CANADIAN RAILWAY MEDICAL RULES HANDBOOK

(FOR POSITIONS CRITICAL TO SAFE RAILWAY OPERATIONS)

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Acknowledgements

This document was prepared by the Medical Advisory Group of the Railway Association of Canada.

RAC		**Version: 1.1**
	Title: INTRODUCTION	

Introduction

This handbook was designed to provide Canadian railway companies and medical service providers with the information necessary to implement the Railway Medical Rules for Positions Critical to Safe Railway Operations (Railway Medical Rules and Railway Rules Governing Safety Critical Positions).

The Safety Critical Positions Rules and the Railway Medical Rules were developed pursuant to Section 18(1)(b), Section 20(1) and Section 35 of the Railway Safety Act (RSA), as amended on June 1, 1999. This Act requires persons working in positions that are deemed critical to safe railway operations to undergo periodic medical examinations. These sections of the RSA are included in the Introduction for reference.

The Act requires that all persons employed in railway Safety Critical Positions must advise their medical professional of that fact prior to any examination.

The Act further requires medical examiners who believe that a person employed in a safety critical position has any condition that may reasonably pose a threat to railway safety must immediately notify both the patient and the railway company. Medical information provided to railway companies in accordance with this section of the Act is privileged and cannot be used in any legal or disciplinary proceedings except as otherwise provided.

The Safety Critical Position Rules and the Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. The Railway Medical Rules became effective on November 29, 2001 simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

The RAC has a standing Medical Advisory Group (MAG) that is composed of medical professionals who represent several member railways and other interested parties. This Group addresses questions and issues of a technical nature, and monitors medical conditions which may affect safe rail operations. From time to time, the RAC may recommend new or revised medical guidelines. Persons who have received a copy of this handbook may obtain updates from the RAC when they become available.

RAC		**Version: 1.1**
	Title: INTRODUCTION	

The intent of these Rules is to provide for individual medical assessments by personal physicians for persons performing work in Safety Critical Positions in the railway industry.

Included in this handbook is background information on how and why the Rules were developed, a copy of section 35 of the Act, a copy of the Rules, guidelines for assessment of medical conditions required by the Rules, and contacts for additional information.

Section 18(1) of the Railway Safety Act reads as follows:

> **18(1)** The Governor in Council may make regulations
>
> (b) declaring positions in railway companies to be critical to safe railway operations.

Section 20 of the Railway Safety Act reads as follows:

> **20(1)** A railway company shall file with the Minister for approval any rules in respect of any matter referred to in subsection 18(1) or (2.1) that it proposes to formulate or revise on its own initiative.

Section 35 of the Railway Safety Act reads as follows:

Medical examination

> **35(1)** A person who holds a position that is declared by regulations made under paragraph 18(1)(b) or by any rule in force under section 19 or 20 to be a position critical to safe railway operations, referred to in this section as a 'designated position', shall undergo a medical examination organized by the railway company concerned, including audio-metric and optometric examination, at intervals determined by the regulations made under paragraph 18(1)(c)(iii) or by any rule in force under section 19 or 20.

Physician or optometrist to disclose potentially hazardous conditions

(2) If a physician or an optometrist believes, on reasonable grounds, that a patient is a person described in subsection (1), the physician or optometrist shall, if in their opinion the patient has a condition that is likely to pose a threat to safe railway operations,

(a) by notice sent without delay to a physician or optometrist specified by the railway company, inform the specified physician or optometrist of that opinion and the reasons for it, after the physician or optometrist has taken reasonable steps to first inform the patient, and

(b) without delay send a copy of that notice to the patient,

and the patient is deemed to have consented to the disclosure required by paragraph (a)

Holder of designated position to inform physician or optometrist

(3) A person who holds a designated position in a railway company shall, prior to any examination by a physician or optometrist, advise the physician or optometrist that the person is the holder of such a position.

Railway company may act in interests of safe railway operations

(4) A railway company may make such use of information provided pursuant to subsection (2) as it considers necessary in the interests of safe railway operations.

Proceedings not to lie against physician or optometrist

(5) No legal, disciplinary or other proceedings lie against a physician or optometrist for anything done by that physician or optometrist in good faith in compliance with this section.

Information privileged

(6) Information provided pursuant to subsection (2) is privileged and

(a) no person shall be required to disclose it or give evidence relating to it in any legal, disciplinary or other proceedings; and

(b) it is not admissible in any such proceedings, except

(i) as provided by subsection (4), or

(ii) where the patient consents.

	Section: 1	Version: 1.1
	Title: BACKGROUND AND HISTORY	

Section 1 - BACKGROUND AND HISTORY

1. Introduction

This section describes the background and history behind the development of the Railway Medical Rules and the Safety Critical Position Rules.

2. Legislative History

Medical requirements for certain railway positions were most recently contained in General Order O-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. This legislation contained standards for vision and hearing only. Medical requirements beyond these had been left up to the individual railways as a matter of company policy

General Order O-9 had been in place since 1978. Minor revisions had been made to the order on several occasions, most recently as part of CTC 1985-3 (April 23, 1985). In 1998, CN and CPR also obtained exemptions from some of the requirements of the General Order to address Canadian Human Rights Commission (CHRC) issues relating to the difference in initial certification and recertification standards.

The move towards legislated medical standards beyond those for hearing and vision arose primarily from the Foisy Commission review of the 1986 Hinton train collision.

Recommendation 10 of the Commission stated "that the CTC review its regulations concerning medical fitness with a view to including standards with respect to matters of physical health in addition to vision and hearing acuity and that regulations establishing such standards be promulgated as soon as possible".

As a result of this recommendation, the RTC set out in 1987 to review the issue of expanded medical examinations. Draft regulations were developed by the RTC (Regulations Respecting the Medical Examination of Railway Employees) and included the requirement for a physical examination including "a review of the nervous, cardiovascular, respiratory, gastro-intestinal, genitourinary and musculoskeletal systems, a clinical history and special investigations if clinically indicated having regard for the examinee's age and work duties". The proposed regulation also included the specific need for chest x-rays, electrocardiogram tests, urinalysis and tuberculin tests. The draft regulation also required railway companies to file standards for medical fitness in each of the aforementioned areas.

The need for expanded medical examinations was carried over into the Railway Safety Act when it was enacted in 1989. Section 35(1) of the RSA requires that railway employees in positions deemed critical to safe railway operations undergo annual medical examinations including audiometric and optometric assessment. Section 35(2) of the Act addressed another of the Foisy commission recommendations by requiring any physician or optometrist

treating a person in a Safety Critical Position to report to the railway's Chief Medical Officer any medical condition that they believe could constitute a threat to safe railway operations. Section 35(3) of the Railway Safety Act requires that persons in Safety Critical Positions inform the physician or optometrist of their position.

Although included in the Railway Safety Act since its inception in 1989, these sections have never been fully enacted due to their reliance on regulation identifying a list of Safety Critical Positions. This regulation has been delayed several times due to various issues and concerns. Also hindering the enactment of this section of the Railway Safety Act was its initial specified requirement for an annual medical examination, a frequency deemed to be excessive by railway industry medical experts. Revisions to the Railway Safety Act, which came into force on June 1 1999, eliminated the annual requirement.

A new initiative aimed at drafting a new medical rule for Safety Critical Positions commenced in December 1996. The Railway Association of Canada's Safety and Operations Management General Committee authorized a formal Medical Steering Committee to oversee the development of Rules Identifying Safety Critical Positions and Rules Governing Medical Standards for SCPs.

The steering committee was comprised of railway industry multi-functional stakeholders including representatives from the Regulatory Affairs, Medical, Employee Relations, Labour Relations and Law departments of various RAC member railways. A Medical Working Group consisting of the Chief Medical Officers from CN, CPR and VIA Rail was also formed to work with medical specialists in the development of specific medical requirements and the guidelines required to support the medical rules. As part of this process field research was carried out in the railway environment.

The Steering Committee's mandate was to develop rules which would provide a contemporary list of Safety Critical Positions based on potential risk to public safety as well as modern and consistent medical requirements which address those diseases or disorders that have the potential to impact railway safety.

In accordance with the requirements of the Railway Safety Act, the steering committee consulted with railway labour organizations throughout the development process. In addition the CHRC and Transport Canada were kept up to date on the rules' progress.

The Safety Critical Position Rules and the Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. The Railway Medical Rules became effective on November 29, 2001, simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

Section 2 – SAFETY CRITICAL POSITION RULES

2.1 - Overview

1. Background

Section 35(1) of the Railway Safety Act refers to the requirement for regulation or rule specifying positions deemed critical to safe railway operations. In 1997 the RAC Medical Steering Committee undertook to develop such a rule along with a related Medical rule for Safety Critical Positions.

The committee's goal was to develop a straightforward rule which would identify the occupational requirements deemed to be safety critical while allowing individual railways to determine the specific list of occupations that meet these requirements on their particular railway.

As required by the Railway Safety Act, consultation with railway labour organizations took place throughout the development process. In addition the Canadian Human Rights Commission and Transport Canada were kept up-to-date on the rule's development.

The Rule Governing Safety Critical Positions was developed by the Railway Association of Canada and approved by the Minister of Transport on June 16, 2000 (copy of approval notice can be found in section 2.3). It became effective on September 30, 2000.

2. Development Process

A vital part of the development of the Railway Rules Governing Safety Critical Positions was ensuring that an objective means was in place to identify those occupations deemed to be critical to safe railway operations.

It was important that the list of Safety Critical Positions include only those positions with the highest risk to public safety.

For this purpose, the Railway Association of Canada's Medical Rules Steering Committee developed a "risk matrix" which would allow an assessment of railway occupations based on five key risk components. These were:

- General risk component of occupation
- Public interface
- Frequency of risk activities
- Presence of safety back-up systems
- Degree of risk environment

Based on this assessment, it was determined that Safety Critical Positions should be comprised of running trades positions directly engaged in train or yard service and positions engaged in rail traffic control. In addition, other occupations would be considered as Safety Critical when performing any of these duties.

Due to variances in actual occupational titles, the list of specific SCP occupations was to be developed and filed with Transport Canada by individual railways. A typical list of occupations would include:

- Locomotive Engineer
- Conductor
- Asst. Conductor (Brakeman)
- Yard Foreman
- Rail Traffic Controller (Train Dispatcher)
- Operators of Specialized Equipment operating as trains
- Asst. Superintendent (Trainmaster)
- Superintendent
- Asst. Chief Rail Traffic Controller
- Chief Rail Traffic Controller

Railways must reassess their SCP occupational list at regular intervals and file updated lists as required.

3. Disclosure Requirements

In addition to being subject to the requirements of the Medical Rules, the Railway Safety Act contains another important obligation for persons employed in a Safety Critical Position. This is the requirement that persons in Safety Critical Positions must, prior to any examination by a physician or optometrist, advise the physician or optometrist that they occupy a Safety Critical Position under the Railway Safety Act. (Note this includes all examinations and not just fitness for duty assessments under the Medical Rules).

