessary, therefore, to develop such a standard.

For several years, the guidelines of the Canadian Cardiovascular Society, the Canadian Medical Association, and the Canadian Council of Motor Transport Administrators have permitted the driver of a heavy truck to return to that occupation following an acute myocardial infarction provided that he or she is functional class I with a negative exercise stress test at 7 metabolic equivalents, has no disqualifying ventricular arrhythmias and is at least 3 months post-infarct. On the basis of available data, however, such a person cannot be assigned a risk lower than 1% of cardiac death in the next year. The risk of sudden death would be lower than this, but would be at least partly offset by the risk of other suddenly disabling events such as syncope or stroke. For such a person, SCI is estimated to be equal to 0.01 in Formula 1.

**Excerpt from the Canadian Cardiovascular Society Consensus Conference 2003: Assessment of the cardiac patient for fitness to drive and fly (final report). Adapted with permission from the Canadian Cardiovascular Society.*

It may be assumed that the average commercial driver spends 25% of his or her time behind the wheel.⁵ Thus, in Formula 1, $TD = 0.25$. As indicated above, V may be assigned a value of 1 for commercial drivers and $Ac = 0.02$ for all drivers. Substituting into Formula 1:

$$\begin{aligned} RH &= TD \times V \times SCI \times Ac \\ &= 0.25 \times 1 \times 0.01 \times 0.02 \\ &= 0.00005 \end{aligned}$$

Allowing such a driver on the road is associated with an annual risk of death or injury to others of approximately 1 in 20 000 (0.00005). This level of risk appears to be generally acceptable in Canada.

A similar standard may be applied to the driver of a private automobile. The average private driver spends approximately 4% of his or her time behind the wheel ($TD = 0.04$).⁶ As indicated above, for such a driver, $V = 0.28$ and $Ac = 0.02$. The acceptable yearly risk of sudden death or cardiac incapacitation for such a person would be calculated as follows:

$$\begin{aligned} RH &= TD \times V \times SCI \times Ac \\ 0.00005 &= 0.04 \times 0.28 \times SCI \times 0.02 \\ SCI &= 0.223 \end{aligned}$$

Thus, the private automobile driver with a 22% risk of sustaining an SCI in the next year poses no greater threat to public safety than the heavy truck driver with a 1% risk.

Finally, for the commercial driver who drives a light vehicle, such as a taxicab or delivery truck, $V = 0.28$ and $TD = 0.25$, placing them at a risk between that of the private driver and the tractor-trailer driver.

References

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2. Hossack DW. Death at the wheel. A consideration of cardiovascular disease as a contributory factor to road accidents. *Med J Aust* 1974;1:164-6.
3. Parsons M. Fits and other causes of loss of consciousness while driving. *Q J Med* 1986;58:295-303.
4. Antecol DH, Roberts WC. Sudden death behind the wheel from natural disease in drivers of four wheeled motor vehicles. *Am J Cardiol* 1990;66:1329-35.
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Appendix G

Definition of Addiction

(American Society of Addiction Medicine, 2011)

Public Policy Statement: Definition of Addiction

Short Definition of Addiction:

Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors.

Addiction is characterized by inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one's behaviors and interpersonal relationships, and a dysfunctional emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment or engagement in recovery activities, addiction is progressive and can result in disability or premature death.

Long Definition of Addiction:

Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Addiction affects neurotransmission and interactions within reward structures of the brain, including the nucleus accumbens, anterior cingulate cortex, basal forebrain and amygdala, such that motivational hierarchies are altered and addictive behaviors, which may or may not include alcohol and other drug use, supplant healthy, self-care related behaviors. Addiction also affects neurotransmission and interactions between cortical and hippocampal circuits and brain reward structures, such that the memory of previous exposures to rewards (such as food, sex, alcohol and other drugs) leads to a biological and behavioral response to external cues, in turn triggering craving and/or engagement in addictive behaviors.

