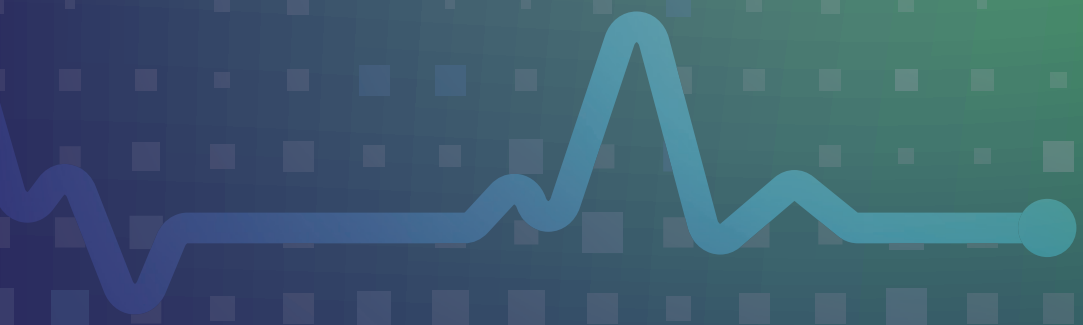
Determining medical fitness to operate motor vehicles

CMA Driver's Guide
10th Edition



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Section 1 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 1st edition in 1974, nearly a half century ago, this 10th edition continues to provide current, practical information for health professionals who have determined that a patient has a condition that may affect their fitness to drive. In consideration of this orientation, clinical information on the diagnosis and evaluation of the various medical conditions has been kept to a minimum to allow the health professional rapid access to guidance on the effects of the given conditions on fitness to drive.

This edition incorporates the latest recommendations of the Canadian Cardiovascular Society (CCS), to be published in 2023. It also profits from the series of systematic literature reviews conducted under the auspices of the Monash University Accident Research Centre and published in the 3rd edition of its report entitled *Influence of Chronic Illness on Crash Involvement of Motor Vehicle Drivers* (Charlton et al., 2021) (often referred to as the "Monash Report").

All sections in this guide have been revised by their respective authors, and references are provided within each section to enable the interested reader to further their knowledge as desired. It is also intended that the references will facilitate the justification for medical standards for fitness to drive if those standards are challenged, a situation that is increasingly frequent for licensing agencies.

1.2 Functional assessment

The 7th edition of this guide recognized that a landmark legal ruling in British Columbia, known as *British Columbia (Superintendent of Motor Vehicles)* v. *British Columbia (Council of Human Rights)* or simply the Grismer decision, 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 Transport Administrators (CCMTA) *Medical Standards for Drivers* (CCMTA, 2021). 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 their driver's licence in the event of a move to another province or 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 into the United States with their commercial vehicles. This agreement has been under revision for some time, and it is possible that the final document will modify these restrictions. Should this come about, this guide will be modified to reflect the changes.

Non-commercial drivers and commercial drivers who are driving non-commercial vehicles are not subject to the same restrictions.

1.4 Methods

A Scientific Editorial Board composed of five member physicians and a physician editor-in-chief continued the work they began with the production of the 8th and 9th editions of the guide. 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 cut-off 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 the latest edition of the Monash Report (Charlton et al., 2021), which remains the most complete and detailed review of the evidence supporting medical standards for drivers at the time of publication of this guide. The US National Highway Traffic Safety Administration (NHTSA) document *Driver Fitness Medical Guidelines* (NHTSA, 2009) is another useful publication that contains both extensive references and an analysis of the literature. In addition, the CCS "risk of harm" formula, first included in the 7th edition of this guide to support its recommendations, has been retained in this edition. However, the recommendations throughout this guide remain largely 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 Diabetes Canada 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. During the examination, the physician should not only look for physical disabilities, but should 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; however, 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 in emergency conditions.

1.6 Public health

Motor vehicle crashes during the period preceding the COVID-19 pandemic killed about 2,000 people in Canada each year and injured another 160,000 (Transport Canada, 2022). By contrast, the number of deaths in Canada directly attributable to COVID-19 was, at the time of writing this section, more than 32,000 over the first 2 years of the pandemic (Statistics Canada, 2022). Because driving activities were sharply curtailed by pandemic restrictions, road crash fatalities were lower than usual over the same period.

Most motor vehicle crashes involve people between the ages of 15 and 55 years, and crashes are a leading cause of death and disability in this group. Major contributing factors to crashes involving younger people are alcohol, speeding, and poor judgment, including driving inappropriately for weather and road conditions and failing 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 about drinking and driving and seat belt use should be considered at least as important as questions about 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, the consequences of a crash involving their loaded vehicles, 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.

It should be remembered that driving is a privilege, not a right. Just as physicians are required to maintain their "fitness" to practise medicine, drivers must maintain their fitness to drive and be prepared to demonstrate their fitness if it is in doubt.

The classification of drivers' licences takes into account any specialized training or knowledge that may be required of the driver. For instance, driving an articulated truck requires specific training that is not required for driving a car; similarly, driving a taxi requires detailed geographic knowledge of the area that may not be required for driving the family car. These additional factors are reflected in the various classes of licences. Usually, holders of Class 1 to 4 licences (for driving heavy vehicle combinations, buses, trucks, emergency vehicles, and minibuses) are referred to as "commercial" drivers, and those holding any other class of licence (for driving automobiles, motorcycles, mopeds, scooters, three-wheel motorcycles, and tractors) are referred to as "non-commercial" drivers. In some jurisdictions, taxi drivers are considered commercial drivers, whereas in others they are considered non-commercial drivers.

Because this guide is intended to provide physicians with guidance on the determination of fitness to drive, rather than the classification of drivers in the licensing system, and because driving activities are an important factor in this determination, the Scientific Editorial Board has decided that this publication will use the terms "non-commercial" and "commercial," rather than "private" and "commercial" as was the case in past editions.

Consequently, commercial drivers are those drivers whose job necessarily includes driving as the pivotal activity, whereas non-commercial drivers are everybody else. Thus, a sales representative who must drive to meet customers and a taxi driver who is transporting paying customers are considered "commercial drivers," while a physician using a car to make house calls is a "non-commercial driver," since there is no requirement for the physician to use a motor vehicle for transportation.

Physicians should assess their patients for fitness to drive in terms of 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 non-commercial 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 non-commercial drivers.

It should also be borne in mind that operators of heavy machinery, such as front-end loaders, may hold a Class 5 (non-commercial vehicle) licence, rather than the higher classes of licences 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 the 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 by reading a printed document.

Some Canadian jurisdictions already offer such continuing education programs, which have proven popular with physicians (Dow and Jacques, 2012). 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

As noted above, driving is considered a privilege. As such, 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 jurisdictions, 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 driver's cost.

In most Canadian jurisdictions, the cost of medical examinations of drivers for whom the periodicity of their medical examinations is mandated by law or regulation is covered by the jurisdiction's medical insurance agency.

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 B for contact information). The CCMTA defines seven classes of licence, described in detail in its standard *Driver Licensing Classification* (CCMTA, 2020):

- **Classes 1 to 4:** Commercial classes of driver licence.
- **Class 5:** Required to drive a passenger vehicle.
- **Class 6:** Required to drive a motorcycle.
- **Class 7:** Learner/instructional driver licence.

1.12 Contact us

This guide is produced as a service to CMA members; however, the CMA and the CMA Group of Companies do 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 us at driversguide@cma.ca or toll-free at 888-855-2555.

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Section 2 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 across jurisdictions.

2.1 Overview

Historically, determining medical fitness to drive was based solely on a medical office examination and a diagnosis. However, various court decisions, including the Grismer decision *(British Columbia [Superintendent of Motor Vehicles] v. British Columbia [Council of Human Rights])*, 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 drivers to be assessed individually for their ability to drive safely. A functional assessment, which is a structured assessment of the person'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. In addition, some jurisdictions perform their own on-road assessments of driving fitness, but these tests are 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 could 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 the functional capabilities of drivers with medical conditions that may affect driving.

Medical standards for drivers (e.g., Canadian Council of Motor Transport Administrators, 2021) 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 as 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

Various authors have described and explained the role of physicians in determining fitness to drive (e.g., Dow, 2006). 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 own 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. A 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 to grant or suspend a licence. There is a role for specialized road testing and computerized screening, as well as some self-administered tests (provided 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, based on tools 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 licensing decisions based solely on the results of this type of testing.

Most Canadian jurisdictions have some form of formal road testing in place, often conducted by occupational therapists who specialize in the functional testing of drivers. In some jurisdictions, certified technicians do the testing. Assessments are typically limited to drivers of non-commercial cars. Drivers of commercial vehicles and motorcycles usually cannot be evaluated in private centres, although some specialized centres have developed testing protocols 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 their 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 (e.g., Rapoport et al., 2018) recommend that any driver with dementia who requires the imposition of licence restrictions to ensure driving safety should be suspended from driving completely* (see Section 8, Dementia).

2.4 Finding an occupational therapist

The Canadian Association of Occupational Therapists offers a service on its website called "Find an occupational therapist" (https://www.caot.ca/site/findot). However, not all occupational therapists perform functional assessments for drivers. Some provincial occupational therapist associations do provide a similar service to the public that will identify those who perform such assessments.

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Section 3 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 patient confidentiality.
- Despite this duty to report, only the motor vehicle licensing authority can suspend or restrict a person's licence.

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 18 of the *CMA Code of Ethics and Professionalism* (Canadian Medical Association, 2018) affirms the notion that physician–patient confidentiality may be breached when required or permitted by law:

> Fulfill your duty of confidentiality to the patient by keeping identifiable patient information confidential; collecting, using, and disclosing only as much health information as necessary to benefit the patient; and sharing information only to benefit the patient and within the patient's circle of care. Exceptions include situations where the informed consent of the patient has been obtained for disclosure or as provided for by law.

**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 advice from 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 (Section 26, Aviation and Section 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 the federal Minister of Transport 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 in the Transport Canada policy "Seafarer medical examination – a physician guide" (Transport Canada, 2013), or contact Marine Medicine at 866-577-7702 for assistance.

This approach is further reinforced by Principle 2 of CMA's "Principles for the Protection of Patient Privacy" (Canadian Medical Association, 2017), which states that:

> In practice, respecting privacy and the duty of confidentiality govern the physician's role as data steward, responsible for controlling the extent to which information about the person is protected, used or disclosed. A central rule to balancing a patient's right to privacy and the duty of confidentiality is the "minimum necessary" use and disclosure of personal health information, whereby a data steward should use or disclose only the minimum amount of information necessary to fulfil the intended purpose. In some circumstances, de-identifying or aggregating personal health information before use or disclosure can minimize the amount of information disclosed. … The duty to maintain patient confidentiality is not absolute and is subject to exceptions in limited circumstances; i.e., when required or permitted by law to disclose information.

The *CMA Code of Ethics and Professionalism* 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), including the publications *Hit the brakes: Do you need to report your patient's fitness to drive?* (CMPA, 2019) and *Medico-legal handbook for physicians in Canada* (CMPA, 2021), 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 physicians from any legal action brought against them 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 A for a message from the CMPA on issues related to patients' fitness to drive and associated risk management.

TABLE 1 (part 1 of 2): Legislation governing reporting of medically unfit drivers and protection for physicians (current as of July 2022)*

Jurisdiction	Reporting	Physician protection for reporting†	Admissibility of reports as evidence in legal proceedings‡
Alberta	Discretionary	Protected	The identity of the reporting physician remains confidential if the report was made in good faith, unless authorization of release of identity
British Columbia	Mandatory to report only when patients who have a medical condition that makes it dangerous to drive continue to drive after being warned of the danger by the physician	Protected unless physician acts falsely or maliciously	Not addressed
Manitoba	Mandatory	Protected	Privileged Not admissible in evidence except to prove compliance with reporting obligations
New Brunswick	Mandatory	Protected as long as information given in good faith	Not addressed
Newfoundland and Labrador	Mandatory	Protected	Privileged Not admissible in evidence except to prove compliance with reporting obligations
Northwest Territories	Mandatory	Protected unless physician acts maliciously or without reasonable grounds	Privileged Not open to public inspection or admissible in evidence 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.
Nova Scotia	Discretionary	Protected	Not addressed
Nunavut	Mandatory	Protected unless physician acts maliciously or without reasonable grounds	Privileged Not open to public inspection or admissible in evidence 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.

TABLE 1 (part 2 of 2): Legislation governing reporting of medically unfit drivers and protection for physicians (current as of July 2022)*

Jurisdiction	Reporting	Physician protection for reporting†	Admissibility of reports as evidence in legal proceedings‡
Ontario	Mandatory if person has or appears to have a prescribed medical condition, functional impairment or visual impairment. Reporting is discretionary if person has or appears to have a medical condition or impairment that makes it dangerous for the person to operate a motor vehicle.	Protected if in good faith	Privileged
Prince Edward Island	Mandatory	Protected	Privileged Not admissible in evidence except to prove compliance with reporting obligations
Quebec	Discretionary, though the Collège des Médecins du Québec expects physicians to report if they have reason to believe a patient represents a serious risk to public safety and continues to drive despite being warned not to	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 open to public inspection or admissible in evidence except to show that the report was made in good faith in accordance with reporting obligation
Yukon	Mandatory	Protected	Not addressed

*Based, in part, on *Medico-legal handbook for physicians in Canada* (Canadian Medical Protective Association, 2021).

†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.

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 makes the decision to restrict driving. 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. The legislation in some jurisdictions expressly states that the reporting duty is not triggered when the patient's condition is distinctly temporary. Physicians must use their clinical judgment in making an assessment of the timeframe for temporary conditions. 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 B). 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 and safety 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. However, when a physician reasonably believes that a patient who continues to drive with a medical condition may pose a risk of serious harm, they may be justified in alerting a third party who can assist in preventing the harm (e.g., police). 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 alert third parties.

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. While patients have a general right of access to information in their medical report, some jurisdictions extend statutory privilege to prevent the release of these reports. Physicians should contact the CMPA for further information specific to their jurisdiction.

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Section 4 Driving cessation

Alert

- Despite research showing that life expectancy exceeds driving expectancy by 9.4 years for women and 6.2 years for men (Foley et al., 2002), 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., voluntary restrictions that will eventually lead 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. Several factors are associated with voluntary driving cessation.

- Age — older drivers are more likely to stop driving of their own accord than younger people (Edwards et al., 2010; Albert et al., 2018).
- Gender — women are more likely to give up driving voluntarily than men (Jette and Branch, 1992; Foley et al., 2002; Bauer et al., 2003; Choi et al., 2012).
- Marital status — drivers who are single, widowed, or divorced are more likely to stop driving than those who are married (Braitman and McCartt, 2008).
- Socio-economic status — drivers with lower income are more likely to stop driving than those with higher income (Andersen, 2016).
- Education — interventions that involve tailored training have been shown to improve knowledge of road safety, change self-perception of driving abilities, and improve behind-the-wheel performance of older drivers (Sangrar et al., 2019).
- Place of residence — drivers living in urban settings are more likely to stop driving than those living in rural areas (Strogatz et al., 2019).
- Functional impairment — drivers with impairments in sensory, motor, or functional abilities are more likely to stop driving than those without impairments (Uc and Rizzo, 2008).
- Transportation support — drivers who have transportation support (from family, friends, or organizations) are more likely to stop driving than those without such support (Choi et al., 2012).

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 that physicians face is when a patient is functionally incapable of driving safely but has a self-perception of competence to drive. Physician involvement includes 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 those with progressive illnesses (e.g., dementia, macular degeneration, multiple sclerosis), early discussions can help the person and their family to plan for the inevitable need to stop driving.

Involuntary driving cessation is more likely to be required when insight declines and/or impairment in driving ability (e.g., with dementia) is present. 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 (Schouten et al., 2022).
- Insight — those with impaired insight are more likely to continue driving and to need intervention (Carmody et al., 2012).

These factors can assist physicians in predicting who may be resistant to discussions about the need for driving cessation or 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 ability. 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 are frequently necessary.

Specialized driving cessation support groups have been shown to be effective in helping patients with dementia and their caregivers to cope with the loss of driving privileges (Dobbs et al., 2009). 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" (Sommerfeld, 2016). However, data indicate that, on average, men outlive their driving careers by 6.2 years and women by 9.4 years (Foley et al., 2002). 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 (Hartford Center for Mature Market Excellence, 2018). Advance driving directives, which may be included as part of advance directives for end-of-life care, may help to facilitate discussions about driving (Betz et al., 2013). 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 (Curl et al., 2014). However, most forms of public transportation (e.g., light rail transit, public buses) are designed primarily for individuals who are 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 transportation services) is critical to meeting the needs of this growing segment of the population. Physicians can and do play a significant 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 person can provide emotional support to the patient during the appointment, and their presence can help to ensure that the family understands the need for the patient to stop driving. It also may be helpful to meet with the family (with the patient's consent) before holding a meeting with both the patient and the 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 during the discussion.
- For patients with progressive illnesses, such as dementia, discuss driving early in the course of the illness, before it becomes a problem (Perkinson et al., 2005). 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 with the patient and family members the risks of continuing to drive.
- Emphasize the need to stop driving, using the driving assessment if available, as the appropriate focus of discussion.
- Often the patient will talk about having a past clean driving record. Acknowledge that accomplishment in a genuine manner, but return to the need to stop driving. Sometimes the discussion can be refocused by saying "Medical conditions can make even the best drivers unsafe."
- 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 patient is feeling and acknowledge their emotions. Avoid lengthy attempts to convince the patient 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 a patient's resistance to accepting advice or direction to stop driving. Explore these feelings with empathy. A focus on the patient's feelings can deflect arguments about the evaluation and the stop-driving directive.
- Ask the patient what they understand 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. The Canadian Automobile Association has a Driving Costs Calculator that helps in identifying all of the ongoing costs of owning and operating a vehicle (see https://carcosts.caa.ca/). For example, on average, it costs $13,654 to own and operate a mid-sized car in 2022, 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.

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 (Croston et al., 2009). Family members play a pivotal role in monitoring and managing compliance with a stop-driving directive and may try numerous methods to ensure that the patient stops driving, including hiding the keys, disabling the car, cancelling the vehicle insurance, or selling the car. However, evidence of the success of these interventions is largely anecdotal.