Physicians and optometrists also have an obligation under the Railway Safety Act to report to the railway any condition in a person occupying a Safety Critical Position which they feel may pose a threat to safe railway operations. A copy of the report must also be provided to the employee.

Individual railways should ensure that they inform those employees in Safety Critical Positions of these requirements. Although information will be provided by the Railway Association of Canada to the medical community at large regarding their obligations under the Railway Safety Act, where possible, individual railways may also wish to provide such

information to those physicians who will be dealing with employees in Safety Critical Positions.

	Section: 2	Version: 1.1
	Title: SAFETY CRITICAL POSITION RULES	
	Subsection 2.2 – Rules	

2.2 - Rules Governing Safety Critical Positions

1. Short Title

For ease of reference, this rule may be referred to as the "Safety Critical Position Rules".

2. Scope

These rules have been developed pursuant to Section 20 of the *Railway Safety Act*.

3. Definitions

A "Safety Critical Position" is herein defined as:

a) any railway position directly engaged in operation of trains in main track or yard service; and

b) any railway position engaged in rail traffic control.

Any person performing any of the duties normally performed by a person holding a Safety Critical Position, as set out in section 3 above, is deemed to be holding a Safety Critical Position while performing those duties.

4. Records to be Kept by the Company

Each railway company shall:

a) maintain a list of all occupational names or titles which are governed by this rule;

b) maintain a list of the names of all employees qualified to serve in Safety Critical Positions; and

c) make all such records related to this rule available to Transport Canada inspectors upon reasonable request.

2.3 - Approval by Minister of Transport

Approval of Rule – Pursuant to Section 20 of the *Railway Safety Act*, Chapter R-4.2, [R.S., 1985, C. 32 (4th SUPP.)]

The Railway Association of Canada (RAC), on behalf of its constituent railway companies, has requested approval of the *Railway Rules Governing Safety Critical Positions* and *Railway Medical Rules for Positions Critical to Safe Railway Operations.*

Paragraph 19.(4)(a) of the *Railway Safety Act* gives the Minister the authority to approve Rules filed by a railway company, on their own initiative, under Section 20 of the *Act*, if he is of the opinion that the Rules are conducive to safe railway operations. Having regard to current railway practice, to the views of the railway companies and the views of the relevant associations and organizations and to other factors that I consider relevant, I am of the opinion that the Rules so filed are conducive to safe railway operations.

Pursuant to the *Railway Safety Act*, paragraph 19.(4)(a), I hereby approve the *Railway Rules Governing Safety Critical Positions* and *Railway Medical Rules for Positions Critical to Safe Railway Operations,* filed by the RAC on behalf of its constituent railway companies as set out in Appendices "B" and "C" attached hereto.

The *Railway Rules Governing Safety Critical Positions* shall apply to the railway companies listed in Appendix "A". This Rule shall come into effect 90 days from the date of approval during which time railway companies must submit their list of safety critical positions to the Department.

The *Railway Medical Rules for Positions Critical to Safe Railway Operations* shall also apply to the railway companies listed in Appendix "A" and will come into effect once the remaining federally regulated companies become signatory to the new Rule and the subsequent revocation by the Governor in Council of General Order 0-9, *Regulations Respecting the Examination of Vision and Hearing of Railway Employees,* amended by CTC 1985-3 RAIL.

Signed by T. Burtch

_____

Director General, Rail Safety
for Minister of Transport

June 16, 2000

_____

Date

Section 3 – RAILWAY MEDICAL RULES

3.1 - Overview

1. Introduction

The Railway Medical Rules were developed over the course of 1998/99 by a Medical Steering Committee formed by the Railway Association of Canada. This committee was comprised of railway industry multi-functional stakeholders including representatives from the Regulatory Affairs, Medical, Employee Relations, Labour Relations and Law departments of various RAC member railways.

A Medical Working Group consisting of the Chief Medical Officers from CN, CPR and VIA Rail worked with medical specialists in the development of specific medical requirements and the guidelines required to support the medical rules. As part of this process field research was carried out in the railway environment.

The Steering Committee's goal was to develop a basic enabling rule which would be supported by recommended medical practices guidelines. This would allow medical assessments to remain current through updates to the guidelines without having to regularly modify the actual rule.

The Medical Rules allow medical assessments for Safety Critical Positions to be directed and managed by a railway's Chief Medical Officer. It requires that an employee must meet medical fitness for duty assessment requirements so as to work in a Safety Critical Position.

The Rules set an assessment frequency of 5 years to age 40 and 3 years beyond age 40 with the Chief Medical Officer having the ability to reduce the interval for specific situations.

Assessments are based on those diseases or disorders that have potential to impact railway safety including sudden impairment, impairment of judgement or alertness, impairment of senses or significant musculoskeletal impairment. The Rules provide the basis for assessments to be conducted by personal physicians at the discretion of individual railways.

As required by the Railway Safety Act, consultation with railway labour organizations took place throughout the development process. In addition, the Canadian Human Rights Commission and Transport Canada were kept up-to-date on the rule's development.

The Railway Medical Rules were developed by the Railway Association of Canada (RAC) and approved by the Minister of Transport on June 16, 2000. They became effective on November 29, 2001 simultaneously with the revocation of General Order 0-9, Regulations Respecting the Examination of Vision and Hearing of Railway Employees, as amended by

CTC 1985-3. Any questions regarding either the Act or the Rules should be addressed to the RAC or to the Department of Transport.

3.2 - Rules

1. Short Title

1.1 For ease of reference, these rules may be referred to as the "Railway Medical Rules".

2. Scope

2.1 These rules, which have been developed pursuant to Section 20 (1) (a) of the Railway Safety Act, define the Medical Fitness for Duty requirements for Safety Critical Positions within railway companies subject to the jurisdiction of the Department.

2.2 In the case of international train movements, a railway company may allow persons to perform limited service in Safety Critical Positions while using medical requirements stipulated by U.S. Federal Railroad Administration regulations.

3. Definitions

3.1 “Chief Medical Officer” means a physician licensed to practice medicine in Canada and who is employed or contracted by a railway company for the purpose of, among other things, directing and managing the area of Medical Fitness for Duty requirements and guidelines.

3.2 “Department” means the Department of Transport, Rail Safety Group.

3.3 “Medical Fitness for Duty” means that a determination was made by the Chief Medical Officer, subject to any restrictions or requirements imposed under Section 6 hereof, that a person has taken the medical assessments required by these rules, and that the person meets all of the Medical Fitness for Duty requirements provided herein.

3.4 “Safety Critical Position” has the same meaning as provided in the Railway Rules Governing Safety Critical Positions.

3.5 “person” means a person in a Safety Critical Position.

4. Frequency of medical assessments

4.1 Subject to sub-section 4.2, a person shall undergo a company organized Medical Fitness for Duty assessment:

a) prior to commencement of employment in a Safety Critical Position;

b) upon promotion or transfer to a Safety Critical Position; and

c) every five years until the age of forty, and every three years thereafter until retirement, or until that person is no longer employed in a Safety Critical Position.

4.2 Without varying the requirement of sub-section 4.1(c), no assessment shall be required under sub-section 4.1(b) if the person had previously occupied a Safety Critical Position which, in the opinion of the Chief Medical Officer, had similar mental and physical demands as the Safety Critical Position into which the person is entering.

4.3 The Chief Medical Officer may require additional assessments to those set out in Section 4.1 if:

a) the person has or may have a medical condition that requires assessment or more frequent monitoring; or

b) the person is returning to work in a Safety Critical Position after a leave due to illness or injury.

5. Assessment for medical fitness for duty

5.1 The Medical Fitness for Duty for a person shall be assessed on an individual basis, taking into consideration medical conditions, both past and current, that could result in:

a) sudden impairment;

b) impairment of cognitive function including alertness, judgement, insight, memory and concentration;

c) impairment of senses;

d) significant impairment of musculoskeletal function; or

e) other impairment that is likely to constitute a threat to safe railway operations.

5.2 The medical conditions referred to in Section 5.1 shall include:

a) diseases of the nervous system, including seizure disorders, narcolepsy, sleep apnea and other disturbances of consciousness, vestibular disorders, disorders of coordination and muscle control, head injury, post traumatic conditions and intracranial tumours;

b) cardiovascular diseases, including high blood pressure, coronary artery disease, myocardial infarction, cerebrovascular disease, aortic aneurysm, congestive heart failure, cardiac arrhythmia, valvular heart disease and cardiomyopathy;

c) metabolic diseases, including diabetes mellitus, thyroid disease, Cushing's Disease, Addison's Disease and pheochromocytoma;

d) musculoskeletal disabilities, including amputation of a limb, arthritis, significant joint dysfunction, disease of the spine, obesity or other significant musculoskeletal conditions;

e) respiratory diseases, including obstructive or restrictive conditions resulting in functional impairment;

f) mental disorders, including the following types of mental disorders:

i) cognitive, including dementias, delirium and amnesia;
ii) psychotic, including schizophrenia;
iii) mood, including depression, manic, bipolar;
iv) anxiety, including panic attacks and phobias; and
v) personality, resulting in anti-social, erratic or aggressive behaviour;

g) substance abuse, including abuse or dependence on alcohol, prescription medications, or illicit drugs;

h) hearing impairment, including hearing acuity;

i) visual impairment, including distant visual acuity, field of vision, colour vision; and

j) any other organic, functional or structural disease, defect or limitation that is likely to constitute a threat to safe railway operations.

6. Medical restrictions

6.1 If the Chief Medical Officer, in making an individual assessment of a person's Medical Fitness for Duty, is of the opinion that there exists a threat to safe railway operations, the Chief Medical Officer may:

a) restrict a person from occupying a Safety Critical Position;

b. require the use of corrective devices or other medical aids; or

c. otherwise restrict a person's ability to work or perform certain tasks in a Safety Critical Position.

6.2 Upon completion of a Medical Fitness for Duty assessment, the Chief Medical Officer shall advise each person and the person's supervisor of that person's Medical Fitness for Duty and of any restrictions or requirements imposed pursuant to sub-section 6.1.

7. Records to be kept by the chief medical officer

7.1 The Chief Medical Officer of the railway company shall maintain records of all persons' medical assessments required hereunder and any restrictions required pursuant to sub-section 6.1.

7.2 The Chief Medical Officer shall maintain copies of all medical policies and guidelines used by a railway company for the examination or assessment of persons employed in Safety Critical Positions.

7.3 The Chief Medical Officer shall make records, policies, and guidelines related to these rules available to the Department upon reasonable request.

3.3 – Approval by Minister of Transport

Approval of Rule – Pursuant to Section 20 of the *Railway Safety Act*, Chapter R-4.2, [R.S., 1985, C. 32 (4th SUPP.)]