The neurobiology of addiction encompasses more than the neurochemistry of reward.¹ The frontal cortex of the brain and underlying white matter connections between the frontal cortex and circuits of reward, motivation and memory are fundamental in the manifestations of altered impulse control, altered judgment, and the dysfunctional pursuit of rewards (which is often experienced by the affected person as a desire to “be normal”) seen in addiction--despite cumulative adverse consequences experienced from engagement in substance use and other addictive behaviors. The frontal lobes are important in inhibiting impulsivity and in assisting individuals to appropriately delay gratification. When persons with addiction manifest problems in deferring gratification, there is a neurological locus of these problems in the frontal cortex. Frontal lobe morphology, connectivity and functioning are still in

the process of maturation during adolescence and young adulthood, and early exposure to substance use is another significant factor in the development of addiction. Many neuroscientists believe that developmental morphology is the basis that makes early-life exposure to substances such an important factor.

Genetic factors account for about half of the likelihood that an individual will develop addiction. Environmental factors interact with the person's biology and affect the extent to which genetic factors exert their influence. Resiliencies the individual acquires (through parenting or later life experiences) can affect the extent to which genetic predispositions lead to the behavioral and other manifestations of addiction. Culture also plays a role in how addiction becomes actualized in persons with biological vulnerabilities to the development of addiction.

Other factors that can contribute to the appearance of addiction, leading to its characteristic bio-psycho-socio-spiritual manifestations, include:

- a. The presence of an underlying biological deficit in the function of reward circuits, such that drugs and behaviors which enhance reward function are preferred and sought as reinforcers;
- b. The repeated engagement in drug use or other addictive behaviors, causing neuroadaptation in motivational circuitry leading to impaired control over further drug use or engagement in addictive behaviors;
- c. Cognitive and affective distortions, which impair perceptions and compromise the ability to deal with feelings, resulting in significant self-deception;
- d. Disruption of healthy social supports and problems in interpersonal relationships which impact the development or impact of resiliencies;
- e. Exposure to trauma or stressors that overwhelm an individual's coping abilities;
- f. Distortion in meaning, purpose and values that guide attitudes, thinking and behavior;
- g. Distortions in a person's connection with self, with others and with the transcendent (referred to as God by many, the Higher Power by 12-steps groups, or higher consciousness by others); and
- h. The presence of co-occurring psychiatric disorders in persons who engage in substance use or other addictive behaviors.

Addiction is characterized by²:

- a. **Inability to consistently Abstain;**
- b. **Impairment in Behavioral control;**
- c. **Craving;** or increased "hunger" for drugs or rewarding experiences;
- d. **Diminished recognition of significant problems** with one's behaviors and interpersonal relationships; and

e. **A dysfunctional Emotional response.**

The **power of external cues** to trigger craving and drug use, as well as to increase the frequency of engagement in other potentially addictive behaviors, is also a characteristic of addiction, with the hippocampus being important in memory of previous euphoric or dysphoric experiences, and with the amygdala being important in having motivation concentrate on selecting behaviors associated with these past experiences.

Although some believe that the difference between those who have addiction, and those who do not, is the *quantity or frequency* of alcohol/drug use, engagement in addictive behaviors (such as gambling or spending)³, or exposure to other external rewards (such as food or sex), a characteristic aspect of addiction is the *qualitative way* in which the individual responds to such exposures, stressors and environmental cues. A particularly pathological aspect of *the way* that persons with addiction pursue substance use or external rewards is that preoccupation with, obsession with and/or pursuit of rewards (e.g., alcohol and other drug use) persist despite the accumulation of adverse consequences. These manifestations can occur compulsively or impulsively, as a reflection of impaired control.