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Section 5 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. The overall availability of alcohol has been identified as a factor associated with the incidence of impaired driving (American Psychiatric Association, 2013). Recent changes in public policy in various jurisdictions that have loosened restrictions for public use of alcohol provide greater opportunities, especially for underage users, and increase the probability of alcohol-impaired driving (Canadian Centre on Substance Use and Addiction, 2020).

People charged by police for impaired driving will have their driving privileges restricted according to provincial or territorial 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 information about seizures induced by alcohol withdrawal, see Section 11.4.7.

5.2 Assessment: 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.

Most of the studies included in a recent systematic review found that alcohol use disorder is associated with increased risk of a motor-vehicle–related crash, and one study showed that the risk increased with the severity (grade) of the disorder (Charlton et al., 2021).

A number of clinical "red flags" have been identified, which may indicate ongoing alcohol use that will impair ability to drive safely (American Psychiatric Association, 2013). These indicators include the following:

- driver with at least one 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 ("alcohol use disorder" in the *Diagnostic and Statistical Manual of Mental Disorders* [DSM-5; American Psychiatric Association, 2013])

- 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 they have been further assessed.

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, in some jurisdictions, reporting drinking-and-driving behaviour to licensing authorities might lead to immediate suspension of the person's licence pending further assessment.

A driver who has had their licence suspended because of a diagnosis of alcohol use disorder may request reinstatement under certain circumstances, such as sustained remission. It is therefore important for primary care physicians to monitor patient adherence to treatment recommendations and recovery, as they may be required to submit progress reports or to confirm the patient's sustained remission.

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.

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Section 6 Drugs

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 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
- drug dependence.

Any physician prescribing medical marijuana should include advice on driving in their discussions with the patient.

6.1 Overview

Patients taking illicit, non-prescription (over-the-counter [OTC]), or prescription drugs known to have pharmacologic effects or adverse effects that can impair the ability to drive should be advised not to drive until their individual response is known or the adverse effects no longer result in impairment (e.g., patients stabilized on long-term opioid therapy for chronic pain or opioid dependence) (Asbridge et al., 2021). Keep in mind that drugs can have unexpected adverse effects as well, which may affect ability to drive.

Concern is growing that there is significant impairment among commercial drivers due to alcohol, cannabis and its derivatives, and stimulants. Alcohol and cannabis are well known to cause deterioration in driving performance. Although truck drivers sometimes use stimulants for fatigue management on long hauls, studies have shown that stimulant users engaged in more risky driving behaviours, showed poorer compliance with traffic and driving regulation, and were at greater risk of falling asleep and of crashes (https://www.ccsa.ca/impaired-driving). Studies of motor vehicle crashes and impairment after taking medications have demonstrated increased risk with antidepressants, benzodiazepines, and Z-drugs, which are commonly prescribed as sleep aids (Dassanayake et al., 2011; National Institute on Drug Abuse, 2019). 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 (Leufkens and Vermeeren, 2014). Residual effects that lead to lane weaving and speed variability while driving have been found to persist at least 11 hours after the nighttime dose (Leufkens and Vermeeren, 2014).

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

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

Patients with a diagnosis of substance use disorder with dependence need specialized treatment. They should be advised not to drive until sufficient stability is achieved in recovery. Reporting of dependence may be mandatory, according to the particular jurisdiction (see Section 3, Reporting — when and why).

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

Care and biological monitoring to ensure sustained remission must be considered to ensure fitness to drive. It is important for primary care physicians to monitor patient adherence to 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, Assessment: Clinical history) and illicit, OTC, or prescription drugs.

Risk factors that may enhance the risk of driving when impaired by a drug include the following:

- the "red flags" listed in Section 5.2
- 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 psychological 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 adverse 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 older adults. Patients who are more heavily sedated for therapeutic reasons should be advised not to 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 — adverse 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 adverse 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 adverse effects, as well as frequency of use, tolerance, and dependence. Patients on long-term prescribed opioid analgesic therapy should be monitored for adverse effects, especially drowsiness.

Patients on a formal opioid agonist maintenance program of methadone or buprenorphine prescribed by a physician are usually eligible for Classes 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 adverse 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, patients receiving such therapy should be followed regularly by the prescribing physician.

6.3.5 Hallucinogens

Drugs such as cannabis 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 medical 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 older adults. Patients who are stable and symptom-free on maintenance doses can usually drive any class of motor vehicle.

6.3.8 Antiseizure medications

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 adverse 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 adverse 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 adverse effects should not drive.

Examples of drugs with possible anticholinergic effects include antidepressants, antipsychotics, antihistamines, 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 disease can trigger excessive daytime somnolence, which can be quantified by the Epworth Sleepiness Scale (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 Cannabis – recreational and medical use

Cannabis is a psychoactive substance containing the specific addictive ingredient delta-9-tetrahydrocannabinol (THC). THC 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 cannabis plant, cannabidiol [CBD]) are available. Although cannabis is a legal substance in Canada now, it is considered harmful from a physiological perspective.

Following a court decision, Health Canada was required to render cannabis available for individuals who wished to use it for medical purposes (which occurred through the Marihuana Medical Access Regulations, now repealed). However, medical marijuana is not an approved drug, and its efficacy remains questionable to both scientists and clinicians. As the College of Family Physicians of Canada (CFPC) position paper on this subject states,

> Smoke is a hazardous delivery system, because (a) psychoactive ingredients reach the CNS [central nervous system] 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–response 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 cannabis is smoked.

Although the acute or chronic level of THC intoxication is difficult to gauge, it is notable that, after alcohol, cannabis is the substance most frequently found in drivers involved in fatal crashes (https://www.ccsa.ca/impaired-driving). A meta-analysis of multiple studies estimated that the risk of being involved in a crash doubled after cannabis use (Hartman and Huestis, 2013). Another study noted that higher levels of THC in the blood of collision-involved drivers was associated with a likelihood of being responsible for the crash three to seven times greater than for drivers who had not used drugs or alcohol (Brady and Li, 2014). The risk associated with cannabis in combination with alcohol has also been found to be greater than for either drug alone (Lenné et al., 2010). Increased crashes, injuries, and deaths are to be expected as rates of driving under the influence of cannabis increase with 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 legislative changes, showed that the average user was consuming 2.1 g of dried cannabis per day. This equates to about five joints of cannabis per day, since the typical joint contains between 500 and 750 mg of dried cannabis (Health Canada, 2019). The CFPC position paper 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 they have consumed the average amount of cannabis 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 (45–60 joints) while supposedly remaining fit to drive. This is a dangerous situation, as physicians may be held liable for any mishaps that happen in the context of a dosage endorsed by the physician.

Physicians need to evaluate patients and discuss very carefully their use of marijuana with respect to the risk related to impaired driving. Recommendations to refrain from driving for a period after using cannabis must be provided in this discussion. It should also be emphasized that driving under the influence of cannabis, no matter the justification for its use, is illegal under the Criminal Code and subject to sanctions.

Recent public policy changes in various jurisdictions in the United States and the legalization of cannabis in Canada have increased availability, which (much like the situation for alcohol availability) is expected to increase impaired driving (Canadian Centre on Substance Use and Addiction, 2020). According to Statistics Canada survey data (Statistics Canada, 2020), there was a small increase, from 14% to 17%, in the proportion of Canadians reporting use of cannabis in the prior 3 months between 2018 (before legalization) and 2019. US data extrapolated to the Canadian context have been projected to result in as many as 308 additional driving fatalities annually (Windle et al., 2021).

Consideration should be given to informing the appropriate licensing authority if the medical condition for which the cannabis is being taken or the use of medical marijuana could interfere with a patient's ability to drive safely, or if addiction involving cannabis is present.

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Section 7 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 that are listed in this guide 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 these 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 (Transport Canada, 2022). 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 voluntary restrictions 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 (Iverson et al., 2010). 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 B).

FIGURE 1: The 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 pre-syncope (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 affect 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, Byszewski AM, Marshall SC, Man-Son-Hing M. In-office evaluation of medical fitness-to-drive. Practical approaches for assessing older people. *Can Fam Physician.* 2005;51(3):372-9 (https://www.cfp.ca/content/cfp/51/3/372.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.

Molnar and Simpson (2010) 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, Functional assessment — emerging emphasis, 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 Appendix C, Canadian Cardiovascular Society's risk of harm formula). Chronic persistent disorders (called "permanent limitations" in Section 2, Functional assessment — emerging emphasis) 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 their 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 (2010).

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 of Canada and the Royal College of Physicians and Surgeons of Canada should be considered.

To learn more about assessing fitness to drive in older patients, see the *Canadian Geriatrics Society Journal of CME* (https://www.geriatricsjournal.ca/).

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Section 8 Dementia

Alert

- Cognitive screening alone cannot be used to determine fitness to drive, except when valid test scores are in the severely impaired range.
- If a patient's fitness to drive is unclear, the physician should recommend further 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 trend implies that the number of older drivers with dementia will also increase significantly. Physicians need to be aware 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 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 cerebrovascular lesions. Parkinson 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. Literature reviews have shown great variability in whether there is an increased risk of collision among those with dementia, but have consistently shown an increased risk of decline in driving skills and of failure in on-road driving tests, even at mild stages of dementia (Man-Son-Hing et al., 2007; Chee et al., 2017).

8.2 Earlier Canadian dementia guidelines

The Third Canadian Consensus Conference on Dementia (CCCD3; Hogan et al., 2007, 2008) set out the following recommendations on fitness to drive for patients with dementia:

- 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 (IADLs) or any of the basic activities of daily living (ADLs). 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 Mini-Mental State Examination (MMSE), has sufficient sensitivity or specificity to be used as a single determinant of driving ability. However, abnormalities on tests, including the MMSE, clock-drawing test, and Trail Making Test part B (also known as the Trails B test), 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: These recommendations were rated by the 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 Updated guideline recommendations

For this chapter (which was updated for edition 9.1 of the CMA Driver's Guide, published in 2019), we followed the framework of the Guidelines International Network (Schünemann et al., 2014) and the ADAPTE process for updating clinical practice guidelines (ADAPTE Collaboration, 2009). We assembled an international knowledge synthesis and guideline update team, which included researchers from Canada, Australia, Belgium, Ireland, England, and the United States. The recommendations in Table 2 are based on this rigorous evidence-informed process (Rapoport et al., 2018).

8.4 Reporting according to stage of dementia

To date, there are no published guidelines as to when patients with mild dementia should be reported in jurisdictions with mandatory physician reporting (see Table 1 in Section 3, Reporting — when and why). However, it is clear, given the guidelines listed in Section 8.2, 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 activities of ADLs or the loss of two or more IADLs (including medication management, banking, shopping, use of the telephone, or cooking) because of cognitive problems.

Another means of defining stages of dementia is the CDR Dementia Staging Instrument (https://knightadrc.wustl.edu/cdr/cdr.htm). A score of 2 (moderate dementia) or 3 (severe dementia) on this scale would preclude driving. Unfortunately, this 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.

8.5 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 screen for cognitive impairment or dementia, rather than to identify unsafe drivers. Furthermore, none has yet consistently shown reliable cut-offs beyond which patients' driving becomes unsafe.

The most studied office-based screening tool for potential concerns about fitness to drive is the Trail Making Test part B, which has a recommended three-minute or three-error cutoff, also known as the "3 or 3 rule" (Roy and Molnar, 2013). Emerging evidence may point to shorter time cut-offs, but it is too early to make any such change, given the limited evidence that is currently available.

TABLE 2 (part 1 of 2): Consensus recommendations on fitness to drive in patients with dementia*

#	Recommendation	Class of Evidence	Agreement†
1	Dementia often has a direct effect upon fitness to drive, and clinicians should address cognitive compromises that may impact fitness to drive.	C	96.60%
2	Diagnosis of dementia alone is not sufficient to withdraw driving privileges.	A	93.80%
3	Severe dementia is an absolute contraindication to driving.	C	96.60%
4	It is unlikely that safe driving can be maintained in the presence of moderate dementia (e.g., the additional presence of basic ADL impairments) and is to be strongly discouraged. If the patient desires to drive, they should be formally assessed and monitored very carefully.	B	92.40%
5a	People with dementia with progressive loss of 2 or more IADLs due to cognition (but no basic ADL loss) are at higher risk of driving impairment.	A	95.20%
5b	A formal assessment and ongoing monitoring of fitness to drive is recommended in this situation if the patient wishes to continue driving.	B	93.80%
6a	No in-office test or battery of tests, including global cognitive screens (e.g., MMSE, MoCA), has sufficient sensitivity or specificity to be used as a sole determinant of driving ability *in all cases*.	A	97.20%
6b	However, abnormalities on these tests may indicate a driver at risk who is in need of further assessment.	B	95.90%
6c	Substantially impaired scores, which are typically associated with moderate to severe dementia, may preclude safe driving.	C	84.10%
6d	If concerns or uncertainty still exist, a specialist opinion should be sought.	C	81.40%
7	Patients with dementia who are deemed fit to continue driving should be re-evaluated every 6 to 12 months or sooner, if indicated.	B	93.10%
8a	Any clinician who has concerns but is uncertain whether a patient's cognitive problems may adversely affect driving should refer the patient for a functional driving assessment, either through an occupational therapy evaluation or directly to the licensing authority.	C	85.50%
8b	If there are clear aspects of the history, physical examination, and cognitive examination that place the patient and public at high risk for crash or impairment, the patient and informant/ caregiver should be advised not to drive, and this conversation (including date and participants) should be documented in the clinical record.	C	96.60%
8c	Clinicians should be aware of the legal reporting requirements in their jurisdiction, be mindful of their professional ethical imperatives, and strive to ensure that mechanisms to remove unsafe drivers from the road are sensitive, timely, and effective.	C	85.50%
9a	Caregivers are able to predict driving safety more accurately than can the patients themselves, although in some circumstances, the caregivers may have a vested interest in preserving the patient's autonomy beyond a safe window …	C	82.10%
9b	… Hence, caregiver concern about driving impairment should be taken seriously …	B	96.60%
9c	… and the possibility of a conflict of interest in preserving driving autonomy must be taken into consideration if such caregiver concern is absent.	C	92.40%
10	Medical comorbidities, physical frailty, and the use of multiple medications are also factors that must be taken into consideration when assessing fitness to drive.	C	93.10%

TABLE 2 (part 2 of 2): Consensus recommendations on fitness to drive in patients with dementia*

#	Recommendation	Class of Evidence	Agreement†
11	We recommend a formal evaluation if behavioural disturbances (e.g., agitation, personality change, psychosis) are concerning for interfering with safe driving.	C	85.50%
12	Patients with prominent language impairment, e.g., primary progressive aphasia or other aphasia in the context of dementia, cannot be adequately screened with typical language-based tests and require a specialized assessment possibly from a speech therapist or neuropsychologist, functional assessment (IADLs, ADLs), and/or a formal driving assessment.	C	84.10%
13	As with many disabling progressive diseases that lead to driving cessation, conversation regarding eventual retirement from driving should be held as early as possible.	C	89.00%
14a	Driving cessation has been associated with social isolation, depression, and other adverse health outcomes.	C	90.30%
14b	Therefore, after a person with dementia has stopped driving, it is important to monitor for these problems longitudinally.	C	87.60%

*Adapted with permission from Springer Nature Customer Service Centre GmbH: Springer Science+Business Media, LLC, part of Springer Nature, *Current Psychiatry Reports* (DOI: https://doi.org/10.1007/s11920-018-0879-x), "An international approach to enhancing a national guideline on driving and dementia" by M.J. Rapoport, J.N. Chee, D.B. Carr, et al., © 2018. For specific methods and more detailed commentary on these recommendations, see the source article (Rapoport et al., 2018) (DOI: https://doi.org/10.1007/s11920-018-0879-x).

†Agreement refers to the percentage of the 145 participants in the consensus process who agreed with each recommendation.

Note: ADLs = activities of daily living, IADLs = instrumental activities of daily living, MMSE = Mini-Mental State Examination, MoCA = Montreal Cognitive Assessment.

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. As outlined in recommendation 6a in Table 2, no single test currently available has sufficient sensitivity or specificity to accurately predict, in the medical office setting, a person's driving safety *in all situations*, but certain tests may be helpful in some situations. If cognition is impaired severely enough (i.e., test results are so poor that test sensitivity is not a concern), the results may be specific enough (i.e., unlikely to represent false results) to justify reporting the findings to the ministry of transportation 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 screening tests can be substantial, both for safe drivers who are inappropriately deprived of independent mobility and for unsafe drivers who continue driving and thereby place themselves and others at risk.

It is recommended that physicians administer more than one 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 part B, or other in-office tests are markedly abnormal (i.e., where the results are concerning, specific, and believable), consideration should be given to whether the patient has moderate or severe dementia, taking into account the person's medical 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 by Molnar et al. (2012) suggests applying the following considerations when using in-office screening tests:

- **Determine whether 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 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 whether the patient is fit to drive or needs more testing on the basis, in part, of 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.

To help make a decision, the physician should ask the following two questions after reviewing the results of cognitive tests, the findings of a physical examination, and the person's driving history:

Given the results of my clinical assessment,

- would I let a loved one get into a car that this patient is driving?
- would I want to have a loved one cross the street in front of a car that this patient is driving?

For each question, three 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, and hence that the physician's assessment of the patient should be forwarded to the ministry of transportation and the patient advised not to drive unless authorized by the ministry of transportation).

Test results do not stand alone but should be considered in the context of more detailed approaches, such as those described in the following resources:

1. An article in the November 2010 issue of *Canadian Family Physician* (Molnar and Simpson, 2010).
2. An article about driving and dementia toolkits in the *Canadian Geriatrics Society Journal of CME* (Byszewski, Molnar et al., 2012).
3. *The Driving and Dementia Toolkit for Health Professionals*, 3rd edition, developed by the Champlain Dementia Network and the Regional Geriatric Program of Eastern Ontario (Aminzadeh et al., 2009).

8.6 When fitness to drive remains unclear

Some provinces, specifically Quebec, Saskatchewan, and British Columbia, offer ministry-funded on-road testing for drivers with potentially compromised driver fitness, including those with cognitive problems.

Other provinces do not provide ministry funding for on-road testing. In these latter provinces, the patient is required to pay for the comprehensive on-road test (at a cost of up to $800), which is performed by a ministry-approved private company and is generally conducted by an occupational therapist.

Physicians should inform themselves about the particular arrangement in their respective jurisdictions and should inform patients and their families that repeat testing may be required every 6 to 12 months even if the person with dementia passes the initial test.