The Railway Association of Canada (RAC), on behalf of its constituent railway companies, has requested approval of the *Railway Rules Governing Safety Critical Positions* and *Railway Medical Rules for Positions Critical to Safe Railway Operations.*

Paragraph 19.(4)(a) of the *Railway Safety Act* gives the Minister the authority to approve Rules filed by a railway company, on their own initiative, under Section 20 of the *Act*, if he is of the opinion that the Rules are conducive to safe railway operations. Having regard to current railway practice, to the views of the railway companies and the views of the relevant associations and organizations and to other factors that I consider relevant, I am of the opinion that the Rules so filed are conducive to safe railway operations.

Pursuant to the *Railway Safety Act*, paragraph 19.(4)(a), I hereby approve the *Railway Rules Governing Safety Critical Positions* and *Railway Medical Rules for Positions Critical to Safe Railway Operations*, filed by the RAC on behalf of its constituent railway companies as set out in Appendices "B" and "C" attached hereto.

The *Railway Rules Governing Safety Critical Positions* shall apply to the railway companies listed in Appendix "A". This Rule shall come into effect 90 days from the date of approval during which time railway companies must submit their list of safety critical positions to the Department.

The *Railway Medical Rules for Positions Critical to Safe Railway Operations* shall also apply to the railway companies listed in Appendix "A" and will come into effect once the remaining federally regulated companies become signatory to the new Rule and the subsequent revocation by the Governor in Council of General Order 0-9, *Regulations Respecting the Examination of Vision and Hearing of Railway Employees,* amended by CTC 1985-3 RAIL.

Signed by T. Burtch

_____

Director General, Rail Safety
for Minister of Transport

June 16, 2000

_____

Date

3.4 - Current List of Railways Signatory to the Rules (Appendix "A")

Railways Rules Governing Safety Critical Positions
and
Railway Medical Rules for Positions Critical to Safe Railway Operations

Agence Métropolitaine de Transport
Amtrak
* Arnaud Railway
Burlington Northern (Manitoba) Ltd.
Burlington Northern and Santa Fe Rlwy Co.
Canadian National Railway Company
Canadian Pacific Railway
Chemin de Fer de la Matapédia et du Golf Inc.
CSX Transportation
Essex Terminal Railway Company
Great Canadian Railtour Company
Goderich and Exeter Railway
Go Transit
Hudson Bay Railway
Kelowna Pacific Railway Ltd.
Montréal, Maine and Atlantic
* MacKenzie Northern Railway
Norfolk Southern
Okanagan Valley Railway
Ontario Northland Railway
Ottawa Central Railway
* Ottawa Valley Railway
Quebec North Shore and Labrador Railway
* Southern Ontario Railway
St. Lawrence & Atlantic Railroad (Québec) Inc.
Sydney Coal Railway
The Toronto Terminals Railway Company Limited
VIA Rail Canada Inc.
* Wabush Mines
West Coast Express Limited
White Pass & Yukon Railroad

* NOTE RailLink Canada Ltd. Power of Attorney covers four (4) railways:, the Mackenzie Northern Railway, the Ottawa Valley Railway, the Southern Ontario Railway and the Goderich and Exeter Railway.
Arnaud Railway and Wabush Mines are covered by one Power of Attorney.

Section 4 – RAILWAY MEDICAL GUIDELINES

4.1 - Overview

FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY OPERATIONS

Guidelines have been developed for a number of medical conditions that are both prevalent in the population and represent a significant potential risk to safe railway operations. These medical guidelines were developed by a team of physicians with an understanding of the occupational requirements of Safety Critical Positions in the railway industry including the Chief Medical Officers of Canadian Pacific Railway, Canadian National and VIA Rail with input from specialists and medical expertise from Transport Canada. The team is known as the Railway Association of Canada (RAC) Medical Advisory Group.

The goal of these medical guidelines is to provide a consistent application of medical standards in the railway industry across Canada while allowing for individual assessment of employees at the discretion of the Chief Medical Officers. The guidelines are made available to any physician or other Health Care Professional in Canada who is involved in treating or assessing an employee in a Safety Critical Position (SCP).

The following guidelines are currently available and may be found within this section of the handbook:

- Cardiovascular Disorders
- Diabetes
- Epilepsy and Isolated Seizures
- Hearing
- Mental Disorders
- Vision.

The RAC Medical Advisory Group will review and update these guidelines as needed to insure they continue to reflect accepted medical practices in Canada. Additional guidelines will be developed as required. Medical conditions not covered by a specific guideline will be governed by accepted medical practice for these conditions.

4.2 - Hearing

FITNESS FOR DUTY MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH IMPAIRED HEARING IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Employees working in an SCP are required to have sufficient hearing to meet the demands of these positions. Individuals who are occupying these positions must, even in noisy environments, be able to receive direct verbal communication and communicate through telephone and radio systems. They must also be able to detect and recognize the type and source location of any sound signal, particularly warning sounds.

2. Fitness for Duty Criteria

An average hearing loss in either ear of less than 40 dB in the frequencies of 500, 1000 and 2000 Hz with or without hearing aids.

3. Assessment Requirements

3.1 Frequency of Assessment

a) Assessment of hearing is done at pre-employment/pre-placement and at every periodic medical assessment.

b) The Chief Medical Officer (CMO) of a railway company may determine different periodicity when there is medical evidence that more frequent assessment is required.

3.2 Procedure of Assessment

a) A screening audiogram[1] is required at pre-employment/pre-placement, at the first periodic medical assessment and at the first periodic medical assessment after age 40.

b) The content of the hearing assessment is determined by each railway company.

c) An individual with an average hearing loss in either ear of between 30 dB and 39 dB at 500 Hz, 1,000 Hz and 2,000 Hz or with a Standard Threshold Shift[2] (STS) of an average of 10 dB or more at 2,000 Hz, 3,000 Hz and 4,000 Hz on a screening audiogram requires a confirmatory audiogram.[3] If the hearing loss is confirmed, a screening audiogram should be performed at the next periodic medical assessment.

d) An individual with an average hearing loss of 40 dB or more at 500 Hz, 1,000 Hz and 2,000 Hz in either ear or both ears on a screening audiogram requires further assessment which must include a confirmatory audiogram and a comprehensive medical assessment by an otolaryngologist (ENT). The medical assessment must include, at minimum:
- A comprehensive medical history
- A physical examination
- A medical report including a medical diagnosis and recommendations regarding the treatment, the use of hearing aids and the impact of the hearing disorder on their ability to occupy a safety critical position. This report must be sent to the CMO of the railway company for review.

[1] Hearing test using an audiometer calibrated in accordance with the requirements of the National Standard Institute (ANSI S3.6 - 1996).

[2] Deterioration of an average of 10 dB or more at 2,000 Hz, 3,000 Hz and 4,000 Hz in either ear or both ears as determined by comparing the most recent audiogram to the baseline audiogram (the first available audiogram). When an STS has been identified and a threshold stability (deterioration of less than an average of 10 dB) established, the most current audiogram becomes the new baseline audiogram.

[3] Audiogram performed by a certified audiologist in accordance with best practice. A confirmatory audiogram must be performed in an audiometric test booth in accordance with the background noise requirements of ANSI S3.1 - 1991.

4. Individual Assessment

The CMO may authorize an individual who does not meet the above criteria to occupy an SCP if the CMO has reasons to believe that the individual can perform his/her duties in a safe manner. In doing so, the CMO must take into consideration the following:

- the specific requirements of the SCP
- the opinion of an otolaryngologist who has assessed the individual and who is of the opinion that the hearing disorder is unlikely to interfere with safe performance of duties and,
- any relevant ability, skill or experience of the individual.

The CMO may also require that a practical test be performed before allowing an individual to occupy an SCP.

4.3 - Vision

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF

INDIVIDUALS WITH IMPAIRED VISION IN SAFETY CRITICAL

POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Employees working in an SCP are required to have sufficient vision to meet the demands of these positions. Working on, or around, moving equipment, identifying track and yard signals, and controlling rail traffic are duties where adequate visual acuity, colour perception, visual fields and extra-ocular muscle balance are mandatory.

Background information on visual requirements and fitness for duty issues is provided in Appendix I.

INDIVIDUALS WHO FAIL TO MEET THE CRITERIA FOR DISTANT OR NEAR VISION, VISUAL FIELDS OR EXTRA-OCULAR MUSCLE BALANCE ARE TO BE ASSESSED BY AN OPHTHALMOLOGIST OR AN OPTOMETRIST BEFORE THEY ARE DECLARED UNFIT TO OCCUPY AN SCP BY THE CMO.

2. Fitness for duty criteria

2.1 Visual Acuity

2.1.1 Distant Snellen acuity

- not less than 6/9 (20/30) in the better eye with or without correction
- not less than 6/15 (20/50) in the worse eye with or without correction

2.1.2 Near acuity

NOTATION	Both Eyes Open (Corrected or Uncorrected)
Reduced Snellen (American)	20/30
Reduced Snellen (Metric)	6/9
Snellen (Metric)	40/60
M notation @ 40 cm	0.63 M
N notation @ 35 cm @ 40 cm	N5 N6
Jaeger notation @ 35 cm @ 40 cm	J2 J4

2.2 Visual fields

The minimum extent of the uninterrupted monocular visual field in each eye without correction should be:

Horizontal meridian: 120^{o}
Vertical meridian: 90^{o}
Oblique meridians: 90^{o}

The monocular visual field must be continuous within these limits.

2.3 Colour vision

2.3.1 Normal unaided* colour vision as determined by the Ishihara Colour Vision Test.

Version of the Ishihara	Plates to be administered	Maximum number of allowable errors
14 plate edition:	1 through 10 inclusively	2
16 plate edition:	1 through 11 inclusively	2

24 plate edition:	1 through 15 inclusively	3
36 plate edition:	1 through 21 inclusively	5

* Unaided means that no visual aid other than clear spectacles, clear contact lenses, or contact lenses with light handling tints may be worn while performing the test. If there is any question as to the lightness of the tint, then clear spectacles or clear contact lenses should be worn while performing the test.

2.3.2 Failure of Ishihara Test

2.3.2 a) Railway Lantern Test (CNLAN)

A specific colour Lantern Test (CNLAN) has been developed by the railway industry. The CNLAN is designed to determine an individual's ability to identify colours used in rail wayside signals. The intensity and size of the lights are equivalent to a viewing distance between 0.2 and 0.4 miles. The colours fall within the American Association of Railroads standards for wayside signals. The testing protocol for the CNLAN is described in Appendix IV.

Individuals who fail the Ishihara Colour Vision Test are required to undergo further assessment, which may include a CNLAN. CN and Canadian Pacific Railway (CPR) currently administer the CNLAN. Testing can be arranged through the Occupational Health Services Department of either CN or CPR.

2.3.2 b) Rail Traffic Control (RTC) Practical Test

Rail traffic controllers who fail the Ishihara Colour Vision Test will be assessed using a practical test developed by each railway company.

NOTE: Both the CNLAN and the RTC tests must be conducted unaided as defined in section 2.3.1.