Persistent risk and/or recurrence of relapse, after periods of abstinence, is another fundamental feature of addiction. This can be triggered by exposure to rewarding substances and behaviors, by exposure to environmental cues to use, and by exposure to emotional stressors that trigger heightened activity in brain stress circuits.⁴

In addition there is a significant impairment in executive functioning, which manifests in problems with perception, learning, impulse control, compulsivity, and judgment. People with addiction often manifest a lower readiness to change their dysfunctional behaviors despite mounting concerns expressed by significant others in their lives; and display an apparent lack of appreciation of the magnitude of cumulative problems and complications. The still developing frontal lobes of adolescents may both compound these deficits in executive functioning and predispose youngsters to engage in “high risk” behaviors, including engaging in alcohol or other drug use. The profound drive or craving to use substances or engage in apparently rewarding behaviors, which is seen in many patients with addiction, underscores the compulsive or avolitional aspect of this disease. This is the connection with “powerlessness” over addiction and “unmanageability” of life, as is described in Step 1 of 12 Steps programs.

Addiction is more than a behavioral disorder. Features of addiction include aspects of a person’s behaviors, cognitions, emotions, and interactions with others, including a person’s ability to relate to members of their family, to members of their community, to their own psychological state, and to things that transcend their daily experience.

Behavioral manifestations and complications of addiction, primarily due to impaired control, can include:

- a. Excessive use and/or engagement in addictive behaviors, at higher frequencies and/or quantities than the person intended, often associated with a persistent desire for and unsuccessful attempts at behavioral control;

- b. Excessive time lost in substance use or recovering from the effects of substance use and/or engagement in addictive behaviors, with significant adverse impact on social and occupational functioning (e.g. the development of interpersonal relationship problems or the neglect of responsibilities at home, school or work);
- c. Continued use and/or engagement in addictive behaviors, despite the presence of persistent or recurrent physical or psychological problems which may have been caused or exacerbated by substance use and/or related addictive behaviors;
- d. A narrowing of the behavioral repertoire focusing on rewards that are part of addiction; and
- e. An apparent lack of ability and/or readiness to take consistent, ameliorative action despite recognition of problems.

Cognitive changes in addiction can include:

- a. Preoccupation with substance use;
- b. Altered evaluations of the relative benefits and detriments associated with drugs or rewarding behaviors; and
- c. The inaccurate belief that problems experienced in one's life are attributable to other causes rather than being a predictable consequence of addiction.

Emotional changes in addiction can include:

- a. Increased anxiety, dysphoria and emotional pain;
- b. Increased sensitivity to stressors associated with the recruitment of brain stress systems, such that "things seem more stressful" as a result; and
- c. Difficulty in identifying feelings, distinguishing between feelings and the bodily sensations of emotional arousal, and describing feelings to other people (sometimes referred to as alexithymia).

The emotional aspects of addiction are quite complex. Some persons use alcohol or other drugs or pathologically pursue other rewards because they are seeking "positive reinforcement" or the creation of a positive emotional state ("euphoria"). Others pursue substance use or other rewards because they have experienced relief from negative emotional states ("dysphoria"), which constitutes "negative reinforcement." Beyond the initial experiences of reward and relief, there is a **dysfunctional emotional state** present in most cases of addiction that is associated with the persistence of engagement with addictive behaviors. The state of addiction is not the same as the state of intoxication. When anyone experiences mild intoxication through the use of alcohol or other drugs, or when one engages non-pathologically in potentially addictive behaviors such as gambling or eating, one may experience a "high", felt as a "positive" emotional state associated with increased dopamine and opioid peptide activity in reward circuits. After such an experience, there is a neurochemical rebound, in which the reward function does not simply revert to baseline, but often drops below the original levels. This is usually not consciously perceptible by the individual and is not necessarily associated

with functional impairments.