8.7 Counselling patients with dementia who can still drive safely

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,* 2nd edition (Byszewski et al., 2011). The patient's fitness to drive should be reassessed every 6 to 12 months, or more frequently if the cognitive impairment progresses (as per recommendation 7 in Table 2). For further information on driving cessation, see Section 4, Driving cessation.

8.8 Disclosure of unfitness to drive

When a patient is found to be unfit to continue driving, the discussion between the physician and the patient is a delicate one, since a poorly chosen word may upset and traumatize the person, when the intention is to help the person 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 (Byszewski, Aminzadeh et al., 2012).

8.9 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 their licence revoked, the physician should monitor for these problems in the course of scheduled follow-up. It is also important to enlist family members and obtain their help in creating a transportation plan for the patient that allows access not only to required appointments (e.g., medical, banking), but also to the social activities that are needed to maintain quality of life.

8.10 Countermeasures

There are few data to support the safety of restricted licensing, co-piloting, or other countermeasures for persons with dementia (Iverson et al., 2010).

8.11 Driving and Dementia Roadmap

The website "Driving and Dementia Roadmap" (https://drivinganddementia.ca/) is a useful resource. This website is intended for use by people living with dementia, caregivers of people living with dementia, and health care providers, with a separate portal for each of these three groups. In addition, for people with dementia and their caregivers, there are separate portals for those who have stopped driving and for those who continue to drive.

The website is based on an intervention framework that addresses both practical components and emotion-focused components of driving cessation. The practical components include information about the risks associated with driving and dementia, information about risk factors and warning signs, communication strategies, and advanced planning for mobility. The emotion-focused components include methods of addressing the impact of driving cessation on relationships, the crises and conflicts that may develop, and the loss and grief associated with this major life transition.

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Section 9 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 3rd edition of the *International Classification of Sleep Disorders* (American Academy of Sleep Medicine, 2014) outlines six categories of sleep disorders: insomnia, sleep-related breathing disorders, central disorders of hypersomnia, circadian rhythm sleep–wake disorders, parasomnias, and sleep-related movement disorders.

The recommendations that follow relate primarily to obstructive sleep apnea (OSA) and narcolepsy, the two 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
- history of drowsy driving
- daytime sleepiness
- recent (within a year) at-fault motor vehicle crash.

Patients with various sleep disorders may also have one 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 older than 40 years of age are also at increased risk of OSA.

Patients with excessive somnolence and one 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 (Blackman et al., 2010).

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 two to three times that of control groups (Mulgrew et al., 2008), with a risk for single and multiple crashes increasing with sleep apnea severity (Komada et al., 2009; Gottlieb et al., 2018). In severe cases of OSA, the risk of a motor vehicle crash may be increased as much as 10-fold (Arita et al., 2015). 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 (George, 2001), particularly in patients with adequate treatment adherence (Karimi et al., 2015). 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 (Haraldsson et al., 1995; Alkan et al., 2021), 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 [Ng et al., 2017], modification of sleeping position, elimination of alcohol and sedatives before sleep) or through the use of oral appliances (Phillips et al., 2013). 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 or treatment with an oral appliance 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.
- Recommendations for fitness to drive vary from one province or territory to another according to provincial and territorial driving safety rules.

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 four times that of control groups (Aldrich, 1989). Patients with cataplexy and sleep paralysis are believed to be at greatest risk for crashes, based on the relative unpredictability of these symptoms. In an online registry of patients with narcolepsy (with assessments completed every 6 months), almost 20% of patients reported a motor vehicle crash or near miss while driving (Ohayon et al., 2018). Younger age, higher score on the Epworth Sleepiness Scale, and presence of a psychiatric condition were associated with higher probability of a crash or a near miss. There is little information about the effect of treatment on risk for crashes.

9.4.1 Driving recommendations for patients with narcolepsy

- 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.

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Section 10 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
- lack of insight or lack of cooperation with treatment that would increase the risk of relapse of mania or psychosis
- 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; Kessler et al., 2005) or the Adult ADHD Self-Report Screening Scale for DSM-5 (ASRS-5; Ustun et al., 2017), 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. Given that many psychiatric disorders are chronic and subject to relapse, 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 one or more psychiatric disorders may well be safer drivers with psychotropic drugs than without them.

Although driving-risk researchers have focused on the major clinical psychiatric disorders, physicians must also consider substance use disorders (see Section 5, Alcohol, and Section 6, Drugs), personality disorders, the effects of psychosocial stressors, and the patient's functional capacity when they are 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. The COVID-19 pandemic has greatly increased the prevalence of such factors and the potential risk of motor vehicle crashes (Vingilis et al., 2020, 2021).

Any significant reduction in functional capacity, especially of a cognitive nature, should alert the physician that further assessment is needed. In particular, post–COVID-19 syndrome (also known as "long haul syndrome" or simply "long COVID") may be a complication in 10% to 30% of those infected with SARS-CoV-2 (Vanichkachorn et al., 2021).

In some cases, suicide has been attributed to the removal of driving privileges, usually in older men (Ko et al., 2021). 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 *Diagnostic and Statistical Manual of Mental Disorders* (5th edition, known as DSM-5; American Psychiatric Association, 2013) and its latest revision (DSM-5, text revision, known as DSM-5-TR, https://psychiatry.org/Psychiatrists/Practice/DSM/Frequently-Asked-Questions#4111; American Psychiatric Association, 2022) have been subject to considerable criticism, but they remain the best we have in progressing toward a diagnostic system that is based on signs representing 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-TR may wish to consider *The Pocket Guide to the DSM-5-TR Diagnostic Exam* (Nussbaum, 2022).

Rapoport et al. (2021), in a comprehensive international systematic review, drew the following conclusions:

> The available study evidence is limited in number, of heterogenous study design and not of high quality. However, there is some evidence for increased risk, which justifies the presence of guidelines which encourage non-driving periods (in cases of acute symptoms and periods of adjustment to treatments), licence conditions and requirements for regular medical review for those with longer term psychiatric disorder. The current research evidence makes it difficult to quantify the magnitude of this increased risk on either a general, or specific diagnosis basis and therefore does not support blanket restrictions. The characteristics of people with psychiatric disorder most at risk of MVC [motor vehicle crash] have not been clearly identified. However, as with any condition that may impact cognition, judgement and insight, the individualised case-by-case approach recommended by international guidelines should continue.
>
> Further research should include objective assessments of psychiatric disorder and MVC risk considering measurement of exposure as a confound, identification of risk factors for MVC among those with psychiatric disorder, delineation of the role of treatment and consideration of impacts of long-term psychiatric disorders and its' [sic] treatments on on-road driving performance.

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 predictive of driving ability only 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 one or more psychiatric disorders 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 their willingness to adapt their 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 their 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) advised 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 had 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 with typical antipsychotic medications.

Cuesta et al. (2011) reported on the usefulness of two 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; Hurford et al., 2011) and the Screen for Cognitive Impairment in Psychiatry (SCIP; Gómez-Benito et al., 2013). Both brief testing instruments showed good to excellent concurrent validity, relative to a Global Cognitive Composite Score derived from a more comprehensive testing methodology, and seem to be reliable and promising tools, although not directly predictive of on-road driving performance; they may be useful resources in assessment of selected cases.

Patients who are taking their prescribed medication, are not actively hallucinating, and have no active delusions, thought disorder, or cognitive or motor adverse effects from antipsychotic medication are 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 constitute a more controversial area. The locus of distress is often with others, not with the individual who has been given the diagnosis. The behavioural pattern is defined as 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 behaviours 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. Please also see Section 10.4.7, Aggressive driving, and Section 16.2, Moderate to severe TBI, for information about driver aggression.

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 that affects short-term memory, concentration, or mental processing speed. The SCIP (described in Section 10.4.1) is an appropriate screening tool that may be used to assess for the presence of cognitive impairment in patients with depression as well as 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 (Kennedy et al., 2016). Tricyclic antidepressants have been associated with an increased risk of motor vehicle crashes, especially at higher doses or if multiple agents are used (Rapoport et al., 2011). Theoretically, selective serotonin reuptake inhibitors and other newer-generation antidepressants have a pharmacologic profile associated with lower risk of cognitive impairment, but evidence in the literature is less clear (Yang et al., 2016).

As reported by Hill et al. (2017),

> Antidepressants have potentially conflicting contributions to motor vehicle crashes in relieving the effects of depression and suicide while posing side effects that may affect driving. While the benefits of antidepressants outweigh their potential risks, prospective studies are needed to better understand the risk of antidepressants and depression on motor vehicle crashes. …
>
> In determining the effects of depression and antidepressants, it is difficult to distinguish effects of depression from effects of drugs [from studies published to date]. …
>
> Based on the reports of the studies included in this analysis, depression and antidepressants pose a potential hazard to driving safety. Physicians and other health providers, including pharmacists, should recognize the inherent risks of both the disorder and medications on driving and educate their patients accordingly. More research is needed to understand the individual contributions of depression versus the medications used to treat depression and to identify strategies to mitigate the effect of both on driving safety.

A challenging issue for investigators is that interpretation of this research is limited by indication and channelling bias (Petri and Urquhart, 1991). Channelling is a form of allocation bias, whereby drugs with similar therapeutic indications are prescribed to groups of patients with prognostic differences. The general principles outlined in this section and especially the alert box should be of foremost consideration.

Electroconvulsive therapy (ECT) may induce sustained confusion in 1 of every 200 patients (McClintock et al., 2014; Johns Hopkins University, Department of Psychiatry and Behavioral Sciences, 2017). 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 (relative risk ratio, 2.25; 95% confidence interval [CI], 1.05–4.82) (see also Section 10.4.6, Attention-deficit/hyperactivity disorder).

Because of frequent comorbidity, patients with a diagnosis of 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 posttraumatic 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, 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 three areas of driving-related concerns: panic-related, crash-related, and social.

A meta-analysis by Rapoport et al. (2009) showed that benzodiazepine users were at a significantly increased risk of motor vehicle crashes relative to non-users. This difference may be accounted for by difficulty in maintaining road position.

Although benzodiazepines may increase the risk of motor vehicle crashes, low-dose clonazepam (1.0–2.5 mg/d), which is sometimes a useful primary maintenance treatment for panic disorder (Nardi et al., 2013; Perna et al., 2016), 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 in relation 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 is not, in itself, a contraindication to driving. However, 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 (Aduen et al., 2019; Norloff, 2020).

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. ADHD in childhood and ADHD in adulthood share many polygenes, which suggests that the genetic etiology is almost the same as the childhood presentation and is persistent (Rovira et al., 2020).

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 (2018),

> 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 found 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.

A multisite 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. Accounting for demographic differences, ADHD but not depression was associated with about twice the risk for multiple violations (relative risk ratio, 2.27; 95% CI, 1.48–3.49), multiple collisions (relative risk ratio, 2.21; 95% CI, 1.31–3.74), and collision fault (relative risk ratio, 1.65; 95% CI, 0.98–2.78). 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 healthy adults in the general population.

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

Chang et al. (2014) studied the association between ADHD and the risk of a serious motor vehicle crash (defined as an emergency hospital visit or death due to a motor vehicle crash) and explored whether ADHD medication influences this risk among patients with the condition. This study showed that drivers with ADHD had lower risk for a motor vehicle crash when they were taking medication than when they were not.

In a later study, Chang et al. (2017) showed that up to 22.1% of motor vehicle crashes involving patients with ADHD could have been avoided if they had received medication for the entire follow-up period.

Dr. Laurence Jerome developed the Jerome Driving Questionnaire (JDQ), now hosted by the Canadian ADHD Resource Alliance (https://www.caddra.ca/wp-content/uploads/JDQ.pdf); this resource is in the public domain.

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 (Richards et al., 2002, 2006; Barkley, 2018). 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. See also Section 16.2, Moderate to severe TBI.

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 patients with trauma than among 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 cognitive behaviour therapy groups, where available. Those without insight will likely be dealt with only 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 the ability to drive. See Section 6.3.7, Antidepressants and antipsychotics.

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Section 11 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 adherence, 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 non-commercial 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 14.7, 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 3) and text format.

11.4.1 Single, unprovoked seizure before a diagnosis

Non-commercial drivers: These patients should not drive for at least 3 months and not before a complete neurologic evaluation — including electroencephalography (EEG) with recording while awake and asleep 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 guideline for non-commercial drivers and not drive non-commercial vehicles for at least 3 months after a single unprovoked seizure. If a complete neurologic evaluation, including EEG while awake and asleep 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.

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 antiseizure medication. However, patients with juvenile myoclonic epilepsy (Janz syndrome) may not drive any class of vehicle unless they are taking appropriate antiseizure medication.

Non-commercial 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 adverse 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 adherence 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 adherence and dose appropriateness should be supported by measurement of drug levels whenever reasonably possible.

TABLE 3: Recommendations for drivers who have experienced seizure

Type of seizure	Non-commercial drivers	Commercial drivers
Single, unprovoked seizure before a diagnosis (including post-traumatic seizures not related to epilepsy)	• No driving for at least 3 months and • Neurologic assessment, preferably including EEG (awake and asleep) and appropriate imaging	• No driving non-commercial vehicles for at least 3 months and • Neurologic assessment, including EEG (awake and asleep) and appropriate imaging • If no epilepsy diagnosis, resume professional driving if seizure-free for 12 months
After a diagnosis of epilepsy	Resume driving if: • 6 months seizure-free* on medication • Physician has insight into patient adherence • Physician cautions against driving while fatigued and against alcohol use	• Resume driving if 5 years seizure-free (recommendations for individual patients may differ on an exceptional basis)
Juvenile myoclonic epilepsy (Janz syndrome)	• No driving of any class of vehicle unless taking appropriate antiseizure medication	
After surgery to prevent epileptic seizures	• Resume driving if 12 months seizure-free after surgery, with therapeutic drug levels (recommendations for individual patients may differ on an exceptional basis)	• Resume driving if 5 years seizure-free (recommendations for individual patients may differ on an exceptional basis)
Seizures only in sleep or immediately on wakening	• Resume driving after 12 months from initial seizure if drug levels are therapeutic	• No driving commercial vehicles for at least 5 years
Medication withdrawal or change:		
Initial withdrawal or change	• No driving for 3 months from the time medication is discontinued or changed	• No driving for 6 months from the time medication is discontinued or changed
If seizures recur after withdrawal or change	• Resume driving if seizure-free for 3 months	• 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	• Resume driving any vehicle if seizure-free off medication for 5 years with no epileptiform activity within previous 6 months on EEG (awake and asleep)	
Auras (simple partial seizures)	Resume driving if: • 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	Resume driving if: • 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
Seizures induced by alcohol withdrawal	Resume driving if: • Has remained alcohol-free and seizure-free for 6 months • Has completed a recognized rehabilitation program for substance dependence • Is adherent with treatment	

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

Note: EEG = electroencephalography.

- **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 one 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 adherence 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, and they frequently must drive 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

Non-commercial drivers: These patients should be seizure-free for 12 months after the surgery and should be 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

Non-commercial drivers: Patients with epilepsy involving seizures that only occur while they are asleep or immediately after wakening can be recommended for a non-commercial 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 antiseizure 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 non-commercial 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. Non-commercial 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 antiseizure 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 EEG while awake and asleep, obtained in the 6 months before resumption of driving.

11.4.6 Auras (simple partial seizures)

Non-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 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, whether or not the person has epilepsy. 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 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.

11.5.1 Post-traumatic seizure

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

Non-commercial 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.

11.5.2 Post-traumatic epilepsy

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

11.6 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 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 syndrome, Huntington 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 they can drive safely.

If the disorder is not progressive, a single 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).

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.

11.7 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 driving evaluation may be indicated; see Section 2, Functional assessment — emerging emphasis.

11.8 Intracranial tumours

A patient who wishes to resume non-commercial 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 disease and parkinsonism

During the early stages, Parkinson 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, adverse 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; www.mocatest.org) may be useful in this regard, followed by an on-road test.

Resources

Koppel S, Di Stefano M, Dimech-Betancourt B, Aburumman M, Osborne R, Peiris S, et al. Influence of epilepsy and/or seizure disorders on MVC risk. In: Charlton JL, De Stefano M, Dow J, Rapoport MJ, O'Neill D, Odell M, et al., project leads. *Influence of chronic illness on crash involvement of motor vehicle drivers.* 3rd ed. Report 353. Victoria, Australia: Monash University Accident Research Centre; 2021 Mar. p. 29-42. Available: https://www.monash.edu/__data/assets/pdf_file/0008/2955617/Chronic-illness-and-MVC-risk_Report-MUARC-report-no-353_JUNE2022.pdf (accessed 2022 July 4).

Koppel S, Di Stefano M, Dimech-Betancourt B, Aburumman M, Osborne R, Peiris S, et al. What is the motor vehicle crash risk for drivers with epilepsy? *J Transport Health.* 2021;23:101286.

Section 12 Vision

Alert

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

- Visual acuity: For non-commercial drivers, corrected vision worse than 20/50 (6/15) with both eyes open and examined together; for commercial drivers, refer to visual acuity standards in the particular jurisdiction.
- Visual field: For non-commercial 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 in the particular jurisdiction.
- 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.

*The province of Quebec has different requirements for non-commercial drivers (e.g., 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 (Patterson et al., 2019). In these circumstances, functional assessments are indicated.

This section begins by presenting information about the recommended visual acuity and visual field needed for safe driving. 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 and recommendations for exceptional cases that require individual assessment. It also provides a list of medical conditions with increased risk for vision problems and a discussion of the use of vision aids in driving.

12.2 Recommended visual functions

12.2.1 Visual acuity (corrected)

Drivers' visual acuity must allow them 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.

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

*Some jurisdictions require an acuity better 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 visual field 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 Section 12.5, Medical conditions and vision aids for driving. 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.

Class of licence	Recommended visual field
Non-commercial (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, optometrist, or occupational therapist that adequate adjustment for driving has occurred. The treating specialist should be experienced in driving assessment.

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 formal testing standards exist for colour vision, all drivers should be able to discriminate among traffic lights.

12.3.2 Contrast sensitivity

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. Individuals with reduced contrast sensitivity may experience difficulty with driving, especially at night or during bad weather, in spite of meeting visual acuity requirements. There are no quantitative minimum requirements for contrast sensitivity; however, drivers are required to be able to discriminate among traffic lights of different colours.

12.3.3 Depth perception

Motor vehicle crashes sometimes occur because of the driver's inability to judge distances accurately. 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.