2.4 Extra-ocular muscle balance

Individuals who experience diplopia at different eye positions within a 30º radius of their habitual straight-ahead gaze or have a restriction of eye movements within 30º of straight-ahead cannot occupy an SCP.

3. Monitoring requirements

3.1 Frequency

Assessment of distant and near acuity, visual fields, colour vision and ocular muscle balance is done every 5 years until the age of 40 and every 3 years thereafter as part of the periodic medical examination.

Assessment of colour vision at pre-employment/pre-placement is done using the Ishihara Colour Vision Test. Individuals with colour vision defects who pass the CNLAN or RTC colour vision test are to be retested at the time of every second periodic medical examination (i.e. every 6 years) only for individuals over age 40. Those who do not pass the CNLAN or RTC colour vision test on retesting are required to undergo further assessment including a practical test developed by each railway company.

The Chief Medical Officer (CMO) may determine different periodicity for those individuals who have symptoms or signs of visual disorders or who are at risk of developing such disorders.

3.2 Testing methods:

Distant and near acuity, visual fields, colour vision and extra-ocular muscle balance assessments may be done by a physician, an optometrist, a nurse or a trained technician duly authorized by the CMO in accordance with current testing protocols (as described in Appendix II).

4. Individual assessment

The CMO may authorize an individual who does not meet the criteria to occupy an SCP if the CMO has reasons to believe that the individual can perform their duties in a safe manner despite their visual disorder.

In doing so, the CMO will take into consideration the following:

- the specific requirements of the position;
- the opinion of an ophthalmologist or an optometrist who has examined the individual; and
- any relevant ability, skill or experience of the individual.

The CMO may also require that a practical test be performed before allowing an individual to occupy an SCP.

5. Guidelines for some exceptional cases

5.1 Refractive surgery

5.1.1 LASIK[1] and PRK[2] procedures

Individuals who had LASIK or PRK procedures cannot be considered fit to work in an SCP until they are documented to have:

- a visual acuity (corrected or uncorrected) that meets the standard by at least day 7 post-op
- developed no complications, and
- a report from an eye care specialist that considers them fit to return to work

Additional reports are required by at least one month and three months post-op verifying that the individual continues to meet the visual acuity requirements and no complications have developed.

5.1.2 RK[3], CK[4] and LTK[5] procedures

Individuals who had RK, CK or LTK procedures cannot be considered fit to work in an SCP until they are documented to have:

- a visual acuity (corrected or uncorrected) that meets the standard by at least day 7 post-op*

[1] Laser Assisted In-Situ Keratomeulesis
[2] Photorefractive Keratectomy
[3] Radial Keratotomy
[4] Conductive Keratoplasty
[5] Laser Thermokeratoplasty

- developed no complications, and
- a report from an eye care specialist that considers them fit to return to work

Additional reports are required by at least one month, three months, and 6 months post-op verifying that the individual continues to meet the visual acuity requirements and no complications have developed.

*If the refractive surgery was RK, then the reports should contain the results from two measurements made at different times of day to verify that the diurnal variations are not significant. One assessment should be in the early morning and the other in the late afternoon.

5.1.3 Implantable Contact Lenses (ICLs)

Individuals who had ICLs cannot be considered fit to work in an SCP until they are documented to have:

- a visual acuity (corrected or uncorrected) that meets the standard by at least day 7 post-op
- developed no complications, and
- a report from an eye care specialist that considers them fit to return to work.

Additional reports are required by at least one month and three months post-op verifying that the individual continues to meet the visual acuity requirements and no complications have developed.

5.2 Monocular Vision

For the present purposes, a monocular individual is a person who has lost the use of one eye or has a visual field in one eye that is less than 40 degrees in any direction. A monocular individual may be deemed as acceptable for an SCP provided that the following conditions are met:

5.2.1 A report by an eye care professional indicates that, with respect to the worse eye, the condition is stable and unlikely to affect the better eye;

5.2.2 With respect to the better eye:

- the vision is corrected to 6/9 or better;

- the visual field is within acceptable limits. The minimal acceptable visual field limits are defined as:

- horizontal meridian of 120º
- vertical meridian of 90º
- oblique meridians of 90º
- a continuous visual field within the above limits.

- colour vision is adequate under binocular viewing conditions;

- the eye's adnexa are normal in all other respects.

5.2.3 The individual, following an adequate period of adaptation, has satisfactorily completed a practical test (*) conducted by a person designated by the CMO demonstrating his/her ability to perform his/her duties in a safe manner while maintaining an adequate look-out for other traffic and obstructions

(*) A practical test or adaptation may not be necessary in all cases. Demonstrated ability to perform tasks similar to those in an SCP that were gained through past work experience may be sufficient.

5.3 Substandard Vision in One Eye

These are individuals whose worse eye has a corrected central vision of less that 6/15 and a normal peripheral visual field in that eye. Individuals who have a scotoma within the central 10º visual field, but the remaining visual field is normal would also fall into this category. These individuals can be deemed fit for an SCP provided that the following conditions are met:

5.3.1 A report by an eye care professional indicates that with respect to the worse eye:

- the condition is stable and unlikely to affect the better eye;
- the visual field is normal outside the central 10º; and
- the eye's adnexa are normal in all other respects.

5.3.2 With respect to the better eye:

- the vision is corrected to 6/9 or better;
- the visual field is normal; and
- the eye's adnexa are normal in all other respects.

5.3.3 With respect to binocular viewing conditions:

- colour vision is adequate; and

- diplopia is absent.

5.3.4 An accredited professional concludes that the visual defect is unlikely to interfere with safe performance of duties, and the CMO is satisfied that any relevant ability, skill or experience of the individual has been given due consideration. In certain cases, a practical test may be advised.

Appendix I - Background Information on Vision

For decades, safety of railway operations has been a concern. This is acknowledged in the Railway Safety Act which has been enacted further to the National Transportation Act. The Railway Safety Act incorporated a prior General Order on the Railway Vision and Hearing Examination Regulations known as the General Order O-9.

Amended the last time in 1985, General Order O-9 has been revoked and is now replaced by the Railway Medical Rules. These rules allow health professionals to assess accurately and equitably the capacity of individuals with impaired vision to occupy a Safety Critical Position (SCP).

Visual Acuity

In general, the recommended standards are similar to those used for commercial drivers in Canada. Most Canadian provinces require a minimum distance acuity of 6/9 (20/30) corrected or uncorrected for the better eye and 6/15 (20/50) corrected or uncorrected for the worse eye. It is anticipated that the majority of individuals between the ages of 18 and 60 years old should be able to meet the proposed distance acuity standards.

A near vision standard is maintained to ensure that individuals over age 40 have the proper spectacle correction in order to read and carry out tasks within arm's length efficiently. It may also identify a small number of moderate hyperopic individuals under age 40 who may benefit from a correction in order to reduce eyestrain.

Refractive Surgery

The primary concern with refractive surgery procedures and individuals who occupy an SCP is that their vision may fluctuate so that they no longer meet the standard due to the regression of the refractive error, changes in the corneal transparency, or both. The main safety concern is whether the individual's acuity would decrease below the standard without them being aware of the change.

The degree of the fluctuation and the time required for vision to stabilize depend on many factors. These factors include the type of surgery, the amount of the surgical correction, and the individual's healing characteristics. In certain cases, individuals may require longer than 6 months for the vision to stabilise. Others, particularly those with small myopic refractive errors, may be fit to return to work by 7 days post-op, providing their visual acuity is stable. (Acuities are considered to be stable when the values are within $\pm$3 letters on separate visits) A review of the literature indicates that the majority of patients who meet this criterion for stability at one week after laser surgery also meet the criteria at 6 months although there is a slight change in the mean refraction towards myopia between one and three months. The tendency to regress

towards myopia is the reason for the reports verifying that the individual still meets the visual requirements.

Although some procedures offer the possibility of stable vision relatively quickly, there are other techniques which may require more time for stabilization and healing. This is the reason for requiring reports at more frequent intervals for those individuals who have had radial keratotomy (RK) conductive keratoplasty (CK) and laser thermal keratoplasty (LTK). RK has the additional complication that diurnal fluctuations of the refractive error and visual acuity are still possible long after surgery. For this reason, individuals who have had RK surgery will have to document that their vision still meets the required standard for different times of the day. The times for assessment would be early in the morning and late in the afternoon or early evening. For those individuals on shift work, the different times would be shortly after waking and after being awake for at least 8 hours. It may be necessary for these individuals to have separate pairs of spectacles for day and night in order to meet the visual acuity standards.

Implantable contact lenses (ICL's) are a relatively new option for individuals with moderate to high refractive errors. It is anticipated that these devices will become more common in correcting myopia and hyperopia in the upcoming years. The ICL's are implanted in either the anterior or the posterior chamber of the eye through small incisions. Visual recovery is usually within a day and most individuals have stable refraction and visual acuity after one week. However, because the device requires more evasive surgery, the risk of infection is higher and there is also the risk that the incisions could reopen if they haven't healed properly. Until more experience is obtained with the devices, the decision on when the individual can return to work should be made in consultation with the surgeon.

Visual Fields

Visual fields are usually assessed using the "confrontation" method which is user-friendly, practical and sufficient to detect quadrantanopias and hemianopias. These visual field losses are large enough to have a detrimental effect on individual's performance resulting in an unacceptable risk to the safety of the individual and others. The simplicity of the confrontation concept has led to a multitude of techniques for performing the test. Some techniques are better than others. The recommended procedure is "finger counting". The finger-counting procedure is primarily intended as a screening test. If a defect is found, then further testing will be necessary to diagnose the cause and quantify the functional impact of the field loss. The recommended test conditions are designed to quantify an absolute loss. The size and contrast of the targets (which have approximately equal detectability) are designed to measure the maximum extent of the visual field. Each eye should be tested. Different testing conditions may be required for diagnostic purposes.

It is possible that a person with a visual field loss might be able to compensate by making additional eye and head movements. Nevertheless these individuals may not be suitable for certain SCP's. Operating equipment on the main track may not be a problem because the

necessary scanning movements are mostly along the near horizontal meridian and at the instrument panel. However, someone working in a large yard or along multiple sections of track may be at greater risk because equipment could be moving on any of the closely-spaced sections of track; the loss of peripheral vision may impair his/her ability to detect moving objects in sufficient time. For these reasons, individuals with a visual field impairment should be considered on an individual basis with a practical evaluation if necessary.

Extra-ocular Muscle Balance

Screening for extra-ocular muscle disorders that could result in double vision is accomplished, in part, through the medical history. A history of double vision, strabismus, turned eye, eye exercises, or a lazy eye require further assessment. There are also a number of systemic conditions where there is an increased likelihood of diplopia. Examples of these conditions include Grave's disease (i.e. hyperthyroidism), diabetes, stroke, multiple sclerosis, and myasthenia gravis.

The visual acuity standard is the other part of the screening process. Failure to meet the acuity standard in the worse eye may be a result of a strabismus or long-standing ocular muscle problem, particularly in the younger individuals.