Over time, repeated experiences with substance use or addictive behaviors are not associated with ever increasing reward circuit activity and are not as subjectively rewarding. Once a person experiences withdrawal from drug use or comparable behaviors, there is an anxious, agitated, dysphoric and labile emotional experience, related to suboptimal reward and the recruitment of brain and hormonal stress systems, which is associated with withdrawal from virtually all pharmacological classes of addictive drugs. While tolerance develops to the “high,” tolerance does not develop to the emotional “low” associated with the cycle of intoxication and withdrawal. Thus, in addiction, persons repeatedly attempt to create a “high”--but what they mostly experience is a deeper and deeper “low.” While anyone may “want” to get “high”, those with addiction feel a “need” to use the addictive substance or engage in the addictive behavior in order to try to resolve their dysphoric emotional state or their physiological symptoms of withdrawal. Persons with addiction compulsively use even though it may not make them feel good, in some cases long after the pursuit of “rewards” is not actually pleasurable.⁵ Although people from any culture may choose to “get high” from one or another activity, it is important to appreciate that addiction is not solely a function of choice. Simply put, addiction is not a desired condition.

As addiction is a chronic disease, periods of relapse, which may interrupt spans of remission, are a common feature of addiction. It is also important to recognize that return to drug use or pathological pursuit of rewards is not inevitable.

Clinical interventions can be quite effective in altering the course of addiction. Close monitoring of the behaviors of the individual and contingency management, sometimes including behavioral consequences for relapse behaviors, can contribute to positive clinical outcomes. Engagement in health promotion activities which promote personal responsibility and accountability, connection with others, and personal growth also contribute to recovery. It is important to recognize that **addiction can cause disability or premature death, especially when left untreated or treated inadequately.**

The qualitative ways in which the brain and behavior respond to drug exposure and engagement in addictive behaviors are different at later stages of addiction than in earlier stages, indicating progression, which may not be overtly apparent. As is the case with other chronic diseases, the condition must be monitored and managed over time to:

- a. Decrease the frequency and intensity of relapses;
- b. Sustain periods of remission; and
- c. Optimize the person’s level of functioning during periods of remission.

In some cases of addiction, medication management can improve treatment outcomes. In most cases of addiction, the integration of psychosocial rehabilitation and ongoing care with evidence-based pharmacological therapy provides the best results. Chronic disease management is important for minimization of episodes of relapse and their impact.

Treatment of addiction saves lives †

Addiction professionals and persons in recovery know the hope that is found in recovery. Recovery is available even to persons who may not at first be able to perceive this hope, especially when the focus is on linking the health consequences to the disease of addiction. As in other health conditions, self-management, with mutual support, is very important in recovery from addiction. Peer support such as that found in various “self-help” activities is beneficial in optimizing health status and functional outcomes in recovery. ‡

Recovery from addiction is best achieved through a combination of self-management, mutual support, and professional care provided by trained and certified professionals.

Explanatory footnotes:

1. The neurobiology of reward has been well understood for decades, whereas the neurobiology of addiction is still being explored. Most clinicians have learned of reward pathways including projections from the ventral tegmental area (VTA) of the brain, through the median forebrain bundle (MFB), and terminating in the nucleus accumbens (Nuc Acc), in which dopamine neurons are prominent. Current neuroscience recognizes that the neurocircuitry of reward also involves a rich bi-directional circuitry connecting the nucleus accumbens and the basal forebrain. It is the reward circuitry where reward is registered, and where the most fundamental rewards such as food, hydration, sex, and nurturing exert a strong and life-sustaining influence. Alcohol, nicotine, other drugs and pathological gambling behaviors exert their initial effects by acting on the same reward circuitry that appears in the brain to make food and sex, for example, profoundly reinforcing. Other effects, such as intoxication and emotional euphoria from rewards, derive from activation of the reward circuitry. While intoxication and withdrawal are well understood through the study of reward circuitry, understanding of addiction requires understanding of a broader network of neural connections involving forebrain as well as midbrain structures. Selection of certain rewards, preoccupation with certain rewards, response to triggers to pursue certain rewards, and motivational drives to use alcohol and other drugs and/or pathologically seek other rewards, involve multiple brain regions outside of reward neurocircuitry itself.