Judging distance is a skill that can be learned, even by people with monocular vision, who would fail standard tests for stereopsis. 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 test is a specialized visual field test 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 tool and of the importance and complexity of visual information processing for safe driving.

12.3.6 Monocularity

The definition of monocularity varies within the literature, ranging from either complete loss of vision in one eye or impairment of vision below a specific cut-off (such that the second eye is functionally noncontributory) to binocular summation. For the purposes of this guide, monocularity is defined as visual acuity of 20/200 or worse and/or a visual field of 20° or narrower in one eye (legal blindness), or removal of one eye. Patients who are newly monocular should have a full ophthalmological examination, including acuity and visual field testing, before they return to driving. The literature suggests that 50% of patients will adjust to monocularity for many daily tasks

within 1 month and 93% will have adjusted by 1 year (Linberg et al., 1988; McLean, 2011). A repeat examination should be scheduled for 3 months from the initial baseline exam and a follow-up consultation (with ancillary testing if needed) for 1 year from the baseline exam. Newly monocular patients may return to driving once their treating ophthalmologist has completed baseline (and any additional) screening as outlined above and is satisfied that they have adapted well to their monocular status. Individuals who are monocular from the beginning of their driver training (e.g., were monocular as children), as well as those who have had a slow loss of vision in one eye, are able to drive, provided they meet the criteria outlined elsewhere in this guide.

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. Conversely, 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.

12.5 Medical conditions and vision aids for driving

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

- 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

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, such as *British Columbia (Superintendent of Motor Vehicles)* v. *British Columbia (Council of Human Rights)*, 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, drivers must demonstrate that the use of the low-vision aid permits them 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. If the licence is obtained using a vision aid, then the driver must always use the vision aid while driving.

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Section 13 Auditory and vestibular disorders

Alert

- Auditory disorders can be permanent or temporary.
- There are no hearing standards for non-commercial drivers in Canada.
- Some commercial drivers are subject to hearing standards.

13.1 Overview

Studies have failed to demonstrate that hearing impairment has a significant effect upon the risk of a motor vehicle crash. Drivers of non-commercial vehicles have never been subject to hearing standards, whereas commercial drivers have been required to meet standards designed to ensure their capability to perform tasks associated with the type of vehicle or the particular cargo being transported. These standards for commercial drivers are facing legal challenges across Canada, as it is claimed that they do not address fitness to drive but are, in fact, job requirements that are unrelated to the person's fitness to actually drive the vehicle safely.

However, people with severe hearing loss will have limited ability to detect emergency sirens and other roadside sounds (e.g., train horns and crossings). Where applicable, these individuals should be encouraged to wear hearing assistive devices while driving, whether or not they are subject to a hearing standard.

Vestibular dysfunction causing vertigo may affect a person's ability to drive.

13.2 Hearing

13.2.1 Standards

The hearing standard for drivers is an anomaly among the medical standards describing fitness to drive. All of the other standards are justified by a demonstrated increase in crash risk or the evident danger to road safety of a given medical condition. Thus, although there are no studies establishing that a blind person is at increased risk of crash involvement, it is evident that they should not drive. In contrast, studies have failed to demonstrate that hearing impairment has a significant effect upon the risk of a motor vehicle crash (Dow et al., 2022), and drivers of non-commercial vehicles have never been subject to hearing standards. Opposition to the hearing standard's role in establishing fitness to drive is often justified by the observation that, if the standard is really a "fitness-to-drive" standard, it would apply to all drivers, not just commercial drivers. Since the hearing standard does not have this broad application, it is argued that it should not be included in the medical standards at all.

Current hearing standards apply only to commercial drivers of certain vehicles — buses, emergency vehicles, taxis, and vehicles carrying dangerous cargoes — as well as Canadian drivers wishing to drive commercial vehicles in the United States. In other words, the hearing standard does not address fitness to drive the vehicle itself, as do all the other medical standards, but rather the driver's ability to perform the ancillary duties included in their employment. Thus, it is really addressing valid road safety requirements for drivers of such vehicles that are job requirements, not fitness-to-drive considerations.

The Canadian hearing standard (Canadian Council of Motor Transport Administrators, 2021) requires that a driver acquiring or maintaining a Class 2 or Class 4 driver's licence, those transporting dangerous goods with a Class 1, 3, or 5 licence, or any Canadian driving a Class 1–4 vehicle in the United States must be able to perceive a forced whispered voice at not less than 5 ft (1.5 m) with or without the use of a hearing aid or must have a hearing loss no greater than 40 dB averaged at 500, 1000, and 2000 Hz in their better ear. These drivers 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%.

The hearing standard is probably the most complicated standard for a driver licensing agency to apply. Although at first view, the hearing standard appears to apply only to drivers who actually drive those particular classes of vehicle, that impression is false.

In Canada, the attribution of a licence for a given class will include all of the classes up to the attributed class. Thus, a Class 3 licence will include Classes 4 and 5, and a Class 1 licence will include Classes 2, 3, 4, and 5, unless the driver has specifically requested the exclusion of one or more of the included classes. As such, a driver with a Class 1 licence who holds all the classes but only drives an articulated truck (Class 1) and never transports dangerous goods or goes to the US in their truck and who has impaired hearing that is below the standard should lose their Class 2 and Class 4 licence, in addition to having their licence restricted as far as transporting dangerous goods and going to the US is concerned. (The fact that they do neither of the latter is immaterial as far as licensing is concerned.)

It should also be noted that even a driver holding only a Class 5 licence (a so-called non-commercial driver) may be required to meet the hearing standard if the pick-up truck or small van that they drive at work is carrying dangerous goods in sufficient quantities to require dangerous cargo warnings.

The Canadian hearing standards for commercial drivers are currently under review and their eventual abolition is a possibility.

In case of doubt or failure on a screening test such as the whisper test, an appropriate audiometric assessment should be performed.

13.2.2 Hearing assistive devices

Even if they can be provided with a noise reducer, hearing aids and cochlear implants amplify ambient noise, which may cause fatigue or annoyance. Furthermore, if the devices are not functioning properly, they may mask warning sounds that the driver should be able to hear. If the physician performing the examination thinks the driver is at risk because of their hearing condition, the person should be referred to the hearing professional who has already examined them to assess the permanent or correctable nature of the problem.

13.3 Vestibular disorders

Vestibular disorders can be categorized according to the specific diagnoses. However, any vestibular disorder can seriously affect driving ability.

13.3.1 Benign paroxysmal positional vertigo

Benign paroxysmal positional vertigo is by far the most frequent cause of peripheral vertigo; the disability is temporary, typically lasting less than 2 months. Usually, a person with this type of vertigo is safe to drive unless there is sensitivity to horizontal head movements, in which case the person should be advised not to drive until their condition has subsided or responded to treatment.

13.3.2 Labyrinthitis or vestibular neuronitis

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. Recovery is progressive over 1 to 2 months. A patient should not drive during this period. Uncommonly, the disorder can recur, but this is not an indication to recommend suspension of the driver's licence.

13.3.3 Menière disease

The physician should assess whether patients with Menière disease or other causes of recurrent acute vertigo remain fit to drive. Those prone to severe, prolonged attacks or chronic imbalance require evaluation by an otolaryngologist for further investigation and adequate treatment. These patients should be advised to pull off the road at the first sign of an acute attack, until their symptoms subside, and they may wish to avoid driving long distances alone. Menière disease can cause permanent hearing loss; such hearing loss must be assessed for commercial drivers who are subject to the hearing standard.

13.3.4 Drop attack

Tumarkin (non-syncopal drop) attacks can be related to Menière disease. If the person is symptomatic while sitting or the attacks are associated with disabling symptoms such as aura, nausea, or light-headedness, the person should not drive until their symptoms have been investigated and controlled with medical treatment.

13.3.5 Chronic bilateral vestibular hypofunction

Menière disease, labyrinthitis, and vestibular neuronitis can be bilateral and may evolve toward symptomatic chronic vestibular hypofunction.

Most patients with fixed bilateral vestibular hypofunction are safe to drive if they have no acute attacks of vertigo and rely more on vision and proprioception for spatial cues. Those with complete bilateral vestibular loss will have difficulty driving in darkness or on bumpy roads, and they may not be safe to drive under those conditions. In such cases, a road test conducted under those conditions, if available, may be the best indicator of driving ability and safety.

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Section 14 Cardiovascular diseases

Alert

- Patients with unstable cardiac disease 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 2023 Canadian Cardiovascular Society (CCS) guideline on fitness to drive (Canadian Cardiovascular Society, 2023). 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 (Tables 4 to 10). Details regarding these and other recommendations can be found in the full report.*

The recommendations are based on expert opinion using the "risk of harm" formula developed by the CCS, as described in Appendix C. 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.

For purposes of its medical fitness-to-drive standards, the CCS has adopted the New York Heart Association (NYHA) functional classification and the left ventricular ejection fraction (LVEF) as indicators of the severity of most cardiovascular disorders. These indicators are used throughout this section.

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 physiological grounds that the cardiovascular workload imposed by driving a vehicle is very light and that 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 can present with sudden cardiac incapacitation, it is not possible with contemporary risk stratification to identify these patients in advance in a meaningful way.

*Guerra PG, Simpson CS, Van Spall HGC. 2023 Canadian Cardiovascular Society guidelines on the fitness to drive. *Can J Cardiol* 2023 Oct. 9 [online]. Available: https://onlinecjc.ca/article/S0828-282X(23)01755-5/fulltext. Used with permission.

TABLE 4: Recommendations for fitness to drive for patients with coronary artery disease

Condition	Non-commercial drivers	Commercial drivers
ACS: PCI performed		
STEMI, LVEF ≤ 40%	May resume driving after 1 month	May resume driving after 3 months
STEMI, LVEF > 40%	May resume driving after 2 weeks	May resume driving after 1 month
NSTEMI, LVEF ≤ 40%	May resume driving after 1 month	May resume driving after 3 months
NSTEMI, LVEF > 40%	May resume driving after 2 weeks	May resume driving after 1 month
ACS without MI (unstable angina)	May resume driving after 48 hours	May resume driving after 7 days
ACS: PCI not performed		
STEMI	May resume driving after 1 month	May resume driving after 3 months
NSTEMI	May resume driving after 1 month	May resume driving after 3 months
ACS without MI (unstable angina)	May resume driving after 7 days	May resume driving after 1 month
Chronic CAD		
Stable angina or asymptomatic CAD*	No restriction	No restriction
PCI (in a non-ACS context)	May resume driving after 48 hours	May resume driving after 48 hours
Cardiac surgery		
CABG surgery	May resume driving after 1 month	May resume driving after 3 months

*Angiographic demonstration of 50% or greater reduction in diameter of the left main coronary artery should disqualify the patient from commercial driving, and 70% or greater reduction in the diameter of the left main coronary artery should disqualify the patient from non-commercial driving, unless treated with revascularization.

Note: ACS = acute coronary syndrome, CABG = coronary artery bypass graft, CAD = coronary artery disease, LVEF = left ventricular ejection fraction, MI = myocardial infarction, NSTEMI = non-ST-segment elevation myocardial infarction, PCI = percutaneous coronary intervention, STEMI = ST-segment elevation myocardial infarction.

Practical tips

- For patients who have undergone coronary artery bypass graft (CABG) surgery or percutaneous coronary intervention (PCI), driving restrictions apply for the duration listed starting from the surgical/procedural date. For patients who have been admitted to hospital but who have not undergone an intervention, driving restrictions apply for the duration listed following discharge from hospital.
- For patients with an acute coronary syndrome (ACS) but with only non-obstructive coronary artery disease (CAD) found at coronary angiography, without additional data to guide decision-making, it is reasonable to manage care as if the patients were revascularized, letting left ventricular function guide further decision-making.

14.3 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 heart disease depends largely on the following:

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

TABLE 5 (part 1 of 3): Recommendations for fitness to drive for patients with valvular heart disease

Condition	Non-commercial drivers	Commercial drivers
Medically treated valvular heart disease		
Aortic stenosis	No restriction if: • NYHA Class I or II Disqualified if: • NYHA Class III or IV	No restriction if: • NYHA Class I, and • no episodes of impaired level of consciousness, and • LVEF ≥ 50% Otherwise disqualified
Aortic regurgitation	No restriction if: • NYHA Class I–III Disqualified if: • NYHA Class IV	No restriction if: • NYHA Class I, and • no episodes of impaired level of consciousness, and • LVEF ≥ 50% Otherwise disqualified
Mitral regurgitation	No restriction if: • NYHA Class I–III Disqualified if: • NYHA Class IV	No restriction if: • NYHA Class I, and • no episodes of impaired level of consciousness, and • LVEF ≥ 50%, and • no history of pulmonary hypertension or systemic embolism Otherwise disqualified
Mitral stenosis	No restriction if: • NYHA Class I–III Disqualified if: • NYHA Class IV	No restriction if: • NYHA Class I, and • no episodes of impaired level of consciousness Otherwise disqualified
Tricuspid regurgitation	No restriction if: • NYHA Class I–III Disqualified if: • NYHA Class IV	No restriction if: • NYHA Class I, and • no episodes of right-sided HF or symptomatic sustained arrhythmia, and • no right ventricular dysfunction, and • LVEF ≥ 50% Otherwise disqualified
Valvular heart disease treated with transcatheter therapy*		
Aortic stenosis, treated with TAVR	May resume driving 1 month after procedure if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I–III	May resume driving 3 months after procedure if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I • LVEF ≥ 30% Otherwise disqualified

TABLE 5 (part 2 of 3): Recommendations for fitness to drive for patients with valvular heart disease

Condition	Non-commercial drivers	Commercial drivers
Aortic regurgitation, treated with TAVR	May resume driving 1 month after procedure if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I–III	May resume driving 3 months after procedure if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Mitral regurgitation, treated with TEER†	May resume driving 48 hours after procedure if: • NYHA Class I–III	May resume driving 1 month after procedure if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Mitral regurgitation, treated with TMVR	May resume driving 1 month after procedure if: • NYHA Class I–III	May resume driving 3 months after procedure if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Mitral stenosis, treated with PBMV†	May resume driving 48 hours after procedure if: • NYHA Class I–III	May resume driving 1 month after procedure if: • NYHA Class I Otherwise disqualified
Tricuspid regurgitation, treated with TEER†	May resume driving 48 hours after procedure if: • NYHA Class I–III	May resume driving 1 month after procedure if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Tricuspid regurgitation, treated with TTVR	May resume driving 1 month after procedure if: • NYHA Class I–III	May resume driving 3 months after procedure if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Surgically treated valve disease		
Aortic stenosis, treated with SAVR	May resume driving 1 month after surgery if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I–III Otherwise disqualified	May resume driving 3 months after surgery if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I • LVEF ≥ 30% Otherwise disqualified
Aortic regurgitation, treated with SAVR	May resume driving 6 weeks after surgery if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I–III Otherwise disqualified	May resume driving 3 months after surgery if: • stable QRS duration‡ and no high-grade atrioventricular block§ in the absence of a permanent pacemaker, and • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Mitral stenosis, treated with SMVR	May resume driving 6 weeks after surgery if: • NYHA Class I–III Otherwise disqualified	May resume driving 3 months after surgery if: • NYHA Class I Otherwise disqualified

TABLE 5 (part 3 of 3): Recommendations for fitness to drive for patients with valvular heart disease

Condition	Non-commercial drivers	Commercial drivers
Mitral regurgitation, treated with SMVR or repair	May resume driving 6 weeks after surgery if: • NYHA Class I–III Otherwise disqualified	May resume driving 3 months after surgery if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified
Tricuspid regurgitation, treated with STVR	May resume driving 6 weeks after surgery if: • NYHA Class I–III Otherwise disqualified	May resume driving 3 months after surgery if: • NYHA Class I, and • LVEF ≥ 30% Otherwise disqualified

*These recommendations pertain to post-procedural driving status; for patients with persistent advanced HF, refer to section 14.4.

†Although few data exist on sudden cardiac incapacitation following these procedures, the consensus opinion is that caution is warranted to allow for appropriate recovery after hospitalization, immobilization, sedation, and vascular instrumentation.

‡Stable QRS duration defined as no new bundle branch block and stability of QRS duration (within 10%) for 24 hours after TAVR or AVR.

§High-grade atrioventricular block defined as second-degree type II or third-degree atrioventricular block.

Note: AVR = aortic valve replacement, HF = heart failure, LVEF = left ventricular ejection fraction, NYHA = New York Heart Association, PBMV = percutaneous balloon mitral valvuloplasty, SAVR = surgical aortic valve replacement, SMVR = surgical mitral valve replacement, STVR = surgical tricuspid valve replacement, TAVR = transcatheter aortic valve replacement, TEER = transcatheter edge-to-edge repair (mitral valve), TMVR = transcatheter mitral valve replacement, TTVR = transcatheter tricuspid valve replacement.

Practical tips

- Patients with untreated severe symptomatic aortic valve stenosis and regurgitation (New York Heart Association [NYHA] Class IV) are disqualified from non-commercial driving. For commercial driving, untreated aortic stenosis must be completely asymptomatic (NYHA Class I).
- Patients with untreated severe symptomatic mitral valve stenosis and regurgitation and those with tricuspid valve regurgitation (NYHA Class IV) are disqualified from both non-commercial and commercial driving.
- Patients undergoing transcatheter aortic valve replacement (TAVR) with a stable QRS duration and no high-grade atrioventricular block may resume non-commercial driving 1 month after the implant date and commercial driving 3 months after the implant date.
- Unless they remain within NYHA Class IV, patients who have undergone mitral valve or tricuspid valve transcatheter edge-to-edge repair (TEER) may resume non-commercial driving 48 hours after the procedure.

14.4 Congestive heart failure, left ventricular dysfunction, cardiomyopathy, and 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 LVEF. Because sudden death is so common in this group, physicians are encouraged to cross-reference this section with section 14.6, Rhythm and devices. In the event of a conflict, the more restrictive recommendation applies.