Individuals who have been identified as being at risk for developing diplopia either by their medical history or visual acuity should be assessed further by an eye care professional.

Colour Vision

Assessment of colour vision is particularly important in railway operations as colour signals are extensively used to control the movements of trains. The use of the Ishihara plate method remains the best screening tool as it is inexpensive, sensitive and specific. The recent development of an improved Lantern Test makes the confirmation process more accurate as it identifies those individuals who are at risk because of their colour identification deficiency.

Coloured spectacle or contact lenses worn before one or both eyes, or other devices purported to aid colour discrimination or correct colour vision deficiencies, are not permitted. It is safe to make the general statement that these devices are primarily designed so that the individual passes the Ishihara (or equivalent) test. On most practical tests, performance usually does not improve unless the practical test is very similar to the colour vision demands of the Ishihara. The reason for the discrepancy is that in aiding discrimination for certain specific colours, the filters usually worsen discrimination for other colours, resulting in no overall improvement in their general colour discrimination capabilities. For example, a red coloured lens which blocks green light from reaching the eye would allow a person to pass the Ishihara test because the orange numbers would appear brighter than the green background while wearing the red lens. However, when the person is required to identify signal lights while wearing the lens, the green light would

appear to be as very dim yellow or white light if they are detected at all and the yellow light would appear as an orange or red light.

One question that is often raised concerns the frequency for retesting colour vision. The reason for the question is that for the vast majority of individuals with normal colour vision, their colour vision remains unchanged throughout their career. This reflects the general trend in the population that colour discrimination remains relatively stable until age 40. Even though colour discrimination begins to worsen at this age, the discrimination loss is along the blue-yellow axis and not the red-green axis so that one's ability to identify railway signals should not be impaired. Data from the CNLAN study support this hypothesis. Individuals over age 40 with normal colour vision did not do worse in identifying simulated wayside signal lights. In fact the general trend in the data was that the older subjects had fewer errors than the younger subjects.

Given that there is little risk of a healthy individual's red-green colour vision deteriorating during their career, individuals who pass the Ishihara test at their initial assessment are not required to redo the test UNLESS there is a change in their general health or the health of their visual system. Conditions that would warrant retesting and frequent monitoring of their colour vision include diabetes, demyelinating diseases, chorioretinal diseases, optic nerve disorders, or prescribed medications that are known to affect colour vision.

Although the age-related changes in colour vision are well established for individuals with normal colour vision, the age-related affects on the colour vision of individuals with congenital colour vision defects is not as certain. In these cases, the issue is whether the normal age-related changes affect their colour discrimination to a greater extent since their discrimination is already compromised. Results on the Ishihara test are inconclusive since the majority of the individuals with colour vision defects miss nearly all the plates on the test even when they are young adults so it is impossible to measure any age-related changes with the Ishihara test. Because of this uncertainty, individuals with a colour vision defect who pass the CNLAN or the RTC colour vision test are to be retested at every second periodic medical examination after age 40 (every 6 years) regardless as to whether their visual or general health has changed.

Monocular Vision

There is little question that an individual's performance on a number of laboratory tests will be impaired when there is either a sufficient reduction in the visual acuity in one eye or the individual is monocular. However, these degradations in laboratory measures do not usually translate into appreciable losses in on-the-job performance. Performance in terms of driving either a truck or automobile has not been shown to be significantly affected when the driver is monocular. Although some studies have reported higher accident rates for drivers with impaired vision in one eye only, more recent studies have not been able to confirm these findings. In fact, one study reported that the accident rates were lower for monocular truck drivers. One possible explanation for the differences is that the older studies did not always control for age and driving experience. Despite the more recent performance data indicating that monocular drivers do not

pose an increased risk, many agencies still remain reluctant to relax the visual field standard for commercial drivers to allow monocular drivers. It is important to remember that, although individuals with monocular visual fields losses may not be a safety risk, there is a general consensus in the data that individuals with an appreciable field loss in both eyes are a significant risk to safety.

Although monocular individuals may not pose an increased risk to safety on the roadways, driving a vehicle is not necessarily equivalent to performing duties in the rail industry. For this reason a more conservative approach is taken in assessing individuals who are monocular or have substandard vision in one eye to ensure that the vision defect will not pose an increased risk to safety. One of the primary safety concerns for the rail industry is the impact of the visual field loss on the person's ability to detect hazards. A person who has lost total vision in one eye has lost approximately 40 ° of his/her peripheral visual field on the same side of the body as the blind eye. This loss could be problematic in detecting objects coming from the side if the person has not developed coping strategies such as scanning eye movements, head turning, or both. The development of these strategies often requires time and this is one reason why Civil Aviation Authority typically uses an adaptation period of 6 months before they will re-license a pilot who has lost vision in one eye and restrict a monocular commercial pilot to a 2-person crew.

Even with the additional eye and head movements, a person with only one eye (or a bilateral loss of upper or lower visual fields) may not be suitable for an SCP. Operating equipment on the main track may not be a problem because the necessary scanning movements are mostly along the near horizontal meridian and at the instrument panel. However, someone working in a large yard or along multiple sections of track may be at greater risk because equipment could be moving on any of the closely-spaced sections of track and the loss of peripheral vision may impair his/her ability to detect moving objects in sufficient time. For these reasons, individuals with a visual field impairment should be considered on an individual basis with a practical evaluation if necessary.

Visual Assessment Form

In order to assist the examining practitioner and the CMO, an example of a visual assessment form is provided in Appendix III. This form could serve as either the actual document or a template for developing an equivalent form.

Appendix II - Visual Assessment Methods

1. Visual Acuity

1.1 Distant acuity

Distant acuity is assessed with the individual wearing his/her habitual distance visual correction (if any), using a Snellen chart or an equivalent.

When acuity charts printed on white surface are used, the light falling on the chart should be uniform and the amount should be greater than 250 lux. Most offices with overhead fluorescent light fixtures will meet this requirement. If the chart is placed at the end of a long hallway, then adequate illumination should be confirmed with a light meter. Long hallways tend to be dimmer than the work areas. Glare sources such as windows are to be away from the chart. The individual being assessed should not sit or stand directly below a light.

If a projected chart or computer screen is used, the room lights should be turned off prior to the assessment.

The individual is allowed only one mistake on a line in order to receive credit for that line. The proposed scoring criterion of allowing only one mistake on a line is explained by the fact that different charts are used in testing distant acuity. These charts vary in the number of letters per line and the types of letters in the line. All letters are not equally difficult to identify. These variations have an influence on the probability that the assessed individual would correctly identify the letters based on guessing and prior experience. For example, it would be easier to obtain 75% correct on a chart with 4 letters per line that are relatively easy to identify than it would be for a chart which had 6 letters per line and the letters vary in their difficulty. Because this factor is difficult to control when using multiple chart designs, there is a necessity to adopt a strict scoring criterion to minimize the interaction.

1.2 Near acuity

Near vision is assessed with the individual wearing his/her habitual visual correction for reading (if any), using one of the following scales:

Reduced Snellen (American)	Reduced Snellen (Metric)
Snellen (Metric)	M Notation @ 40 cm
N Notation @ 35 cm or 40 cm	Jaeger Notation @ 35 cm or 40 cm

Examiners must use the appropriate test distance specified for the given scale. Testing is done with individuals wearing their current visual correction for reading. Normal office lighting is sufficient. There should be no shadows falling on the near acuity card.

An adequate screening test for near acuity is the recognition of text printed in regular Times New Roman Font at an 8 point letter size held at 40 cm.

2. Visual fields

Visual fields are assessed using the confrontation method. If a defect is found, then a more quantitative method should be used.

2.1 Recommended procedure (confrontation method)

- The individual is positioned 0.66 to 1.0 metre away from the examiner. The examiner should be positioned at approximately the same height as the individual. Individuals do not need to wear their corrective lenses but those with higher prescriptions may find the test easier to perform when wearing their habitual prescription. Normal office lighting is sufficient.

- The individual is instructed to occlude his/her left eye using the palm of his/her hand. The examiner occludes or closes his/her right eye.

- The individual is instructed to fixate the examiner's open eye with his/her open eye. The examiner informs the individual that he/she will be holding his/her hand in different locations to test the individual's side vision. The individual is to report how many fingers are held up. The examiner informs the individual that he/she will be holding up 1, 2, or 4 fingers. (3 fingers are difficult to distinguish from 2 or 4.) The examiner reminds the individual to maintain fixation on the open eye and not to glance at the hand.

- The examiner holds his/her hand about halfway between him/herself and the individual. The examiner starts with his/her hand in one of the four quadrants approximately 50 degrees from the common line of sight. The hand should be placed in the middle sector of the quadrant. (Other areas of the quadrant can also be tested.) The examiner holds up 1, 2, or 4 fingers and asks the individual to tell how many fingers are present. Fingers should be kept in a plane parallel to the individual's facial plane and rotated so that the fingertips are directed toward the individual's line of sight.

- The examiner repeats this procedure for the other 3 quadrants.

- The examiner may have to switch hands to test the other half of the visual field.

- If the individual responds incorrectly, the examiner moves his/her fingers closer to the individual's line of sight until the number of fingers is identified correctly. The examiner compares the difference in position between when he/she was first able to identify the number of fingers correctly and the position of his/her hand when the individual identified the number of fingers correctly.

- The procedure is repeated for the other eye.

2.2 Quantification of field loss.

In order to assess the functional extent of field loss, any of the following test methods could be used. Other test conditions may be necessary for diagnostic purposes.

LIST OF EQUIVALENT TEST METHODS

- 3 mm white target at 33 cm viewing distance (black or grey background).
- Goldmann Perimeter: Target III 3/e.
- Humphrey Perimeter: Size III at 15 decibels.
- Octopus 1-2-3 Perimeter: Size III at 10 decibels.
- Dicon Perimeter: 10 decibel target.

3. Colour vision

Colour vision is screened using the Ishihara Colour Vision Test. This test is designed to be used under natural daylight. If natural daylight is unavailable, "natural daylight" fluorescent lamps may be used. In practice, normal "cool white" fluorescent lamps are sufficient for the vast majority of individuals. A few individuals with very mild defects may pass using this light source. Although they do pass, they usually make more errors than an individual with normal colour vision. This means that, if an individual makes the maximum number of allowable errors when cool white fluorescent lamps are used, this individual should be re-tested using natural daylight or light source that is rated as comparable a suitable substitute for natural daylight.

Incandescent bulbs, halogen or warm white fluorescent lamps should not be used to illuminate the Ishihara test.

When scoring the test, the individual has to read the complete number correctly in order for the response to be counted as correct. Missing one digit of a two-digit number is an error.

4. Extra-ocular muscle balance

The medical history can be used to identify individuals who are at risk of developing double vision while at work. These risk factors include a past history of double vision, strabismus, turned eye, lazy eye, eye training exercises, or extra-ocular muscle surgery. There are also a number of systemic conditions that are associated with an increased risk of diplopia. Examples include Grave's disease (i.e. hyperthyroidism), diabetes, stroke, multiple sclerosis, and myasthenia gravis. Individuals who have any of these risk factors should be assessed further by an optometrist or ophthalmologist to determine the likelihood of developing double vision.