† See ASAM Public Policy Statement on *Treatment for Alcohol and Other Drug Addiction*, Adopted: May 01, 1980, Revised: January 01, 2010 (<http://www.asam.org/advocacy/find-a-policy-statement/>)

‡ see ASAM Public Policy Statement on *The Relationship between Treatment and Self Help: A Joint Statement of the American Society of Addiction Medicine, the American Academy of Addiction Psychiatry, and the American Psychiatric Association*, Adopted: December 01, 1997 (<http://www.asam.org/advocacy/find-a-policy-statement/>)

2. These five features are not intended to be used as “diagnostic criteria” for determining if addiction is present or not. Although these characteristic features are widely present in most cases of addiction, regardless of the pharmacology of the substance use seen in addiction or the reward that is pathologically pursued, each feature may not be equally prominent in every case. The diagnosis of addiction requires a comprehensive biological, psychological, social and spiritual assessment by a trained and certified professional.
3. In this document, the term “addictive behaviors” refers to behaviors that are commonly rewarding and are a feature in many cases of addiction. Exposure to these behaviors, just as occurs with exposure to rewarding drugs, is facilitative of the addiction process rather than causative of addiction. The state of brain anatomy and physiology is the underlying variable that is more directly causative of addiction. Thus, in this document, the term “addictive behaviors” does not refer to dysfunctional or socially disapproved behaviors, which can appear in many cases of addiction. Behaviors, such as dishonesty, violation of one’s values or the values of others, criminal acts etc., can be a component of addiction; these are best viewed as complications that result from rather than contribute to addiction.
4. The anatomy (the brain circuitry involved) and the physiology (the neuro-transmitters involved) in these three modes of relapse (drug- or reward-triggered relapse vs. cue-triggered relapse vs. stress-triggered relapse) have been delineated through neuroscience research.

Relapse triggered by exposure to addictive/rewarding drugs, including alcohol, involves the nucleus accumbens and the VTA-MFB-Nuc Acc neural axis (the brain’s mesolimbic dopaminergic “incentive salience circuitry”—see footnote 2 above). Reward-triggered relapse also is mediated by glutamatergic circuits projecting to the nucleus accumbens from the frontal cortex.

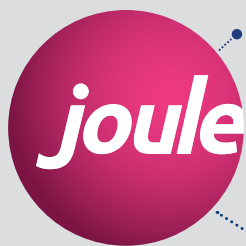
Relapse triggered by exposure to conditioned cues from the environment involves glutamate circuits, originating in frontal cortex, insula, hippocampus and amygdala projecting to mesolimbic incentive salience circuitry.

Relapse triggered by exposure to stressful experiences involves brain stress circuits beyond the hypothalamic-pituitary-adrenal axis that is well known as the core of the endocrine stress system. There are two of these relapse-triggering brain stress circuits – one originates in noradrenergic nucleus A2 in the lateral tegmental area of the brain stem and projects to the hypothalamus, nucleus accumbens, frontal cortex, and bed nucleus of the stria terminalis, and uses norepinephrine as its neurotransmitter; the other originates in the central nucleus of the amygdala, projects to the bed nucleus of the stria terminalis and uses corticotrophin-releasing

factor (CRF) as its neurotransmitter.

5. Pathologically pursuing reward (mentioned in the Short Version of this definition) thus has multiple components. It is not necessarily the amount of exposure to the reward (e.g., the dosage of a drug) or the frequency or duration of the exposure that is pathological. In addiction, pursuit of rewards persists, despite life problems that accumulate due to addictive behaviors, even when engagement in the behaviors ceases to be pleasurable. Similarly, in earlier stages of addiction, or even before the outward manifestations of addiction have become apparent, substance use or engagement in addictive behaviors can be an attempt to pursue relief from dysphoria; while in later stages of the disease, engagement in addictive behaviors can persist even though the behavior no longer provides relief.

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