TABLE 6: Recommendations for fitness to drive for patients with heart failure, LVAD, or heart transplant

Condition	Non-commercial drivers	Commercial drivers
Heart failure		
NYHA Class I	No restriction	Disqualified if EF < 30%
NYHA Class II	No restriction	Disqualified if EF < 30%
NYHA Class III	No restriction	Disqualified
NYHA Class IV	Disqualified	Disqualified
Receiving intermittent outpatient or home inotrope therapy	Disqualified	Disqualified
LVAD	May resume driving if: • at least 2 months after implant, and • NYHA Class I or II Otherwise disqualified	Disqualified
Heart transplant	May resume driving if: • at least 6 weeks after discharge, and • NYHA Class I or II, and • on stable immunosuppression therapy, and • undergoing annual reassessment Otherwise disqualified	May resume driving if: • at least 6 months after discharge, and • NYHA Class I, and • EF ≥ 50%, and • undergoing annual reassessment that includes testing to rule out active ischemia Otherwise disqualified

Note: EF = ejection fraction, LVAD = left ventricular assist device, NYHA = New York Heart Association.

Practical tips

- Among patients with heart failure with reduced ejection fraction, commercial driving is restricted to those with left ventricular ejection fraction ≥ 30% and New York Heart Association (NYHA) Class I or II symptoms.
- Non-commercial drivers with heart failure and NYHA Class IV symptoms are disqualified from driving.

14.5 Inherited arrhythmia syndromes and cardiomyopathies

Patients with inherited arrhythmia syndromes and cardiomyopathies are increasingly recognized in clinical practice. The risk posed when these patients get behind the wheel is determined predominantly by the risk of sudden death or non-fatal (but temporarily incapacitating) ventricular arrhythmias. The magnitude of the risk depends on symptom status, adherence to therapy, and stability over time.

TABLE 7 (part 1 of 2): Recommendations for fitness to drive for patients with inherited arrhythmia syndromes and cardiomyopathies

Condition	Non-commercial drivers	Commercial drivers
Brugada syndrome		
Spontaneous type 1, asymptomatic	No restriction	No restriction (after expert evaluation)
Provoked type 1, asymptomatic	No restriction	No restriction
Symptomatic, prior syncope*	No restriction	Disqualified (consider resumption of driving at ≥ 3 years, with expert evaluation§)
Symptomatic, prior cardiac arrest	May resume driving after 3 months	Disqualified
Long QT syndrome		
Asymptomatic, QTc < 500 ms	No restriction	No restriction if adherent to recommended β-blocker therapy
Asymptomatic, high-risk features (QTc > 500 ms with long QT syndrome type 2 or 3), receiving recommended β-blockers	No restriction¶	Disqualified, but may be considered for resumption of driving (with expert opinion) after 6 months if adherent to recommended β-blocker therapy
Prior syncope,* receiving β-blockers†	May resume driving after 3 months	Disqualified, but may be considered for resumption of driving after 12 months if adherent to recommended β-blocker therapy
Prior cardiac arrest, receiving β-blockers†	May resume driving after 3 months	Disqualified (consider resumption of driving at ≥ 5 years, with expert evaluation§)
Arrhythmogenic right ventricular cardiomyopathy		
Definitive diagnosis‡ and no prior syncope*	No restriction¶	Disqualified (unless condition is stable and expert evaluation determines otherwise§)
Prior syncope* and stable on appropriate therapy	May resume driving after 3 months¶	Disqualified (consider resumption of driving at ≥ 3 years, with expert evaluation§)
Prior sustained ventricular arrhythmia event and stable on appropriate therapy	May resume driving after 3 months	Disqualified (consider resumption of driving at ≥ 5 years, with expert evaluation§)
No definitive diagnosis: variant carriers, family members with no definite arrhythmogenic right ventricular cardiomyopathy, possible or borderline diagnosis	No restriction	No restriction

TABLE 7 (part 2 of 2): Recommendations for fitness to drive for patients with inherited arrhythmia syndromes and cardiomyopathies

Condition	Non-commercial drivers	Commercial drivers
Lamin cardiomyopathy		
Prior sustained ventricular arrhythmia, stable on appropriate therapy	May resume driving after 3 months	Disqualified (consider resumption of driving at ≥ 5 years, with expert evaluation§)
No high-risk features	No restriction	No restriction
High-risk features (two or more of LVEF < 45%, male sex, NSVT, and non-missense variants)	No restriction¶	Disqualified
Other arrhythmogenic cardiomyopathies		
Prior sustained ventricular arrhythmia event, stable on appropriate therapy	May resume driving after 3 months	Disqualified (consider resumption of driving at ≥ 5 years, with expert evaluation§)
Low risk of ventricular arrhythmia (< 1% annually), according to expert opinion	No restriction	No restriction
Higher risk of ventricular arrhythmia event, according to expert opinion	No restriction if annual risk of ventricular arrhythmia < 22% Driving prohibited if annual risk of ventricular arrhythmia ≥ 22%	Driving prohibited if annual risk of ventricular arrhythmia ≥ 1%
Hypertrophic cardiomyopathy		
Prior sustained ventricular arrhythmia event	May resume driving after 3 months	Disqualified (consider resumption of driving at ≥ 5 years, with expert evaluation§)
No high-risk features	No restriction	No restriction
High risk features: any of wall thickness ≥ 30 mm, syncope,* otherwise unexplained systolic dysfunction (LVEF < 50%), and presence of an apical aneurysm or a calculated risk of ventricular arrhythmia above 6% over 5 years	If syncope is present, may resume driving after 3 months; if asymptomatic, no restriction¶	Disqualified (consider resumption of driving at ≥ 3 years, with expert evaluation,§ and after age 60 years)

*Syncope presumed to be arrhythmic.

†If β-blockers are recommended. Exceptions may apply for patients with prior left cardiac sympathetic denervation.

‡If a patient with a borderline diagnosis has a syncopal or sustained ventricular arrhythmia event that is deemed, after expert evaluation, to have been caused by arrhythmogenic right ventricular cardiomyopathy, the recommendation for patients with a definitive diagnosis should be followed.

§If risk of impairment of consciousness is considered less than 1% annually, based on expert opinion.

¶If an implantable cardioverter defibrillator has been implanted, refer to section 14.6, Rhythm and devices.

Note: LVEF = left ventricular ejection fraction, NSVT = non-sustained ventricular tachycardia.

Practical tips

- Commercial driving in patients with heart failure with reduced ejection fraction is restricted to those with left ventricular ejection fraction ≥ 30% and with New York Heart Association (NYHA) Class I or II symptoms.
- Non-commercial drivers with heart failure and NYHA Class IV symptoms are disqualified from driving.

14.6 Rhythm and devices: cardiac implantable electronic devices, bradyarrhythmias, and tachyarrhythmias

The general trend away from risk stratification guided by electrophysiology studies and toward risk stratification based on left ventricular function is reflected in the 2023 CCS guideline and in medical standards for fitness to drive, given that most trials of implantable cardioverter defibrillators have identified left ventricular function as one of the most important determinants of risk.

TABLE 8a: Recommendations for fitness to drive for patients with pacemakers

Condition	Non-commercial and commercial drivers
Permanent pacemaker	
Transvenous and leadless pacemakers, *with* prior impaired consciousness or high-grade atrioventricular block	Disqualified for 1 week after implantation, after which patient may resume driving
Transvenous and leadless pacemakers, *without* impaired consciousness or high-grade atrioventricular block	No restriction*
Generator change	No restriction*
Upgrade/lead revision	If there is a prior history of impaired level of consciousness or high-grade atrioventricular block, patient is disqualified for 1 week, after which patient may resume driving Otherwise no restriction*

*All procedures (including those marked as "No restriction") are subject to driving restrictions relating to appropriate recovery from hospitalization, site of intervention, vascular access, and the anesthesia provided (i.e., general anesthesia or sedatives).

TABLE 8b (part 1 of 2): Recommendations for fitness to drive for patients with ICDs*†

Condition	Non-commercial drivers	Commercial drivers‡
Transvenous ICD		
Primary prophylaxis	May resume driving 1 week after implant	Disqualified
Secondary prophylaxis for VF or VT *with* impaired level of consciousness	May resume driving 3 months after implant	Disqualified
Secondary prophylaxis for sustained VT *without* impaired consciousness	May resume driving 1 week after implant	Disqualified
Subcutaneous ICD	Same recommendations as for primary and secondary prophylaxis with transvenous devices	Disqualified
Generator change	No restriction§	Disqualified
Upgrade/lead revision	May resume driving 1 week after procedure	Disqualified

TABLE 8b (part 2 of 2): Recommendations for fitness to drive for patients with ICDs*†

Condition	Non-commercial drivers	Commercial drivers‡
ICD delivery of therapy		
Appropriate ICD shock or any ICD therapy *with* impaired level of consciousness or otherwise disabling	May resume driving 3 months after event	Disqualified
Non-shock ICD therapy (i.e., anti-tachycardia pacing) *without* impaired level of consciousness and not otherwise disabling	May resume driving 1 week after event	Disqualified
Inappropriate ICD therapies	No restriction	Disqualified
Electrical storm (≥ three VT or VF events in 24 hours)	Disqualified for 3–6 months after event, dependent on severity of electrical storm and clinical management; expert evaluation required to determine eligibility to return to driving	Disqualified

*All recommendations are subject to physician judgment, incorporating patient-specific considerations and risk factors for arrhythmias and syncope. Furthermore, all recommendations are based on devices with satisfactory operational parameters (i.e., normal functionality). In cases of suboptimal capture thresholds and sensing, unusual programming, or compromised device functionality, restrictions should be at the discretion of the treating physician.

†Remote monitoring should ideally be provided for all patients receiving ICDs, to ensure that generator and lead malfunctions can be identified early, both to prevent malfunction of the device system and to mitigate the risk of adverse events while driving.

‡Drivers with ICDs are disqualified from commercial driving on the basis of their underlying condition (e.g., ventricular dysfunction, history of ventricular arrhythmia) rather than the ICD itself.

§All procedures (including those marked as "No restriction") are subject to driving restrictions relating to appropriate recovery from hospitalization, site of intervention, vascular access, and the anesthesia provided (i.e., general anesthesia or sedatives).

Note: ICD = implantable cardioverter defibrillator, VF = ventricular fibrillation, VT = ventricular tachycardia.

Practical tip

- Patients with electrical storm caused by ventricular arrhythmia may require more aggressive driving restrictions (relative to the standard 3-month restriction), depending on the severity of the electrical storm and clinical management (ablation and/or antiarrhythmic therapy). Those with clustered arrhythmias, implantable cardioverter defibrillator shocks, and a greater number of arrhythmias per cluster (or shorter cluster length) may require prolonged driving restrictions, at the discretion of the treating physician.

TABLE 8c: Recommendations for fitness to drive for patients with bradyarrhythmias	
Condition	**Non-commercial and commercial drivers***
Sinus node dysfunction	
Sinus node dysfunction *without* impaired level of consciousness	No restriction
Sinus node dysfunction *with* impaired level of consciousness (sick sinus syndrome)	Disqualified until appropriate pacemaker therapy is in place
Atrial fibrillation with conversion pauses (≥ 5 seconds) or conversion pauses with impaired level of consciousness	Disqualified until appropriate pacemaker therapy is in place
AV and fascicular block†	
Isolated first-degree AV block	No restriction if no impaired level of consciousness‡
Isolated RBBB, left anterior fascicular block, or left posterior fascicular block	No restriction if no impaired level of consciousness‡
LBBB	No restriction if no impaired level of consciousness‡
Bifascicular block	No restriction if no impaired level of consciousness‡
Second-degree AV block (Mobitz I)	No restriction if no impaired level of consciousness‡
First-degree AV block + bifascicular block	No restriction if no impaired level of consciousness‡
Second-degree AV block (Mobitz II)	Disqualified until appropriate pacemaker therapy is in place
Alternating LBBB and RBBB	Disqualified until appropriate pacemaker therapy is in place
Acquired third-degree AV block	Disqualified until appropriate pacemaker therapy or successful resolution in the case of a reversible cause (e.g., inferior STEMI or Lyme carditis)
Congenital third-degree AV block	No restriction if no impaired level of consciousness†

*For commercial drivers, at least annual follow-up with the treating physician is recommended for evaluation of symptoms and possible progression of conduction abnormalities.

†There are special considerations when conduction disease is present in patients with certain cardiomyopathies (e.g., sarcoidosis) and various inherited conditions (laminopathies, muscular dystrophies). In these patients, driving restriction is at the discretion of the treating physician.

‡For patients with first-degree AV block, isolated RBBB, left anterior fascicular block, left posterior fascicular block, LBBB, bifascicular block, second-degree AV block (Mobitz I), first-degree AV block + bifascicular block, and congenital third-degree AV block, no restrictions are required if there is no history of impaired level of consciousness. If there is a history of impaired level of consciousness, driving is disqualified until appropriate therapy with a cardiac implantable electronic device is in place.

Note: AV = atrioventricular, LBBB = left bundle branch block, RBBB = right bundle branch block, STEMI = ST-segment elevation myocardial infarction.

Practical tip

- Patients with congenital third-degree atrioventricular block may require a driving restriction if they are symptomatic or have evidence of marked bradycardia (junctional pauses > 3 seconds). Decisions related to therapy with a cardiac implantable electronic device and driving restrictions should be made at the discretion of the treating physician with expertise in congenital heart disease.

TABLE 8d: Recommendations for fitness to drive for patients with tachyarrhythmias

Condition	Non-commercial drivers	Commercial drivers
Ventricular arrhythmias*		
VF (no reversible cause)	May resume driving 3 months after index event	Disqualified
VT/VF due to a reversible cause†	Disqualified until/unless successful treatment of underlying condition	
Hemodynamically unstable VT or VT *with* impaired level of consciousness	May resume driving 3 months after event	Disqualified
Sustained VT with structural heart disease *without* impaired level of consciousness (in patients without ICD)‡	May resume driving 3 months after event	Disqualified
Sustained VT§ with structurally normal heart (i.e., idiopathic VT) *without* impaired level of consciousness	May resume driving 1 week after event, provided there is satisfactory control	Disqualified
Supraventricular tachycardia, atrial fibrillation, atrial flutter		
With impaired level of consciousness	Disqualified until satisfactory control	
Without impaired level of consciousness	No restriction	
Following electrophysiology study or catheter ablation procedure	May resume driving 48 hours after procedure if no new conduction disturbance, dysrhythmias, or exacerbation of underlying condition¶	

*All patients should receive an ICD wherever indicated (i.e., VT/VF with no reversible cause, hemodynamically unstable VT, or VT with impaired consciousness).

†Examples of reversible causes of VT/VF include, but are not limited to, VF within 24 hours of myocardial infarction, VF during coronary angiography, VF with electrocution, and VF secondary to drug toxicity. Reversible-cause VF recommendations overrule the VF (no reversible cause) recommendations if the reversible cause is treated successfully and the VF does not recur.

‡In patients with an ICD present, refer to ICD recommendations (Table 8b).

§Sustained VT is VT that lasts for more than 30 seconds and/or results in hemodynamic compromise within 30 seconds.

¶All procedures (including those marked as "No restriction") are subject to driving restrictions relating to appropriate recovery from hospitalization, site of intervention, vascular access, and the anesthesia provided (i.e., general anesthesia or sedatives).

Note: ICD = implantable cardioverter defibrillator, VF = ventricular fibrillation, VT = ventricular tachycardia.

Practical tips

- Patients with supraventricular tachycardia, atrial fibrillation, or atrial flutter with impaired level of consciousness may drive following satisfactory clinical control of their arrhythmia, at the discretion of the treating physician.
- Women may experience symptoms associated with supraventricular tachycardia more frequently than men.

14.7 Syncope

Most episodes of syncope have a vasovagal mechanism, which can usually be diagnosed from the history, and do not warrant further investigation. When syncope is not clearly vasovagal, further testing is necessary to reach the diagnosis and direct possible therapy.

A patient with structural heart disease (e.g., reduced ejection fraction, significant valvular disease, previous myocardial infarction, or significant congenital heart disease) is potentially at high risk and should be subject to driving restrictions, pending clarification of the underlying heart disease and the cause of syncope.

TABLE 9: Recommendations for fitness to drive for patients who experience syncope

Condition	Non-commercial drivers	Commercial drivers
Single episode of typical vasovagal syncope	No restriction	
Recurrent (within 12 months) vasovagal syncope	No restriction	
Syncope with a reversible cause or syncope that has been treated (e.g., orthostatic, hemorrhage, dehydration)	May resume driving after 1 week	May resume driving after 1 month
Situational syncope with avoidable trigger (e.g., micturition syncope, defecation syncope)	May resume driving after 1 week	May resume driving after 1 month
Single episode of unexplained syncope	May resume driving after 1 week	May resume driving after 12 months
Recurrent episode of unexplained syncope (within 12 months)	May resume driving after 3 months	May resume driving after 12 months
Syncope due to documented tachyarrhythmia or inducible tachyarrhythmia at electrophysiology study	Refer to section 14.6, Rhythm and devices	
Syncope with diagnosed and treated cause (e.g., permanent pacemaker for bradycardia)	Refer to section 14.6, Rhythm and devices	

Practical tips

- Syncope as a symptom can result from a wide range of underlying cardiovascular pathologies, associated with a wide spectrum of risk for recurrent episodes. This highlights the importance of appropriately investigating patients with syncope, to determine the underlying cause.
- Patients with vasovagal syncope, even those with recurrent episodes, have a very low risk of experiencing an episode while driving, which negates the need for driving restrictions.

14.8 Congenital heart disease and cyanotic heart disease

Patients with congenital heart disease, including cyanotic heart disease, may pose a risk of sudden cardiac incapacitation ranging from trivial to substantial and may require specialized evaluation by experts. Guidance from other sections can be applied as appropriate for many specific conditions; however, it is often the case that individual risk assessments are required according to the unique set of structural lesions and their severity, taking into consideration their capacity to produce sudden incapacitation.

TABLE 10: Recommendations for fitness to drive for patients with cyanotic heart disease / Eisenmenger syndrome

Condition	Non-commercial and commercial drivers
Cyanotic heart disease / Eisenmenger syndrome	No restrictions unless other limiting conditions are present Expert individual risk assessment is recommended

Practical tips

- Patients with complex (corrected or uncorrected) congenital heart disease should discuss their fitness to drive with a practitioner who has expertise in the field.
- Patients with supplemental oxygen requirements should be carefully assessed, possibly with the help of respiratory medicine specialists, with regard to their fitness to drive. If applicable, local restrictions concerning the use of in-vehicle oxygen delivery systems should be followed.

14.9 Abnormal blood pressure

14.9.1 Hypertension

Hypertension, other than uncontrolled malignant hypertension, is not 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 mm Hg is, however, often accompanied by complications that make driving dangerous, and patients with this level of hypertension must be evaluated carefully.