Failure to meet the acuity standard in the worse eye may be a result of a strabismus or long-standing ocular muscle problem, particularly in the younger individuals. Individuals who fail to meet the worse eye acuity should also be referred to determine the cause of the reduced visual acuity and whether diplopia is likely.

Diplopia within 30 degrees of fixations can be tested by the Broad H test. The Broad H test is common screening procedure to test the integrity of cranial nerves III, IV, and VI. The examiner asks the individual to follow his pen (or similar object) without moving their head as the examiner traces out an "H" pattern in front of the individual. The examiner starts with the pen directly in front of the individual and moves it slowly to the right approximately 30 degrees straight along a horizontal line. From this location, the examiner then moves the pen up 30 degrees, back down to the horizontal line and then down another 30 degrees in the inferior gaze. The pen is returned back to the horizontal line and then moved back through the straight ahead position to a point 30 degrees to the left of straight ahead. The upper left and lower left gaze positions are then tested by moving the pen up and down 30 degrees.

The examiner looks at the individual's eyes to make sure that they are both fixating on the target and asks the individual to report whether the pen appears double in any position. A report of diplopia or a misalignment of the eyes in any position would warrant further assessment by an eye care professional.

Appendix III- Vision Reporting Form Example

Employee Information (Employee to complete all areas) Last Name First Name Initial		Employee No. Date of Birth:	Male ☐ Female ☐
Position	Department	Work Location Telephone: (Home) (Office)	
Supervisor's Name	Employee's Signature		

Information to the Examining Eye Care Specialist

Canadian railway employees working in a Safety Critical Position (SCP) operate or control the movement of trains. Physical or mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Railway employees working in an SCP are required to have periodic screening assessments. This employee failed to meet the visual screening standard established for the Canadian railway industry by Government Legislation in the area(s) checked below. Your assessment of these areas is required. The established standard for each area is described.

SECTION A

- ☐ **Visual Acuity**

  Standards:

  Corrected or uncorrected distance visual acuity not less than 6/9 (20/30) in the better eye.
  Corrected or uncorrected visual acuity not less than 6/15 (20/50) in the worse eye.
  Corrected or uncorrected near visual acuity of 6/9 (20/30) with both eyes open.

	Distance Vision		Near Vision	
	Uncorrected	Best Corrected	Uncorrected	Best Corrected
Right Eye				
Left Eye				
Both Eyes				
Test Method				

1. If new glasses or contact lenses are required to meet the vision standards, have they been prescribed?

   - ❑ Yes. Anticipated date of dispensing _____
   - ❑ No. Explain: _____

2. Even though the acuity standards are met with an updated prescription, are there other conditions contributing to the reduction in visual acuity other than uncorrected refractive errors?

   - ❑ Yes. Indicate diagnosis and management.

   _____
   _____
   _____
   _____

   - ❑ No

3. If the best corrected visual acuities do not meet the required standard, indicate your diagnosis and management of this patient's condition.

   _____
   _____
   _____
   _____

4. If the better eye does meet the requirement, but the worse eye does not meet the acuity requirement, then we require an extra-ocular muscle assessment as outlined in Section B and visual field assessment of each eye as outlined below in Section C.

SECTION B

- **Extra-Ocular Muscle Balance**

Standard: No diplopia at different eye positions within a 30 degree radius of their straight-ahead gaze or a restriction of eye movements within 30 degrees of straight-ahead.

a. Is diplopia present within a 30 degree radius of straight-ahead gaze under daytime or night time viewing conditions?

☐ Yes ☐ No

b. Are there any restrictions of eye movements within 30 degrees of straight-ahead?

☐ Yes ☐ No

If "Yes" to either question, please indicate your diagnosis and management of the extra-ocular muscle or binocular vision problem.

_____
_____
_____
_____
_____
_____

SECTION C

- ☐ **Visual Fields/Peripheral Vision**

1. Does this employee meet the following limits of uninterrupted monocular visual field for each eye tested separately without correction?

Standard	Right Eye		Left Eye	
	Yes	No	Yes	No
Horizontal meridian: 120° Continuous				
Vertical meridian: 90° Continuous				
Oblique meridians: 90° Continuous in both the 135^{o} and 45^{o} meridians				

2. If "No" is answered to any of the above limits, please attach the results and indicate your diagnosis and management of the visual field problem.

_____
_____
_____
_____

3. Indicate test method used:

- ☐ 5 mm white target at 33 cm viewing distance (black or grey background)
- ☐ Goldmann: Target III 3/e
- ☐ Humphrey: Size III at 15 decibels
- ☐ Octopus 1-2-3 Size III at 10 decibels
- ☐ Dicon Perimeter: 10 decibel target
- ☐ Equivalent Condition (Specify)_____

EYE CARE SPECIALIST STATEMENT, INFORMATION AND REPORTING GUIDELINES:

An answer to the following is required:

Are there other visual conditions or disorders that could affect this employee's performance in a Safety Critical Position in the Canadian railway industry?

- ❑ Yes. Indicate diagnosis and management.

  _____
  _____
  _____
  _____

- ❑ No

This report will be used to make an assessment on this employee's fitness for duty and constitutes a third party service. In completing this report, please be thorough and write legibly. If you have any questions regarding any component of this report, call the toll-free number listed below.

I certify that the information documented in this report is, to the best of my knowledge, correct.

Date of examination: _____

Signature: _____ ☐ Optometrist
☐ Ophthalmologist

Name (Print): _____ Telephone: ( ) _____

Address: _____ Fax: ( ) _____

City/Province: _____ Postal Code: _____

Report and Invoice may be sent to:

Appendix IV – CNLAN - Lantern Colour Vision Test

Introduction

The Lantern Colour Vision test is designed to determine one's ability to identify colours used in rail wayside signals. The intensity and size of the lights are equivalent to a viewing distance between 0.2 and 0.4 mile (0.3 to 0.64 km). The colours fall within the American Association of Railroads standards for wayside signals.

Test Description

The test should be conducted under normal room illumination at a viewing distance of 4.6 meters (15 feet). There are three parts to the Lantern: the lantern itself, the control unit and a remote control unit. There is a slot on the back of the lantern for carrying the control unit. The unit should be placed in the slot with the top facing away from the lantern and the connectors facing up. The remote control is attached to the control unit.

A computer cable connects the control unit to the lantern. On the left front of the lantern, is a connector for the control unit. (Just above the plug for the power cord). The control unit also has an RS232 connection so that a computer can control the lantern if desired.

Test Set-up

Place the lantern 4.6 metres from the applicant. Remove the control unit from the back. If necessary, connect the control unit to the lantern using the computer cable. The control unit can be placed anywhere convenient. We recommend placing it so that you view both the applicant and the lantern. The power switch is on the right side of the lantern. This switch controls power for both the lantern and control unit. As the power comes on, the control unit will set the lantern to the first example set. The colour of the lights will be listed on the control unit display.

Pressing the arrow buttons on the control panel changes the test lights. The arrow pointing to the left displays the previous set of lights and the arrow pointing to the right advances to the next set of lights. The lights will be extinguished between presentations. The button labelled with the "X" turns off the lantern's light, but the control unit remains on. To turn the lantern on, press one of the arrow buttons.

The test lights can also be changed by the remote control. The asterisk on the remote control presents the previous set of lights and the pound button (#) advances to the next set of lights. The number buttons can be used to move to a specific set of test lights. To present a specific set, you must always press two buttons. For example, to display set 5, you must press 0 and 5.

Aim the remote control at the dark rectangular window on the control unit. If the control unit received information from the remote, a little red light will flash. A light on the remote will also flash if the information was transmitted. Pressing 0 twice will turn off the tests lights.

We recommend that you turn off the lights, if not the entire lantern, between tests. The reason is that there is a thermostat which will turn off the light if the lantern gets too hot. It takes about 45 minutes before it cools down enough to use.

Testing Procedure

Before starting the test, make sure that the tested individual has corrected or uncorrected distance vision that meets the current standards.

The individual's normal clear spectacle lenses or clear contact lenses can be worn while performing the test. However, coloured spectacle lenses or coloured contact lenses worn before one or both eyes or other devices purported to aid colour discrimination or correct colour vision deficiencies are not permitted. Contact lenses, which are tinted with a light blue handling tint, are permitted. Light handling tints have essentially no effect on the test results. However, if there is any question as to how light the tint is, then testing must be done with either clear spectacle lenses or clear contacts lenses.

The candidate should be seated comfortably at a distance of 4.6 metres (15 feet) from the lantern and have a straight-on view of the front of the lantern. The room lights should be turned on. If necessary, set the lantern to the first presentation. This is one of the examples. Inform the candidate that this is a test to determine his/her ability to identify rail signal light colours. State that "there will always be three lights presented. The colours of the lights will be in any combination of red, green and yellow. Only the names of red, green and yellow should be used to identify the lights. Identify the colour of the lights starting at the top, followed by the middle, and then the bottom. The three lights that you see here are examples. The top is green, the middle is yellow and the bottom is red." Advance to the next presentation. Inform the candidate that this is another example. It has red on top, yellow in the middle, and green on the bottom.

Ask if there are any questions or if the candidate would like to see the examples again. If not, advance to the third set of lights. This is the first test set. Record the responses on the score sheet by circling the correct answer and writing in the incorrect response. Allow approximately 5 seconds for a response. If the candidate takes longer than 5 seconds to respond, extinguish the lights, by pushing the "X" button or entering 00 on the remote. In order to avoid confusion in recording, do not advance to the next set until the candidate has responded. The test set ends at 15.

If the candidate uses a colour name other than red, green or yellow, remind her/him that only red, green and yellow responses are allowed. The exception to this rule is that amber can be used to identify yellow lights.

A passing performance is no more than one error, and that error cannot be identifying a red light as green or a green light as red.

Alternative Testing Protocol (for shorter sighting distances)

In some positions, the sighting distance required for identifying signal light colours is not as far as required on the main track. These are usually positions where the employee is operating equipment only within a yard. The sighting distances in these settings are usually significantly shorter than the distances on the main track. Shortening viewing distance for the Lantern Test can accommodate these differences in visual demands. For example, if the test distance from the lantern was 2.3 metres (7.5 feet), then the Lantern Test would correspond to viewing distances on the track ranging from 0.1 to 0.2 mile (0.16 to 0.32 km). Table 1 lists some equivalent distances between the Lantern Test and actual viewing distances. The exact test distance may have to be determined on an individual basis. However, there is a limit. A Lantern Test distance closer than 0.5 metre is an unrealistic simulation. This occurs because, as one gets within 50 yards of the dwarf (and wayside signals) signal lights along the track, their brightness begins to decrease. This decrease is due to the relatively narrow and directed beam spread of the lights. In contrast, the brightness of the Lantern Test lights will continue to become brighter as the test distance decreases. There is also a change in the scoring criterion at the shorter test distances. Individuals must now obtain a perfect score (i.e., no errors).

Table 1. Test distance for the lantern and the equivalent viewing distance in the field.

Lantern Test Distance		**Equivalent Field Viewing Distances**			
Metres	**Feet**	**Miles**	**Feet**	**Yards**	**Metres**
4.6	15	0.2 to 0.4	1050 to 2110	350 to 700	320 to 640
2.3	7.5	0.1 to 0.2	530 to 1060	175 to 350	160 to 320
1.15	3.75	0.05 to 0.1	260 to 530	90 to 175	80 to 160
0.5	1.8		130 to 265	45 to 85	4o to 80

Troubleshooting

The filter wheel keeps turning and the light does not come on.

This usually means that the cable connecting the control unit and the lantern is not completely plugged in. Reconnect both plugs and make sure that they are secure.

Replacing the light bulb.

Before you replace the bulb, you may want to let the lantern cool for 1 hour. The light will automatically turn off when the temperature inside the lantern gets too hot. If the black tube holding the light is very hot to the touch, wait and retry the lantern before replacing the bulb.

If it is the bulb, then loosen the set-screw on the black tube coming out of the back of the lantern. Gently pull back on the plastic fixture until the bulb is completely removed. The replacement is 10 watt, 18 volt Sig. Bulb. These are the bulbs that are used in the searchlight style signal lights.

Replacing the remote batteries.

The batteries for the remote are located on the backside at the bottom. It takes 2 AA batteries.

If there are any other problems, ship the unit to the address below with a short description of the problem.

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Appendix V - Acknowledgements

The RAC would like to acknowledge the contribution of:

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4.4 – Epilepsy or Other Epileptic Seizures

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH EPILEPSY OR OTHER EPILEPTIC SEIZURES IN A SAFETY CRITICAL POSITION IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Sudden impairment of their alertness, judgement, or sensory or motor function can pose a serious safety threat.

Although the overall prognosis for seizure control is excellent, with about 70% of patients having a 5-year remission of seizures, epilepsy is a condition which can cause sudden and unpredictable impairments of the functions noted above. Each person with epilepsy has different disabilities. Complete evaluation of each case is therefore needed to assess the risk of seizure recurrence and the risk to safety caused by a seizure. The notion of "significant risk" cannot be precisely defined. A risk-free environment is unattainable and undoubtedly some employees with no history of epilepsy will have their first, and unpreventable seizure on the job.

Background information on epilepsy and other epileptic seizures is provided in Appendix I.

2. Basic considerations

Employment of individuals with epilepsy or other epileptic seizures in an SCP shall be guided by the following considerations:

2.1 Medical history and findings (see Appendix II)

- nature of seizure disorder
- results of investigations
- adherence to treatment protocols
- results of treatment

2.2 Treatment
- antiepileptic drugs (AEDs)
- surgery
- withdrawal of medication

2.3 Nature of the job

3. Definitions

For the purpose of this document, the definitions of epilepsy and other epileptic seizures are those of the International League Against Epilepsy:

- **Epileptic seizure** is defined as a clinical manifestation presumed to result from an abnormal and excessive discharge of a set of neurons in the brain. The clinical manifestation consists of sudden and transitory abnormal phenomena which may include alteration of consciousness, motor, sensory, autonomic, or psychic events perceived by the patient or an observer.

- **Epilepsy** is defined as a condition characterized by recurrent (two or more) epileptic seizures, unprovoked by any immediate identified cause. An individual who has a first seizure with an electroencephalogram (EEG) with epileptiform activity must be considered suffering from epilepsy until proved otherwise.

- **Single or isolated seizures** are defined as one or more epileptic seizures occurring within a 24-hour period.

- **Unprovoked seizures** are defined as seizures that occur in relation to a well-demonstrated antecedent condition, substantially increasing the risk for epileptic seizures. Two major subgroups may be categorized as follows:

    - **Remote symptomatic unprovoked seizures** owing to conditions resulting in a static encephalopathy subsequent to insult to the central nervous system (CNS) such as infection, cerebral trauma, or cerebrovascular disease, which are generally presumed to result in a non-progressive (static) lesion.

    - **Symptomatic unprovoked seizures** owing to progressive CNS disorders.

- **Acute symptomatic seizures (Provoked seizures)** are defined as seizures occurring in close temporal association with an acute systemic, metabolic, or toxic insult or in association with an acute CNS insult (infection, stroke, cranial

trauma, intracerebral hemorrhage, or acute alcohol intoxication or withdrawal). Such seizures are often isolated epileptic events associated with acute conditions, but may also be recurrent seizures or even status epilepticus when the acute conditions recur, e.g., in alcohol withdrawal seizures.

4. Medical Fitness for Duty Criteria

4.1 In the case of epilepsy:

4.1.1 treated at any time with AEDs only:

- A period of 5 years without seizures with or without medication, and
- Absence of epileptiform activity in serial EEGs performed over a period of 5 years and interpreted by a certified electroencephalographer
- Following withdrawal of AEDs, absence of epileptiform activity in serial EEGs performed over a period of 3 years and interpreted by a certified electroencephalographer.

4.1.2 that has been treated surgically:

- A period of 5 years following the surgery, on medication, without seizures, and
- Absence of epileptiform activity in serial EEGs performed over a period of 5 years and interpreted by a certified electroencephalographer.

4.1.3 with epileptic seizures occurring in relation to sleep only

- Absence of postictal impairment during wakefulness
- Treatment with AEDs
- Stable clinical pattern for 5 years

4.1.4 with stricly simple partial seizures, including isolated auras, as defined in Appendix I, which occur even with AED treatment:

- Absence of cognitive sensory, or motor impairment
- Stable clinical pattern for 5 years.

4.2 In the case of epileptic seizures other than epilepsy

4.2.1 Single or isolated seizure

Fitness for duty of individuals with single or isolated seizure or with remote symptomatic unprovoked seizures must be assessed using the fitness for duty criteria determined for individuals with epilepsy.

4.2.2 Acute symptomatic seizures (provoked seizures)

Fitness for duty of individuals with acute symptomatic seizures (provoked seizures) must be assessed individually. Once the seizure trigger has been clearly identified and the seizures judged unlikely to recur, a minimum of 1 year from the illness or the acute CNS insult may be considered acceptable prior to returning to an SCP.

4.3 Other criteria of temporary exclusion from an SCP of individuals with epilepsy

- Job requiring overtime or rotating shifts resulting in sleep deprivation or the likelihood of disturbed sleep patterns
- Non compliance with treatment
- Inadequate blood AED levels
- Side effects from AEDs that could significantly impair job performance

4.4 Criteria of permanent exclusion

4.4.1 Symptomatic unprovoked seizures owing to progressive CNS disorders.

4.4.2 Repeated non compliance with treatment.

5. Monitoring requirements before and after returning to work in an SCP

5.1 Within 3 months before returning to work in an SCP: review by a neurologist with submission of a written report.

5.2 After returning to work:

- Yearly review by a neurologist with submission of a written report
- For individuals taking AEDs, results of blood AED levels forwarded quarterly to the Chief Medical Officer of the railway company

6. Individual assessment

Individuals with epilepsy or other epileptic seizures must be assessed with regard to their suitability for a particular position. The nature of the duties and responsibilities associated with their specific Safety Critical Position must be closely evaluated before any final determination of their fitness for duty.

Appendix I - Background Information on Epilepsy and other Epileptic Seizures

Appropriate medical information is required to establish the diagnosis of epilepsy as outlined in Appendix II. The medical information may predict the prognosis for seizure control. Physicians are expected to classify seizures and epilepsies in accordance with current international classification applicable to each. Terms in this document related to epilepsy are defined in accordance with a 1997 report of the International League Against Epilepsy published in the journal EPILEPSIA, volume 38, pp 614-618.

Simple partial seizures are seizures with evidence of a clinical partial onset in which alertness and ability to interact appropriately with the environment are maintained. Complex partial seizures are those in which impairment of consciousness, amnesia, or confusion during or after a seizure is reported. Auras are a type of subtle simple partial seizure which may herald the onset of a clinically evident attack.

Most patients with epilepsy take daily antiepileptic drugs (AEDs). Current practice in adults is to taper and then stop AEDs after two, or preferably 5 years without seizures. About 60% of patients will remain seizure-free. In most, there are no clear-cut predictors of remission or of successful drug withdrawal in otherwise normal adults with normal neurological examinations. Some patients may wish to remain on AEDs even if they have been seizure-free for many years because of concerns about driving, work, and the social handicaps associated with epilepsy. Some patients have disorders which respond well to medication but which have a high likelihood of recurrence if AEDs are stopped. Neurologists do not usually recommend stopping drugs in these subjects.

If seizures cannot be adequately controlled with AEDs, surgical treatment may be needed. Such patients are investigated and treated in highly specialized centres. About 60% to 80% of such patients will be seizure-free after surgery. Medication is normally continued after surgery and then may be tapered and stopped after 1 to 3 years if the patient remains seizure-free. This may be done sooner if the cause of the seizures was a well-circumscribed lesion, especially if the seizures were infrequent and of relatively recent onset.

Some isolated seizures occur with systemic metabolic, toxic, or acute CNS diseases and are presumed to have been provoked by them. However, they may herald remote symptomatic recurrent spontaneous seizures. Review of the literature on risk factors for recurrent seizures after a first attack associated with these conditions indicates that adequate evidence is available for head injury only. A single seizure occurring within a week of minor head trauma rarely recurs. With more severe head trauma, especially if a seizure occurs more than one week after injury, 60% to 80% recur, 50% within the first year. More severe head trauma, bacterial meningitis with neurologic sequelae, encephalitis, and brain abscess are the most likely to lead to seizures.

Seizures often occur during alcohol withdrawal but are rarely precipitated by alcohol use itself. Seizures may, however, be a direct consequence of some non medical drugs. These events may occur when an individual is no longer under the influence of alcohol or a drug of abuse. In each case, the seizure may also be a symptom of an underlying brain disorder unmasked by the use of alcohol or drugs. For these reasons, employees with such attacks require complete neurological evaluation including an EEG and imaging, and must be evaluated according to the guidelines for individuals with epilepsy.

These rules for a Safety Critical Position in the Canadian railway industry have been developed based on the European studies of Chadwick and van Donselaar on professional drivers (bus, heavy truck, taxi, commercial van). Although scientifically reliable data are not available for all conditions, these authors believe that their figures are good approximations. In the USA, experts from the American Academy of Neurology, the American Epilepsy Society, and the Epilepsy Foundation of America calculated the recurrence risk after a first unprovoked seizure to be 8.12% in the second six-month period after the initial attack, and 5.36% in the third six-month period after the initial attack. Their recommendations for a seizure-free interval before driving were based on an estimate of the actual time driven of 1 hour/24 hours and a seizure/accident ratio of 0.55. They suggested that driving personal passenger cars could be permitted after a 3 months seizure-free period and believed that in treated and reliable patients, the first 3 months determined the likelihood of remaining seizure-free for the next year. For professional drivers, the US Federal Highway Administration requires a 10-year period without seizures and without AEDs for interstate and international driving.