Higher standards are required of commercial drivers. If a commercial driver is found to have blood pressure of 170/110 mm Hg or higher, the patient should be referred to an internist or other appropriate specialist for an opinion. The long-term risks associated with sustained hypertension (over 170/110 mm Hg) 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.

14.9.2 Hypotension

Hypotension is not a contraindication to the operation of any type of motor vehicle unless it has caused episodes of syncope (refer to section 14.7, Syncope).

14.10 Anticoagulants

Although the use of anticoagulant drugs is not 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.

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Other resources

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Section 15 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 has been completed.
- Reporting of patients who have had a stroke and may be unsafe to drive is mandatory for physicians **in some but not all** regional or provincial jurisdictions. Physicians should check their local reporting requirements.

15.1 Overview

Cerebrovascular disease can cause physical, visuospatial, neuropsychological, or cognitive symptoms that can lead to unsafe driving. Driving is significantly associated with community reintegration at 1 year following stroke (Finestone et al., 2010). Various lesion locations may be associated with greater or lesser risks of driving impairment after stroke (Rapoport et al., 2019). A detailed history and a thorough physical examination, documenting hemiparesis, motor or sensory losses, ataxia, and visual field deficits, as well as cognitive or communication (e.g., dementia/aphasia) issues, are required.

In-office tools for cognitive testing (e.g., clock-drawing test, Montreal Cognitive Assessment [MoCA; www.mocatest.org], Trail Making Test parts A and B) can also help in defining the patient's disability state.

Finally, where resources are available, a comprehensive driving evaluation, sanctioned by a motor vehicle licensing authority, may be required to determine fitness to drive.

15.2 Cerebrovascular disease

15.2.1 Transient ischemic attack

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 2.0% to 4.1% (Giles et al., 2007) and at 90 days is 10.5% (Johnston et al., 2000). 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.

15.2.2 Stroke

Patients who have had a stroke should not drive for at least 1 month. During this time, assessment by their regular physician is required. Such patients may resume driving if the following conditions are met:

- The physician notes no clinically significant motor, sensory, coordination, cognitive, perceptual, visual, or neuropsychological 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.

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; these types of changes could significantly affect driving ability. Reports from reliable family members may help the physician 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, because 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.

Where there is a residual loss of motor power, sensation, or other physical, perceptual, neuropsychological, or cognitive deficit, a driving evaluation at a designated driver assessment centre (Appendix B) may be required. 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.

Patients with a visual field deficit from a stroke must undergo a visual field study by an optometrist or ophthalmologist. Patients with major changes to their visual field should be counselled not to drive. The reporting requirements to the licensing agency vary according to the jurisdiction, although a patient's refusal to follow advice not to drive should be reported in all Canadian jurisdictions.

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.

15.2.3 Cerebral aneurysm

Symptomatic cerebral aneurysms (characterized by headaches, dilatation of the pupils, seizures, and pain behind the eyes) 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 non-commercial vehicle after a symptom-free period of 3 months and will be eligible to drive commercial vehicles after being symptom-free for 6 months. However, this guideline is empirically based, and each patient should be considered on an individual basis. Any significant residual physical, psychological, 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 should be reported to the licensing authority, if appropriate. Recommendations for patients with cerebral aneurysm are summarized in Table 11.

TABLE 11: Recommendations for patients with symptomatic cerebral aneurysm

Patient condition	Non-commercial driving	Commercial driving
Untreated cerebral aneurysm	Disqualified	Disqualified
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 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 of injury by driving and that driving is a privilege, not a right. Referral to social services will help patients to identify and apply for community resources, such as assisted transportation. Stroke survivors with physical disabilities may require medical justification to obtain such services. The physician should expect requests for documentation when patients apply for such assistance or when they fill out a disabled parking pass application to allow them to park in more convenient designated areas.

For additional detail, see Section 4, Driving cessation.

15.4 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 residual physical, visuospatial, neuropsychological, or cognitive impairment that might affect safe driving. This is not an easy task, and the doctor–patient relationship can be affected as a result.

In general, if there is uncertainty about the patient's ability to drive after a history, physical examination, and possibly in-office testing have been carried out, a formal driving evaluation, sanctioned by a motor vehicle licensing authority and including an on-road assessment, should be performed.

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Section 16 Traumatic brain injury

Alert

- Patients who have experienced a significant traumatic brain injury 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.
- Patients who have sustained a moderate to severe traumatic brain injury should undergo a medical assessment before they return to driving.
- Patients with significant, persistent motor, cognitive, or behavioural deficits after moderate to severe traumatic brain injury may require a comprehensive on-road driving evaluation before they return to driving.
- After concussion, patients may resume driving when their symptoms allow them to do so.

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 or concussion may have significant persisting deficits. 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 occur even after clearly abnormal findings on computed tomography (CT) or MRI. Conversely, persistent cognitive dysfunction is seen in some individuals after apparently normal neuroimaging.

A moderate to severe TBI is defined as a brain injury where the patient has a Glasgow Coma Scale score below 13, post-traumatic amnesia (confusion) lasting longer than 24 hours, and/or evidence of intracranial injury on CT or MRI of the brain, as well as a requirement for admission to hospital for treatment of the injury. Concussion is defined as a mild brain injury with no evidence of intracranial injury on imaging and an expectation of complete symptom resolution with 2 weeks (1 month for adolescents) for most individuals. Brain injury of either type may result in physical impairments such as motor dysfunction, as well as cognitive impairments often associated with frontal lobe injuries; the latter manifest as challenges with insight, problem solving, and decision-making. Such injuries can also result in behavioural impairments, including poor impulse control and aggression. The same is true for acquired brain injury resulting from anoxia, encephalitis, the effects of tumours, or other cerebral insults.

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 concerning fitness to drive. A comprehensive effort to improve this situation included 71 specific recommendations for the assessment and treatment of patients with persisting symptoms after a brain injury (Marshall et al., 2012). However, a recent study (Sarmiento et al., 2021) revealed that many health care providers do not consistently screen or educate patients who have experienced mild TBI about driving after their injury. There is a need for clearer return-to-driving guidelines for this patient population and more education for physicians.

Internationally, efforts are under way to develop a better understanding of and methods of caring for patients with "[our] most complex disease, in [our] most complex organ" (Tenovuo et al., 2021) while recognizing the limitations of randomized controlled trials in contributing to this research.

In a systematic review, Chee et al. (2019) concluded that there was no evidence to support major changes to existing clinical guidelines for driving with TBI. Further research was recommended, particularly to examine the risk of motor vehicle crashes with respect to TBI severity and time after injury, with carefully defined injury severity and objective measures of crash risk.

For patients experiencing post-traumatic seizures, see Section 11.5.1.

16.2 Moderate to severe TBI

Any patient who has sustained a moderate to severe TBI should not return to driving until a comprehensive medical assessment, including cognitive and physical examinations, has been completed. A detailed history about the effects of the TBI on the particular patient, including information from the family or other reliable informants and additional cognitive screening by an occupational therapist with experience as a driver rehabilitation specialist, will help the physician make the best decisions about the 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 cognitive abilities, including information processing speed, visuospatial ability, and attention
- adequate upper- and lower-extremity motor coordination and power
- acceptable visual fields and acuity, with diplopia ruled out
- behavioural ability to comply reliably with the rules of the road and to drive within any conditions set by licensing authorities.

For patients with continuing cognitive, physical, or behavioural impairments that could affect the ability to drive, referral for a comprehensive on-road driving evaluation is recommended. For patients who are not medically fit to return to driving because of impairments after a TBI, consideration should be given to reporting the patient to the licensing authority as appropriate, at least until they have completed recovery or undergone successful driving rehabilitation.

If screening for post-traumatic amnesia is positive (according to the Abbreviated Westmead Post Traumatic Amnesia Scale incorporating the Glasgow Coma Scale; https://aci.moodlesite.pukunui.net/course/view.php?id=48), 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. Palubiski and Crizzle (2016) found that the duration of post-traumatic amnesia was a probable predictor of on-road driving performance.

Patients with TBI are more likely to engage in serious driver aggression (Ilie et al., 2015, 2017).

16.3 Concussion

Concussion is defined by the American Association of Neurological Surgeons (2021) as "an injury to the brain that results in temporary loss of normal brain function. Medically, it is defined as a clinical syndrome characterized by immediate and transient alteration in brain function, including alteration of mental status or level of consciousness, that results from mechanical force or trauma." Unlike persons who have sustained a moderate to severe TBI, those who have sustained a concussion may have ongoing symptoms, which typically (in about 80% of cases) resolve completely within 1 to 3 months after the injury. Although symptoms may persist, a person who has sustained a concussion will typically have good insight and awareness, as well as being able to recognize the potential effect of the injury on their driving abilities. When symptoms are more prominent (e.g., severe migraine headache), the patient may not be able to drive; however, when symptoms have improved or are more tolerable, driving ability may not be affected. The

physician should highlight for the patient that they are responsible for recognizing their own ability to operate a vehicle safely and competently. Patients may resume driving after concussion when their symptoms allow them to do so.

Most people with less severe injuries, such as concussion, recover spontaneously. They should, however, be monitored for symptoms, and a substantial 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, the latter being more likely among those with inadequate rest after concussion. According to Iverson (2012), moderate or higher scores on more than one of four specific symptoms — headache, dizziness, noise sensitivity, and memory problems — with the Sport Concussion Assessment Tool, version 2 (SCAT2; https://bjsm.bmj.com/content/bjsports/43/Suppl_1/i85.full.pdf) may predict slower recovery. The current version of this tool (since 2017) is the SCAT5 (Concussion in Sport Group, 2017; https://cattonline.com/scat/). A YouTube video (27 minutes long) is available demonstrating application of the SCAT5 (https://www.youtube.com/watch?v=gNoadxx37_E).

16.4 Functional impairment

Medical assessment alone is often insufficient to determine a patient's fitness to drive, and further evaluation by medical specialists, neuropsychological testing, or formal comprehensive driving assessment may be needed for a more accurate evaluation and to help in developing a better understanding of specific driving problems. In a recent systematic review that considered neuropsychological testing after moderate and severe TBI, executive functions had the largest effect size with respect to driving ability, followed by verbal memory, processing speed/attention, and visual memory (Egeto et al., 2019).

Individuals with TBI are slower to anticipate traffic hazards than uninjured age-matched controls.

The recommendations of the Acquired Brain Injury Knowledge Uptake Strategy (ABIKUS Guideline Development Group, 2007) for driving after moderate to severe acquired brain injury are as follows (see Part III, Section 12.2 of the ABIKUS guideline):

- For all patients with moderate to severe acquired brain injury who wish to drive, including adolescents, a physician with experience in assessing brain injury should perform screening, in accordance with legislation and preferably 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 take the following steps:
    - Advise the patient and/or their advocate that they are obliged by law (if applicable) to inform the motor vehicle licensing authority (driver fitness unit) that the individual has experienced a neurologic 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 care professionals, and family/caregivers, as well as the patient, about any concerns related to driving, and reinforce the need for disclosure and assessment if return to driving is sought after a substantial post-injury delay.
    - 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.

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, their family, and others at risk of injury by driving. These discussions should be documented in the medical record.

16.6 Summary

It is routinely expected that people with mild TBI or concussion will be able to return to driving, and driving after moderate to severe brain injury may also be possible. Evaluation of the patient must consider any residual physical, cognitive, or perceptual impairment to safe driving, as well as the person's emotional state. 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.

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Section 17 Vascular diseases

Alert

Immediate contraindications to driving — a patient with either of the following problems should be advised not to drive until the 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, deep venous thrombosis, or chronic limb-threatening ischemia that is severely symptomatic 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 if the person is driving. Aneurysms occur in the chest, abdomen, pelvis, and extremities and include those related to dissection with or without connective tissue diseases. When completing a medical examination report for a motor vehicle licensing authority, the physician should document maximum aneurysm diameter using an appropriate method. An abdominal ultrasound examination, computed tomography, or magnetic resonance imaging will reliably indicate the size of the aneurysm (Chaikof et al., 2018). Only the anterior–posterior or transverse diameter is predictive of rupture; the length of the aneurysm has no relation to the likelihood of rupture (Filardo et al., 2012). Uncontrolled risk factors such as hypertension may affect rupture rates, although specific data are not available (Sweeting et al., 2012). Ongoing review of the patient is required. A patient with an aortic aneurysm should have the benefit of the opinion of a vascular surgeon. A surgically indicated aortic aneurysm is essentially inconsistent with driving a road vehicle.

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 (Lancaster et al., 2022). In selected cases, the comorbid conditions and the threat of aneurysm rupture based on size (larger than 6 cm in men and 5.5 cm in women) may preclude driving until the aneurysm is repaired (Lederle et al., 2002). A patient in whom surgical repair of their aneurysm is warranted should not drive until the aneurysm is repaired.

Following successful endovascular or open repair of an abdominal aortic aneurysm, the patient may drive once recovered, if no other medical contraindication exists.

Rupture of thoracic and thoracoabdominal aneurysms is also related to aneurysm size, and the threshold for repair is 6 cm. Prospective data comparing early surgery with conservative follow-up are not available. The threshold for repair of thoracic and thoracoabdominal aneurysms is influenced by the size, extent, and location of these aneurysms (Rokosh et al., 2021). Therefore, definitive recommendations for surgery await prospective data; again, however, any aneurysm that warrants surgical intervention is inconsistent with operating a road vehicle.

17.3 Peripheral arterial vascular diseases

Chronic limb-threatening ischemia, the most advanced form of atherosclerotic lower limb arterial occlusive disease, can impair the ability to drive because of the severity of limb or foot pain, narcotic intake, or foot mobility. Although prospective data on driving fitness are not available for patients with a condition of this nature, once the disease is successfully treated, a return to driving should be achievable.

Both Raynaud phenomenon and Buerger disease of sufficient severity to cause symptoms require evaluation. These conditions rarely preclude driving unless they cause functional limitations, but ongoing surveillance is required. Those with digital or forefoot amputation related to these conditions may return to regular driving, whereas those with transfemoral or transtibial amputation 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. At that point, the patient may safely resume driving a motor vehicle.

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Section 18 Respiratory diseases

Alert

Immediate contraindication to driving — a patient with the following type of problem should be advised not to drive until the condition has been evaluated and has been treated or has resolved:

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

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 (Karakontaki et al., 2013). Marked dyspnea may also limit a person's physical ability to operate a motor vehicle. It is important to note that suboptimal oxygenation could destabilize respiratory illness and impair cognition (Parekh et al., 2005), and the resulting insufficient cerebral oxygenation could compromise driver fitness (Karakontaki et al., 2013; Skovhus Prior et al., 2015). 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 (Bahammam and Al-Jawder, 2012). Furthermore, older age and physical decline from respiratory disease may affect a person's functional ability to drive (Colón-Emeric et al., 2013).

18.2 Assessment

Impairment associated with dyspnea can be characterized as follows:

- **Mild** — Dyspnea when walking quickly on level ground or when walking uphill; ability to keep pace with people of the same age and body build when walking on level ground, but not on hills or stairs.
- **Moderate** — Shortness of breath when walking for a few minutes or after 100 m of 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 and other chronic respiratory diseases

Driving could be dangerous for a patient with untreated chronic hypoxia. Many patients with chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), drive safely and regularly, even when oxygen use is required. It is important to recognize that driving performance cannot be determined solely by disease severity; a focus on functional abilities is also needed (Orth et al., 2008). A driving assessment, road test, or both are recommended if the physician has any doubt about the patient's ability to operate a motor vehicle. Oxygen equipment, if used, must be safely secured in the vehicle. Refer to Table 12 for recommendations for patients with chronic respiratory disease, summarized from the Canadian National Safety Code (Canadian Council of Motor Transport Administrators, 2021).

TABLE 12: Recommendations for patients with chronic respiratory disease

Level of impairment*	Non-commercial driving	Commercial driving
None or mild	No restrictions	No restrictions
Moderate	No restrictions The level of impairment should be reassessed periodically to ensure no progression of disease, which might affect the individual's functional ability to drive.	Depends on the nature of the activities. On-road testing may be required. Health care provider will need to address the following: • Comment on degree of functional impairment • Confirm moderate impairment by means of pulmonary function testing or symptoms • Assess the patient's insight about their respiratory condition
Moderate or severe, with use of supplemental oxygen at rest	Road test, while using supplemental oxygen, to ensure appropriate functional ability. Oxygen equipment must be secured safely and used while driving. Routine clinical re-assessment is required.	Not eligible for a licence. Severe impairment or the need for continuous supplemental oxygen signifies difficulties with the level of functional performance that would be deemed necessary for commercial driving.

*Level of impairment can be characterized on the basis of respiratory symptoms or pulmonary function testing. The relationship between respiratory symptoms and pulmonary function is not perfect, so a focus on the individual's symptoms and functional abilities should be prioritized.

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, Motorcycles and off-road vehicles.

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Section 19 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 has 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 upon 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 and recognition of, 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 beyond what might be required for any specific level of complication or level of glycemic control. In general, patients are considered fit to drive if it can be demonstrated that they (1) are fastidious and knowledgeable about controlling their blood glucose levels, (2) are able to avoid severe hypoglycemic episodes, and (3) have no complications of diabetes that would affect safe driving.

For recommendations and additional information pertaining to drivers with diabetes who are receiving treatment appropriate to their situation, please review the 2018 Diabetes Canada guidelines on diabetes and driving (Houlden et al., 2018). The recommendations (all Grade D, Consensus, except where indicated otherwise) are as follows:

1. Fitness of people with diabetes to drive should be assessed on an individual basis. People with diabetes should take an active role in assessing their ability to drive safely.

2. All drivers with diabetes should undergo a comprehensive medical examination at least every 2 years by a physician/nurse practitioner competent in managing people with diabetes. The medical examination should include an assessment of glycemic control; frequency and severity of hypoglycemia; symptomatic awareness of hypoglycemia; and the presence of retinopathy, neuropathy, nephropathy, amputation and CV [cardiovascular] disease, to identify whether any of these factors could significantly increase the risk of a motor vehicle accident. Commercial drivers should also undergo a medical examination at the time of application for a commercial license.
3. Drivers with diabetes treated with insulin secretagogues and/or insulin:
    1. Should maintain a log of their SMBG [self-monitored blood glucose] measurements either by using a memory-equipped BG [blood glucose] meter or electronic record of BG measurement performed at a frequency deemed appropriate by the person with diabetes and their health-care team. For commercial drivers, for initial commercial licence application, the record should include the last 6 months (or since the diagnosis of diabetes if less than 6 months). BG logs should be verifiable on request.
    2. Should always have BG monitoring equipment and supplies of rapidly absorbed carbohydrate within easy reach (e.g. attached to the driver's-side visor or in the centre console).
    3. Should consider measuring their BG level immediately before and at least every 4 hours while driving or wear a real-time CGM [continuous glucose monitoring] device.
    4. Should not drive when their BG level is < 4.0 mmol/L [Grade C, Level 3 for type 1 diabetes; Grade D, Consensus for type 2 diabetes]. If the BG level is < 4.0 mmol/L, they should not drive until at least 40 minutes after successful treatment of hypoglycemia has increased their BG level to at least 5.0 mmol/L [Grade C, Level 3 for type 1 diabetes; Grade D, Consensus for type 2 diabetes].
    5. Must refrain from driving immediately if they experience severe hypoglycemia while driving, and notify their health-care provider as soon as possible (no longer than 72 hours).
4. Private [non-commercial] and commercial drivers with diabetes and hypoglycemia unawareness or history of severe hypoglycemia in the past 12 months **must** measure their BG level immediately before and at least every 2 hours while driving or wear a real-time CGM device.
5. If any of the following occur, health-care professionals should inform people with diabetes treated with insulin secretagogues and/or insulin to no longer drive, and should report their concerns about the person's fitness to drive to the appropriate driving licensing body:
    1. Any episode of severe hypoglycemia while driving in the past 12 months.
    2. More than 1 episode of severe hypoglycemia while awake but not driving in the past 6 months for private [non-commercial] drivers, and in the past 12 months for commercial drivers.

The full guideline can be accessed online at https://www.diabetes.ca/health-care-providers/clinical-practice-guidelines/chapter-21#panel-tab_FullText

For commercial drivers who have had their licence suspended, all Canadian jurisdictions allow for shorter periods of suspension of driving privileges following an episode of hypoglycemia that required the intervention of a third person, if recommended by a specialist. Circumstances that could merit a shorter period of suspension include the following:

- Reinstatement of a commercial licence may be considered for persons with diabetes treated with insulin secretagogues whose commercial licence has been suspended owing to severe hypoglycemia or hypoglycemia unawareness if in the past 6 months there have been 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 licence if in the past 6 months they have had any episode of severe hypoglycemia while awake or any hypoglycemia unawareness.
- Reinstatement of a commercial licence may be considered for persons with diabetes treated with insulin whose commercial licence has been suspended owing to severe hypoglycemia or hypoglycemia unawareness if in the past 6 months there are no episodes of severe hypoglycemia and no evidence of hypoglycemia unawareness.

Provincial guidelines may differ from the above, and reinstatement of a commercial licence may be prolonged or shortened on a case-by-case basis, depending on perceived risk for driver safety.

Similar recommendations apply to non-commercial drivers who are subject to shorter periods without driving. If the specialist is satisfied that the situation that caused the suspension of driving privileges has been resolved and the patient's condition has been stabilized for a sufficient period, a recommendation to the licensing agency may be justified.

19.3 Nondiabetic renal glycosuria

Patients with nondiabetic renal glycosuria can safely drive any type of motor vehicle.

19.4 Nondiabetic 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 non-commercial 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 symptoms, 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 non-commercial 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 could 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 experience 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 syndrome

Patients with Cushing 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 disease

A patient with Addison 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.

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Section 20 Renal diseases

Alert

- A substantial proportion of patients undergoing dialysis 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 experience 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 long-distance 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 must undergo 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 (89% hemodialysis, 11% peritoneal dialysis) revealed that 40% of surveyed patients were "not comfortable driving" (Vats and Duffy, 2010). However, 42% of this group continued to drive, with 48% of those reporting crashes. Approximately three-quarters of patients who admitted to feeling uncomfortable driving reported one 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 (68% hemodialysis, 32% peritoneal dialysis). The "Am I a Safe Driver?" checklist asks patients to answer 24 specific questions (one of which was omitted for the dialysis patients). The authors concluded that answering "yes" to two or more questions on the checklist was potentially useful for identifying patients at high risk for driving impairment (84% sensitivity, 58% specificity), but confirmation by other methods was required, as nearly half of "screen-positive" patients might 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) a checklist such as "Drivers 65 Plus: Check Your Performance" (AAA Foundation for Traffic Safety, 2019) may be useful for identifying patients who require further evaluation. However, the 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 to do so.

Hemodialysis patients should not drive further than one or two days' distance 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 their attending nephrologist before any travel plans are made.

20.2.2 Peritoneal dialysis

The fitness-to-drive issues for patients undergoing peritoneal dialysis are similar to those for hemodialysis patients, as outlined in Section 20.2.1, Hemodialysis. 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 the surgery can drive a motor vehicle.

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Section 21 Musculoskeletal disabilities

Alert

- A patient with any permanent musculoskeletal disability should be advised not to drive until their 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 affect a patient's driving ability. In assessing such a patient, it is important to establish from the outset 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 adaptations in 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 their 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 both the cause and the severity of physical impairment. However, all can affect 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 a 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 their 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. In addition, in most people who have had an upper-limb amputation, the impairment affects one or several fingers, not the entire limb, so they will not necessarily need such adaptive devices (National Highway Traffic Safety Administration, 2009: 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 for assessment of driving ability. It is up to each person to demonstrate their 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 the resumption of 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 years or

younger, 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 (National Highway Traffic Safety Administration, 2009: 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 for assessment of driving ability. It is up to each person to demonstrate their 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 (Meikle et al., 2006; National Highway Traffic Safety Administration, 2009: p. 15).

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 (National Highway Traffic Safety Administration, 2009: p. 18). 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 the ability to drive safely or they lack 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 their 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, Opioids).

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 for 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, Arthritis, other musculoskeletal pain, and ankylosis). 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 non-commercial vehicles can best be determined by a driver examiner. Patients wearing braces or body casts must be evaluated according to 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 drivers of non-commercial vehicles. 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. However, in one study, people with lumbar radiculopathy had slower reaction times than a control group. This was especially true after a selective nerve block (Al-khayer et al., 2008).

21.2.5 After 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. Physicians should advise their patients about other related factors that could affect safe driving, in addition to the direct effects of their surgery.

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, and the effects of analgesics, age, and comorbidities:

- For right hip arthroplasty, 6 weeks (Ganz et al., 2003) to 8 weeks (MacDonald and Owen, 1988; Abbas and Waheed, 2011).
- For left hip arthroplasty, 2 weeks (Ganz et al., 2003), or 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 one study (Abbas and Waheed, 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), the data are too limited to make that recommendation.

In all of 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 postoperative 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.

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Section 22 Miscellaneous conditions that may affect fitness to drive

Alert

- The fitness to drive of any patient must be assessed on an individual basis.

22.1 Overview

There are a number of medical conditions with the potential to 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. Regardless of safety device use, motorists and occupants with morbid obesity remain at greater risk of death if involved in a motor vehicle crash (Joseph et al., 2017; Elkbuli et al., 2019).

Cardiovascular, respiratory, and metabolic comorbidities are common in patients with obesity. The presence of sarcopenic obesity, suggested by poor grip strength, slow gait, and history of immobility, should raise questions about fitness to drive. Hypoglycemia is common after a patient has undergone bariatric surgery (Lehmann et al., 2021).

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 could still affect their ability to resume driving. The hypoactive subtype of delirium is more common than the hyperactive type and is often overlooked.

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 they have 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 they have been seen in a follow-up appointment to determine whether 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.

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 (Nguyen et al., 2018; Formentin et al., 2019), kidney disease (Kepecs et al., 2018), rheumatoid arthritis, and chronic fatigue syndrome. It is important to assess the fitness to drive of patients with advanced disease (Weir et al., 2017; Mansur et al., 2018).

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 both medical knowledge and 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 yet continue to go about their daily activities (including driving) to the best of their abilities. In fact, many look upon the process of living their lives as normally as possible as a challenge. Even the most common conditions may affect these patients' 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, so long as reasonable precautions are observed. Unfortunately, unless patients receive counselling 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, or knitting. Overall, a patient's fitness to drive must be questioned when they are unable to work (Lalić, 2019).

According to a recent meta-analysis (Scott et al., 2017), history of a fall in drivers aged 55 years or older is predictive of a risk of being involved in a future road incident. It has been estimated that older drivers who declared having experienced a fall (from 6 months to 3 years previously) had a 40% increased risk of being involved in a motor vehicle crash relative to those who did not report a fall. As such, the literature has established a link between history of a fall and the risk of future motor vehicle crashes, but the mechanism underlying this association is not completely understood.

Acknowledgement: Assistance with the literature search on the topic of falls and risk of motor vehicle crashes was provided by Michel Gaudet, Direction de la recherche en sécurité routière, Vice-présidence aux stratégies de marketing, de sécurité routière et d'expérience employé, Société de l'assurance automobile du Québec.

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Section 23 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 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.

Oral surgery and dental procedures: Fitness to drive may be affected temporarily following oral surgery with local anesthesia and dentoalveolar procedures such as placement of implants. Factors affecting driving performance after the procedure might include stress, pain, and exhaustion. Given the number of adults who undergo oral surgery, the impact on postoperative driving safety may be considerable. Patients undergoing such procedures should be advised not to drive themselves home after the procedure.

23.4 Major surgery

After major surgery, each patient's recovery should be evaluated 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.

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Section 24 Seat belts, airbags, and child restraints

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 years and younger should sit only in the back seat. 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, Airbags, or 24.4, Child restraints. Physician documentation of the circumstance is not required. The applicant must indicate on the form that they have read the airbag deactivation brochure and understand 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' Form" at https://tc.canada.ca/en/road-transportation/motor-vehicle-safety/air-bag-deactivation-how-obtain-declaration-requirement-air-bag-deactivation-form). However, depending upon the jurisdiction, there may be a requirement to obtain permission from the local licensing authority rather than from Transport Canada.

24.2 Seat belts

Some provincial/territorial 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" (positioning the seat belt across the hips and below the abdomen), 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 factor that is common to those seriously injured as a result of airbag deployment is not their height, weight, sex, or age. Rather, it is their proximity to the airbag when it started to deploy. In particular, infants and children age 12 years or younger are vulnerable to serious injury when an airbag deploys. Hence, children should be placed in the back seat, with an appropriate child seat or restraint.

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 that has led the physician to inform 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 that has led the physician to inform the person that airbags pose a special risk.
- The passenger is an infant or child with a medical condition that necessitates riding in the front seat for monitoring (see also Section 24.4, Child restraints).
- The passenger is an infant or child and the vehicle does not have back seats.

24.4 Child restraints

All Canadian jurisdictions have laws or regulations rendering the use of child restraints obligatory for all children under a given age or height, although the specific age or height may vary from one jurisdiction to another. Proper installation of any child restraint is imperative; unfortunately, however, verification of child seat installation has shown that many parents simply place the restraint system on the back seat without attaching it to the vehicle's hard points. For example, not attaching the top strap is a frequent error.

Child restraint systems are designed for installation in the rear of the vehicle but in certain circumstances, they may be installed in the front passenger seat. For example, a child may have special needs that require monitoring by the driver. In this situation, the child's seat should never be placed on the front passenger seat without deactivation of the airbag, which usually requires an exemption granted by the licensing agency (see Section 24.1, Overview, for information about applying for an exemption to allow deactivation). The requirement for deactivation of the airbag should be discussed during parent counselling (e.g., before a child is discharged after a hospital stay).

If a child with special needs requires a customized child restraint system and the prescribed system does not conform to federal safety testing standards, the jurisdiction's licensing bureau should be consulted to determine whether a formal waiver is required. If such a waiver is required, the treating physician will typically be asked to provide pertinent medical documentation supporting the waiver request.

24.5 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 are 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, consult information on "Road Safety in Canada" provided by Transport Canada (https://tc.canada.ca/en/road-transportation/road-safety-canada).

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Section 25 Motorcycles and off-road vehicles

Alert

- Alcohol is a factor in the majority of deaths 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 non-commercial passenger vehicle.

As long as off-road vehicles are not driven on provincial/territorial roads, they do not need licence plates, and their use is not subject to any regulation. However, in Quebec a valid licence for any class of vehicle is required when a person is driving off-road vehicles on provincial trails (Province of Quebec, 2022).

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.

Alcohol is a factor in the majority of deaths involving off-road vehicles. Among those 20–49 years of age, 68% of such deaths involve alcohol (Statistics Canada, 2021). Thus, the admonition "If you drink, don't drive" applies to drivers of off-road vehicles as much as, if not more than, drivers of on-road vehicles. See also Section 5, Alcohol.

25.2 General

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

Driving a motorcycle requires the full use of all four 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 conditions

- **Angina** — Exposure to cold and cold winds can trigger an angina attack in susceptible individuals.
- **Asthma** — Exposure to cold and cold winds may trigger "cold" anaphylaxis and bronchoconstriction.
- **Carotid sinus sensitivity** — This condition is dangerous for drivers or passengers on motorcycles or off-road vehicles 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.

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Section 26 Aviation*

Alert

Physicians in Canada have the following obligations for patients who are pilots, flight engineers, or air traffic controllers:

- Physicians are subject to the mandatory reporting requirement outlined in the *Aeronautics Act*, Section 6.5, which requires that any pilots, flight engineers, or air traffic controllers who have a medical condition that could affect aviation safety be reported to the regional aviation medical officers of Transport Canada.
- Physicians should remind pilots of their obligations under the Canadian Aviation Regulations, Section 404.06, to not exercise their privileges if they have an illness, injury, or disability; are taking medications or drugs; or are undergoing medical treatment that could impair their ability to function safely.
- Physicians may countersign medical declarations for lower-risk categories of aviation licences or permits.

26.1 Overview

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

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

Periodic examinations of pilots are performed by physicians, known as civil aviation medical examiners (CAMEs), who are appointed by the minister of transport. Episodic care of pilots is often undertaken 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 treatment is prescribed) that might make it unsafe for them to perform their duties, they must "ground" themselves temporarily, according to Section 404.06 of the Canadian Aviation Regulations (1996) (CARs).

A physician diagnosing a condition that might affect flight safety must report the condition to a regional aviation medical officer (RAMO) of Transport Canada. See Section 26.7, Contacts, for information about reaching a RAMO.

26.2 Aeronautics Act

All physicians in Canada have mandatory reporting obligations under Section 6.5, "Medical and Optometric information," of the *Aeronautics Act* (1985), which reads 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 [their] opinion the patient has a medical or optometric condition that is likely to constitute a hazard to aviation safety, inform a medical adviser designated by the Minister forthwith of that opinion and the reasons therefor.

*Prepared by Transport Canada.

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 [their] person by a physician or optometrist, advise the physician or optometrist that [they are] the holder of such a document.
3. The Minister may make such use of any information provided pursuant to subsection (1) as the Minister 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 [them] 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.

26.3 Physician responsibilities

26.3.1 Reporting

If uncertain whether a condition might affect flight safety, then the physician should discuss the case with a RAMO. See Section 26.7, Contacts, for information about reaching a RAMO.

If certain that a condition might affect flight safety, the physician must take the following steps:

- Advise the pilot of the medical condition.
- Remind the pilot of their obligations under CARs Section 404.06 to not exercise the privileges of their licence or permit; i.e., to self-ground.
- Report the case to a RAMO. The report will be confidential and privileged.
  - Reports can be made by telephone or in writing using the Civil Aviation Medicine Medical Condition Reporting Form (26-0011). This report can be submitted electronically and is confidential and privileged. See section entitled "Reporting a Medical Condition" at https://tc.canada.ca/en/aviation/medical-fitness-aviation/assessing-medical-fitness-pilots-air-traffic-controllers#toc6.
- 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 against the reporting physician.

Physicians may wish to contact the Canadian Medical Protective Association for advice should they have questions about their reporting obligation. See also Section 3, Reporting — when and why, in this guide.

26.3.2 Physician countersignature

Some lower-risk categories of aviation licences and permits do not require applicants for a medical certificate to visit a CAME. A pilot can instead visit any licensed physician in Canada to request that the physician countersign a medical declaration form, indicating they are fit to perform the aviation duties associated with the particular category of licence or permit. If the pilot does not have any of the conditions listed on the declaration, then the physician may countersign the declaration. However, if in the physician's opinion the applicant may require further assessment for fitness for aviation, the physician may recommend that the applicant seek a medical examination from a CAME.

26.4 Medical conditions

This section of the guide is not intended to replace a textbook on aviation medicine. It is designed simply to alert community physicians to aspects of medical fitness that are of unique importance to aircrew and to list the medical conditions to which the mandatory reporting requirements apply (as detailed in Section 26.5, Conditions that must be reported by the physician).

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 may contact a RAMO for guidance (see Section 26.3.1, Reporting and Section 26.7, Contacts).

Further information on specific medical conditions may be obtained from the Civil Aviation Medicine branch of Transport Canada: https://tc.canada.ca/en/aviation/medical-fitness-aviation

Pilots with any of the conditions listed in Section 26.5 are obligated not to exercise the privileges of their licence or permit pending assessment by a RAMO.

26.5 Conditions that must be reported by the physician

26.5.1 Vision

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

Reporting of the following is mandatory:

- diplopia
- monocular vision
- visual field defects — including partial loss of a visual field or significant scotoma
- 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.

26.5.2 Ear, nose, and throat

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

Reporting of the following is mandatory:

- hearing loss — 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.

26.5.3 Cardiovascular conditions

Cardiovascular illness is a significant concern for aviation safety, and a RAMO must be notified.

Reporting of the following 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.

26.5.3.1 Blood pressure

Uncontrolled abnormal blood pressure is a concern for aviation safety, as are medications with adverse effects of postural hypotension, arrhythmias, or effects on the central nervous system.

Reporting of the following is mandatory:

- initial treatment of hypertension with medication
- symptomatic hypotension or hypertension.

26.5.3.2 Valvular heart disease

Reporting of the following 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, candidates for prosthetic valvular replacement must be assessed individually by a RAMO.

26.5.3.3 Congenital heart disease (CHD)

Reporting of the following is mandatory:

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

26.5.3.4 Cardiac arrhythmia

Even benign arrhythmias can cause distraction, which, during critical phases of flight, may cause an aviation incident or crash.

Reporting of the following is mandatory:

- premature atrial or ventricular contraction — when symptomatic or medication is required for control

- paroxysmal tachyarrhythmias — all tachyarrhythmias, even if they appear to be asymptomatic
- atrial fibrillation and flutter — at initial diagnosis and when any change in treatment is required
- sinus node dysfunction or sick sinus syndrome — symptomatic bradycardia
- heart block and bundle branch blocks — second- or third-degree heart block or the development of a new right or left bundle branch block
- pacemaker or automatic implantable defibrillation device.

26.5.4 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
- carotid bruits.

26.5.5 Other vascular disorders

Reporting of the following is mandatory:

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

26.5.6 Nervous system

Disorders of the central nervous system can result in subtle or sudden incapacitation, which can be fatal in the aviation environment.

Reporting of the following is mandatory:

- syncope or pre-syncope
- 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 incidents/crashes; any condition that interferes with balance or coordination
- headache — migraine with aura; may include visual loss, cognitive impairment, and other neurologic deficits; any type of severe or prolonged headache requiring medications
- disorders of coordination and muscular control.

26.5.7 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.

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 — on initial diagnosis or if there is an increasing requirement for inhaled bronchodilators, steroids, or other medications
- pneumothorax — spontaneous pneumothorax, pleural blebs, lung cysts, or other conditions that may lead to problems with expansion of trapped gas
- pulmonary embolism
- sarcoidosis.

26.5.8 Endocrine and metabolic disorders

Reporting of the following is mandatory:

- diabetes mellitus
- type 1 diabetes — on initial diagnosis; pilots and air traffic controllers with type 1 diabetes are considered for certification by a RAMO, on an individual basis
- type 2 diabetes — treatment 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 — on initial diagnosis of these conditions and when there are significant changes in treatment
- pituitary disease — on initial diagnosis and investigation; any mass compromising the optic chiasm
- adrenal disease — on initial diagnosis and investigation
- use of anabolic steroids.

26.5.9 Renal system

Reporting of the following is mandatory:

- renal colic or the discovery of kidney or bladder stones
- development of renal failure or treatment with renal dialysis
- requirement for renal transplantation; after successful transplantation, when there are significant changes in treatment.

26.5.10 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 adverse effects from medications (e.g., non-steroidal anti-inflammatory drugs); those requiring second- or third-stage medications (e.g., gold, azathioprine)
- any condition that could impair functionality in the aviation environment, such as distracting pain, reduced strength, or reduced range of motion.

26.5.11 Psychiatric and cognitive disorders

Psychiatric or mental illness is concerning for aviation safety. Even when symptoms are effectively treated, the adverse effects of medications used for treatment, such as selective serotonin reuptake inhibitors (SSRIs), may not be compatible with aviation.

Pilots with mental health issues may be reluctant to discuss their conditions with a CAME and may be more likely to seek advice and treatment from a family or community physician. Pilots are generally not permitted to exercise the privileges of their licences or permits until their cases have been assessed by a RAMO.

Reporting of the following is mandatory:

- cognitive disorders — including dementia, as soon as suspected or diagnosed
- psychosis — including bipolar affective disorder
- mood disorders — including anxiety and depression
- substance use disorders — including episodes of substance use that could be concerning for aviation safety (e.g., impaired driving conviction or substance use while performing aviation duties); see also Section 26.6, Substance use
- attention-deficit/hyperactivity disorder — either with or without medication for management.

26.5.12 Other medical conditions

Reporting of the following is mandatory:

- any diagnosis of significant illness that may affect aviation safety, due to either the effects of the underlying illness or the effects of treatment.

26.6 Substance use

Transport Canada uses the following definitions of terms related to substance use (Transport Canada, 2020):

- Substance: Any alcohol, drug (legal or illegal), medication (prescribed, non-prescribed, herbal, or over-the-counter), or self-administered toxin with psychoactive properties.
- Substance abuse: A maladaptive pattern or episode of substance use resulting in:
    - continued or recurrent use in situations in which it is physically hazardous or potentially harmful to health;
    - continued or recurrent use despite social, personal, or occupational problems caused or exacerbated by use;
    - excessive use;
    - failure to fulfill major role obligations at work, school, or home;
    - legal problems;
    - violations of provisions of the *Aeronautics Act*, the CARs, or other Transport Canada regulations or policies related to impairment or substance use; or
    - a verified positive drug or alcohol test conducted for legal, medical, occupational, investigative, or administrative purposes.

- Alcohol: By law, no one may function as a crew member of an aircraft (or work as an air traffic controller) if they have consumed alcohol within the previous 12 hours. After heavy drinking, even this interval will be too short because alcohol can affect balance and orientation for up to 48 hours.
- Cannabis: By law, flight crew (pilots and flight engineers) and flight controllers (air traffic controllers) are prohibited from using cannabis for at least 28 days before being on duty. Cannabis use is defined as the use of any cannabis product (including cannabidiol [CBD]) by any method (including smoking, vaping, eating, or applying to the skin) for any purpose (including medical, recreational, or other non-medical reasons). For more details, see the Civil Aviation Medicine cannabis policy (Transport Canada, 2019).
- Illicit drugs: Illicit drugs impair judgment and coordination; the effects may last for prolonged periods.

Over-the-counter medications, natural health products, and prescription medications may have adverse effects that negatively affect aviation safety. Pilots should not perform their duties while taking any of these medications, unless they have been assessed and cleared by a RAMO.

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

26.7 Contacts

Civil Aviation Medicine headquarters:

Civil Aviation Medicine
Transport Canada
617-330 Sparks St.
Place de Ville, Tower C
Ottawa ON K1A 0N8

Email for general inquiries: NCRCivAvMedicine-Inquiries-EnquetesMedecinesAeroCivRCN@tc.gc.ca
Local tel: 613-990-1311
Toll-free: 1-800-305-2059
Facsimile: 613-990-6623
Website: https://tc.canada.ca/en/aviation/medical-fitness-aviation

Civil Aviation Medicine branch offices (RAMOs):

See https://tc.canada.ca/en/aviation/civil-aviation-contacts-offices#civil_aviation_medicine for a complete list of branch offices and current contact information.

References

Aeronautics Act, R.S.C., 1985, c. A-2 (amended 2015). Medical and optometric information. Available: https://laws.justice.gc.ca/eng/acts/A-2/page-6.html#docCont (accessed 2022 Oct. 14).

Canadian Aviation Regulations, SOR/96-433, 1996. Subpart 4: Medical requirements. Available: https://laws-lois.justice.gc.ca/eng/regulations/sor-96-433/page-36.html (accessed 2022 Oct. 20).

Transport Canada. *Staff instruction 404-002. Civil Aviation Medicine cannabis policy.* Ottawa (ON): Transport Canada; 2019.

Transport Canada. *Staff instruction 424-002. Civil Aviation Medicine directive – substance use.* Ottawa (ON): Transport Canada; 2020.

Other resources

Transport Canada. Cannabis legalization. In: *General operating and flight rules: Better pilot decision-making*. Ottawa (ON): Transport Canada; 2019. Available: https://tc.canada.ca/en/aviation/general-operating-flight-rules/better-pilot-decision-making/cannabis-legalization (accessed 2022 Oct. 14).

Transport Canada. *Handbook for civil aviation medical examiners*. TP 13312. Ottawa (ON): Transport Canada; 2019. Available: https://tc.canada.ca/en/aviation/publications/handbook-civil-aviation-medical-examiners-tp-13312 (accessed 2022 Oct. 14).

Transport Canada. *Medical fitness for aviation* [website]. Ottawa (ON): Transport Canada; 2021 Mar. 19. Available: https://tc.canada.ca/en/aviation/medical-fitness-aviation (accessed 2022 Oct. 14).

Section 27 Railway*

Alert

- The term "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 in the *Canadian Railway Medical Rules Handbook*, at https://www.railcan.ca/wp-content/uploads/2022/05/Canadian-Railway-Medical-Rules-Handbook-May-2022-3.pdf

27.1 Overview

This section concerns assessing the medical fitness for duty of an individual occupying a railway Safety Critical Position. These individuals operate or control the movement of trains. An individual in a Safety Critical Position must identify themselves as such to a physician before any assessment.

The occupations designated as Safety Critical Positions may vary among railways, but typically include the following:

- 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.

27.2 Railway Safety Act

The *Railway Safety Act* (RSA) is federal legislation that gives the Minister of Transport jurisdiction over railway safety matters (*Railway Safety Act*, 1985). 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.

*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.

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 requires 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 they hold 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 RSA, 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 Canadian Medical Protective Association for advice should they have questions about their reporting obligations.

27.4 Medical fitness for duty assessments

The Railway Medical Rules were developed by the Railway Association of Canada (2022) and approved by the Minister of Transport. These rules specify the required frequency of medical assessments and include a section on Railway Medical Guidelines.

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 Railway Medical Guidelines

The Railway Medical Guidelines have been developed to assist with the medical fitness for duty assessment of an individual occupying a railway Safety Critical Position. Medical conditions covered in the Railway Medical Guidelines (Railway Association of Canada, 2022) include the following:

- cardiovascular disorders
- diabetes
- epilepsy or other epileptic seizures
- hearing impairment
- mental disorders

- sleep disorders
- substance use disorders
- therapeutic opioid use
- vision impairment.

The medical fitness for duty assessment should also take into consideration treatment and medications that could affect railway safety.

For any individual with a medical condition not covered by the Railway Medical Guidelines, their medical fitness for duty will be determined by the railway's chief medical officer, who will be guided by the "medical fitness for duty considerations" listed in each guideline, by accepted medical practice, and by related industry medical standards.

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 (37–42 lb) of force to lift switch lever
    - 18–27 kg (40–60 lb) of force to pull switch over
    - 17–19 kg (37–42 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.

Rail 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

The *Canadian Railway Medical Rules Handbook* (which includes the current Railway Medical Guidelines) is available on the Railway Association of Canada website (https://www.railcan.ca/wp-content/uploads/2022/05/Canadian-Railway-Medical-Rules-Handbook-May-2022-3.pdf).

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 Railway and other regional short line railways can be obtained from the Railway Association of Canada (tel 613-564-8088).

References

Railway Association of Canada, Medical Steering Committee and Medical Advisory Group. *Canadian railway medical rules handbook (for positions critical to safe railway operations)*. Ottawa (ON): The Association; 2001 (updated 2022 May). Available: https://www.railcan.ca/wp-content/uploads/2022/05/Canadian-Railway-Medical-Rules-Handbook-May-2022-3.pdf (accessed 2022 Oct. 14).

Railway Safety Act, R.S.C., 1985, c. 32 (4th Supp.). Available: https://laws-lois.justice.gc.ca/eng/acts/r-4.2/ (accessed 2022 Oct. 14).

Appendix A

Fitness to drive issues and risk management

Message from the Canadian Medical Protective Association (updated 2022)*

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. Most jurisdictions include statutory protection from liability in civil actions for making a report in good faith. In all jurisdictions, physicians will generally not be faulted for breaching patient confidentiality if a report is made in good faith.

The CMPA regularly reviews its experience in assisting members in matters related to fitness to drive. These reviews have identified three 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 and medical regulatory authority (College) policies for reporting in their jurisdiction and assess the patient's condition in light of those statutory and regulatory parameters.

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.

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

Complaints about reporting

Some patients may 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, Colleges have been supportive of the physician's decision to report.

License 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 and College policies 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 is 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 license, 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: "Hit the brakes: Do you need to report your patient's fitness to drive?," "Good practices: Privacy and confidentiality," and "Medico-legal handbook for physicians in Canada" (section 4: Important legislation), which are all available on the CMPA website (www.cmpa-acpm.ca). CMPA members are also encouraged to contact the Association for case-specific advice regarding their reporting duties from experienced physician advisors.

Appendix B

Provincial/territorial contact information for reporting potentially unfit drivers*

Driver assessment centres and rehabilitation resources in your area can also be located by contacting these offices.

ALBERTA
Driver Fitness and Monitoring
Government of Alberta
Main floor, Twin Atria Building 4999–98 Ave. NW
Room 109
Edmonton AB T6B 2X3
Tel (780) 427-8230 (toll-free in Alberta 310-0000)
Fax (780) 422-6612
https://www.alberta.ca/contact-driver-fitness-and-monitoring.aspx

BRITISH COLUMBIA
Office of the Superintendent of Motor Vehicles
Road Safety BC
PO Box 9254, Stn Prov Govt
Victoria BC V8W 9J2
Tel (250) 387-7747 or toll-free (855) 387-7747
Fax (250) 387-4891
https://www2.gov.bc.ca/gov/content/transportation/driving-and-cycling/roadsafetybc/contact

MANITOBA
Manitoba Public Insurance — Driver Fitness
234 Donald St.
PO Box 6300
Winnipeg MB R3C 4A4
Tel (204) 985-1900 or toll-free (866) 617-6676
Fax (204) 953-4992
Email: Driverfitness@mpi.mb.ca
https://www.mpi.mb.ca/Pages/driver-fitness.aspx

NEW BRUNSWICK
Department of Justice and Public Safety
Motor Vehicle Branch
Marysville Place
20 McGloin St., Floor 3
PO Box 6000
Fredericton NB E3B 5H1
Tel (506) 453-2410
Fax (506) 453-7455
Email: DPS-MSP.Information@gnb.ca
https://www2.gnb.ca/content/gnb/en/departments/public-safety/publicsafety.html

NEWFOUNDLAND AND LABRADOR
Motor Registration Division
Service Newfoundland and Labrador
Motor Registration Building
PO Box 8710
St. John's NL A1B 4J5
Tel (877) 636-6867
Email: mrd@gov.nl.ca
https://www.gov.nl.ca/motorregistration/locations-and-contact-information/

NORTHWEST TERRITORIES
Registrar of Motor Vehicles
Compliance and Licensing Division
Department of Infrastructure
Government of the Northwest Territories
5015 49th St.
PO Box 1320
Yellowknife NT X1A 2L9
Tel (867) 767-9088 ext. 31169
Email: registrar@gov.nt.ca
https://www.gov.nt.ca/en/contact-gnwt

*As of Feb. 1, 2023

NOVA SCOTIA

Transportation and Infrastructure Renewal
Medical Fitness Section
PO Box 1652
Halifax NS B3J 2Z3
Tel (902) 424-5732
Fax (902) 424-0772
Email: medicalfitness@novascotia.ca
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
https://www.gov.nu.ca/en/transportation

ONTARIO

Driver Medical Review Office
Ministry of Transportation
77 Wellesley St.
PO Box 589
Toronto ON M7A 1N3
Tel (416) 235-1773 or (800) 268-1481 (within Ontario)
Fax (416) 235-3400 or (800) 304-7889
Email: driverImprovementOffice@ontario.ca
https://www.ontario.ca/page/reporting-driver-medical-review
https://www.ontario.ca/page/medical-review-ontario-drivers

PRINCE EDWARD ISLAND

Department of Transportation, Infrastructure and Energy
Registrar of Motor Vehicles
Highway Safety Division
PO Box 2000
Charlottetown PE C1A 7N8
Tel (902) 368-5210 or (902) 368-5234
Fax (902) 368-5236
www.princeedwardisland.ca/en/topic/transportation-and-infrastructure
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 (SAAQ)
333 boul Jean-Lesage, CP 19600
Québec QC G1K 8J6
Tel (800) 361-7620 (general information)
Fax (418) 643-4840
https://saaq.gouv.qc.ca/extranet-sante/sante-conducteurs
https://saaq.gouv.qc.ca/

SASKATCHEWAN

Saskatchewan Government Insurance
Medical Review Unit
2260 11th Ave., 3rd floor
Regina SK S4P 0J9
Tel (800) 667-8015 ext. 6176 or (306) 775-6176 (within Regina)
Fax (866) 274-4417 or (306) 347-2577 (within Regina)
Email: mruinquiries@sgi.sk.ca
https://sgi.sk.ca/medical-conditions

YUKON

Driver Sanctions Coordinator
Government of Yukon
Department of Highways and Public Works
Motor Vehicles Branch
PO Box 2703
Whitehorse YT Y1A 2C6
Tel (867) 667-3563 or (800) 661-0408 ext. 5315
Fax (867) 393-6220
Email: motor.vehicles@yukon.ca
https://yukon.ca/en/department-highways-public-works

Medical Fitness for Aviation (Canada.ca)

Contact information for Medical Fitness for Aviation and Civil Aviation Medicine is available at https://tc.canada.ca/en/aviation/medical-fitness-aviation

Appendix C

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 (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:

(1) $RH = TD \cdot V \cdot SCI \cdot Ac$

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 (Hossack, 1974; Parsons, 1986; Ostrom and Eriksson, 1987; Antecol and Roberts, 1990). 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 automobile (Ontario Ministry of Transport, 1987). Truckers are involved in only approximately 2% of all road accidents but in approximately 7.2% of all fatal accidents (Parsons, 1986). 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 to be acceptable in Canada even though this information is crucial in the formulation of guidelines based on the probability of some event occurring in a defined 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 after an acute myocardial infarction provided that he or she is New York Heart Association 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 partially offset by the risk of other suddenly disabling events such as syncope or stroke. For such a person, risk of SCI is estimated to be equal to 0.01 in formula 1.

*Excerpt from: Ross D, Simpson C, et al. Canadian Cardiovascular Society Consensus Conference 2003 Assessment of the Cardiac Patient for Fitness to Drive and Fly: final report. Ottawa: Canadian Cardiovascular Society; 2003. Available: https://ccs.ca/app/uploads/2020/12/DF_CC_2003.pdf (accessed 2023 Feb. 14).

It may be assumed that the average commercial driver spends 25% of his or her time behind the wheel (Parsons, 1986). 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:

$$RH = TD \cdot V \cdot SCI \cdot Ac$$

$$= 0.25 \cdot 1 \cdot 0.01 \cdot 0.02$$

$$= 0.00005$$

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) (Statistics Canada, 1987). 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:

$$RH = TD \cdot V \cdot SCI \cdot Ac$$

$$0.00005 = 0.04 \cdot 0.28 \cdot SCI \cdot 0.02$$

$$SCI = 0.223$$

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 that driver at a risk between that of the private driver and that of the tractor-trailer driver.

References

Antecol DH, Roberts WC. Sudden death behind the wheel from natural disease in drivers of four wheeled motor vehicles. *Am J Cardiol*. 1990;66(19):1329-35.

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