The participants at a 1996 workshop representing all members of the European Union declared that people with epilepsy would be fit for professional driving when the risk of a seizure in the next year was not greater than 2%. A driving ban of 5-10 years was considered acceptable for a seizure-free subject off medication and without any EEG abnormality. In the case of a patient with a single isolated seizure without any known cause, a normal neurological examination and EEG, and, on no medication, a seizure-free period of 2-5 years was considered acceptable.

The risk posed by seizure recurrence for workers in a Safety Critical Position in the Canadian railway industry has not been studied but should not be greater than for professional drivers in Canada. This is understandable if the time during which the employee is alone in command is less than that for heavy truck or bus drivers, and if devices such as dead man controls or other safety mechanisms are used.

Appendix II - Medical Information Suggested for the Evaluation of Epilepsy or Isolated Seizures in Individuals Occupying a Safety Critical Position in the Canadian Railway Industry

Documentation

- Authorization to obtain medical records
- Pertinent medical records, including hospital and office notes and previous test results
- Records/reports of motor vehicle accidents and work accidents for the previous 5 years
- Reports of seizure recurrences

Medical History

- Etiology
- Family history of epilepsy
- Age of onset
- Circumstances of onset, e.g., alcohol use
- Date of last seizure, including isolated auras
- Clinical seizure pattern:
    - Presence of an aura with attention to alteration of sensory, motor or, cognitive functions
    - Duration and stability of the clinical pattern
    - Assessment of the level of risk associated with any interference with occupational activities
    - Accurate description of the seizure(s) including frequency, relation to time of the day and sleep cycle, alteration of consciousness, postictal features
- Precipitating factors:
    - Identify correctable factors such as sleep deprivation.
    - Identify seizures induced exclusively by specific situations with a view to determining if triggers can be modified or avoided and if treatment is likely to be effective.
- Treatment records:
    - Evaluate treatment with drugs or surgery or both.
    - Review drug level results over previous 5 years and effectiveness of treatment

- Compliance with treatment including factors such as avoidance of alcohol and sleep deprivation
- Adverse reactions to treatment

EEG including sleep tracing

MRI

Diagnosis in accordance with the International Classification of Epilepsies

Appendix III - Example of a Medical Report for the Evaluation of Epilepsy or Isolated Epileptic Seizures in Individuals Occupying a Safety-Critical Position in the Canadian Railway Industry

IDENTIFICATION

Name: _____ Initials: _____ Surname: _____

Address: _____

City: _____ Province: _____Postal Code: _____

Telephone no. (work): _____ (home): _____

Date of birth: _____ SIN/Employee no: _____

SECTION A (To be completed by the examined individual only if currently employed in an SCP)

Information on work schedule

Average number of hours worked per week: _____

Average number of hours worked per day: _____

Irregular work shifts Yes: ___ No: ___

Overtime Yes: ___ No: ___

If yes, how many hours in overtime per day: _____

how many hours in overtime per week: _____

Maximum of hours worked per day: _____

SECTION B (To be completed by the neurologist after reading Section A)

General information

How long has the applicant been your patient? _____

Is there a family history of seizure disorders? Yes_____ No _____

If yes, give details: _____

_____

Information on individual's seizures

Date of first seizure: Y: ___ M: ___ D: ___ Date of last seizure: Y: ___ M: ___ D: ___

Type(s) of seizures: (Describe prodrome, pre-ictal, ictal and post-ictal symptomatology and duration):

_____

_____

_____

_____

Etiology of seizure disorders (according to the International Classification):

_____

Describe all precipitating factors:

_____

_____

_____

Aside from seizures, does the examined individual's health condition include other neurological symptoms or signs?

Yes:_____ No:_____

If yes, provide details: _____

_____

_____

Are you aware of any other medical condition that could impact the safety of the railway operations?

Yes:_____ No:_____

If yes, give details: _____

_____

Treatment

Current treatment: _____

Does the examined individual adhere to his/her treatment? Yes:_____ No:_____

Is the examined individual free from side effects from treatment? Yes:_____ No:_____

If no, provide details: _____

_____

Has the examined individual been adequately educated on his/her condition? Yes:_____ No:_____

Did the examined individual ever have surgery for his condition? Yes:_____ No:_____

If yes, give date and describe procedure: _____

_____

Neurological examination

Is the examined individual currently free from abnormal neurological findings? Yes: _____ No: _____

If no, give details: _____

_____

_____

Additional reports

EEG

IMPORTANT: The results of an EEG recorded during the past year and signed by a certified electroencephalographist must be attached to this medical report.

Antiepileptic Drug (AED) levels: Please attach copies of all AED blood levels performed during the past year:

Name of drug:_____

	Results
Dates: Y:____ M: ____ D: ____	_____
Y: ____ M: ____ D: ____	_____
Y: ____ M: ____ D: ____	_____
Y: ____ M: ____ D: ____	_____

CONCLUSION

The Chief Medical Officer would appreciate your professional opinion on the examined individual's fitness to work in positions that are critical to the safety of the public, other employees and him/herself.

Comments: _____

_____

_____

In order to assess your patient's capacity for occupying a Safety Critical Position in the Canadian railway industry, would you recommend that he/she be medically assessed by a physician appointed by the railway?

Yes: ____ No: ____

PHYSICIAN'S IDENTIFICATION

Name:_____ Date of examination: Y: ___ M: ___ D: ___

Address (in full): Street: _____

City: _____ Province: _____ Postal Code: _____

Telephone:_____ Fax: _____

_____
Signature

Date: Y: ____ M: ____ D: ____

Appendix IV - Acknowledgements

The RAC would like to acknowledge the contribution of:

DR. Guy Rémillard
Neurologist and Electroencephalographist
Associate Clinical Professor
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Assistant Neurologist, Epilepsy Clinic
Neurological Hospital and Institute
McGill University

Member of the Committee of Epilepsy International on Motor Vehicle Driving and Epilepsy

Dr. Frederick Andermann
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Director
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Dr. Benjamin Zifkin
Associate Clinical Professor
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Université de Montréal

Consultant Neurologist Epilepsy Clinic
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4.5 – Mental Disorders

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF

INDIVIDUALS WITH MENTAL DISORDERS IN SAFETY CRITICAL POSITIONS

IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Impairment of their alertness, judgement or sensory or motor function can pose a serious safety threat.

If not well controlled, some mental disorders can cause impaired performance. Fitness for duty guidelines have been developed for the employment of individuals with mental disorders in the Canadian railway industry.

Background information on mental disorders is provided in Appendix I.

2. Basic considerations

Employment of individuals with mental disorders in an SCP will be guided by the following considerations:

2.1 Presence of a mental disorder from Axis I of the Diagnostic and Statistical Manual IV (DSM IV) of the American Psychiatric Association.

2.2 Presence of a personality disorder.

2.3 Degree of impairment of cognitive function, alertness and memory.

2.4 Degree of mood dysfunction, with special attention to euphoria, depression, suicidal or homicidal risk.

2.5 Degree of behavioural dysfunction.

2.6 History of mental disorder, and the severity of previous episodes.

2.7 Compliance with treatment, insight into the disorder, reliability and responsibility for self- observation.

2.8 Side effects of medications as they relate to mental functions, coordination and reaction time.

2.9 Likelihood of recurrences or of acute or gradual incapacitation at work.

All of the above considerations focus on assessing the ability of the individual to perform safely, consistently and predictably over time.

3. Guidelines for specific disorders

3.1 Anxiety Disorders

3.1.1 Generalized anxiety disorder

Description This disorder is characterized by excessive anxiety and worry lasting for at least six months and relating to a number of events or activities. The worry can not be controlled by the individual and it leads to feeling restless or keyed up, to having difficulty concentrating, being irritable, and experiencing skeletal muscle tension. Often there is difficulty falling asleep or staying asleep. The intensity of the symptoms must be of such a degree that it interferes with the normal function of the individual.

Fitness for duty: Individuals suffering from generalized anxiety disorder can not work in an SCP because of the risk of impaired judgement, inattention and fatigue. Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as stable for three months before they can return to work in an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the Chief Medical Officer (CMO).

3.1.2 Post-traumatic stress disorder (PTSD)

Description: Post-traumatic stress disorder is characterized by pervasive agitation, depression and/or emotional numbing and various re-experiencing phenomena, including flashbacks, nightmares and reminders. Panic attacks are common in this disorder. Thus, the condition pervasively degrades attention, judgement and predictability.

Fitness for duty: Individuals suffering from PTSD can not work in an SCP. Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as asymptomatic for three months before they can return to work in an SCP. The individual must be asymptomatic for three months in three areas: recurrence, hyperarousal and affective problems. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement, attention, alertness, predictability, and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.1.3 Panic disorder

Description: Panic disorder is characterized by the sudden, unexpected onset of extremely high anxiety associated with strong physical evidence of adrenergic output including rapid heart beat, pounding heart, sweating, trembling, sense of shortness of breath, feelings of choking, chest pain, nausea or abdominal distress, dizziness, feelings of unreality or being detached from oneself, fear of imminent catastrophe or doom, chills or hot flashes. These symptoms will suddenly explode within an individual. The attacks are brief, usually lasting only a few minutes, but are totally incapacitating. Frequency can be highly variable, from once every few months to several times per day.

Fitness for duty: Individuals suffering from panic disorder can not work in an SCP because their ability to perform their duties may be unpredictable. Individuals who have been treated by psychotherapy (including cognitive behavioural therapy) and/or pharmacotherapy must be documented as asymptomatic for six months before they can return to work in an SCP. This disorder is chronic and the symptoms can render the sufferer non-functional very quickly. There needs to be clear evidence that the disorder has been completely resolved. Individuals must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement, attention, ability to function in an SCP, and also on the side effects of any medication. It must also take into consideration the degree of stress in the individual's life. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.1.4 Phobic disorder

Description: Phobic disorder is similar to panic disorder except that the panic occurs only in relation to a specific, fixed stimulus. As long as the stimulus is not associated with the SCP, it is possible for an individual with phobic disorder to function appropriately.

Fitness for duty: Individuals with phobic disorder must be stable while working in their SCP. They must be assessed by their physician who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement, attention, predictability, their ability to function in an SCP, and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO. The phobic disorder must be a response to neutral objects. If the phobic object is work-related, such as engines, engine cabs, switching yards, moving cars or particular locales along the right of way, the illness must treated as Panic Disorder.

3.1.5 Obsessive-compulsive disorder (OCD)

Description: Obsessive-compulsive disorder (OCD) is characterized by recurrent, intrusive, distressing ideas, impulses, thoughts (obsessions), or patterns of behaviour (compulsions) that are viewed by the individual as outside his or her normal thinking and that produce anxiety if resisted. The emphasis is on the intrusiveness and inappropriateness of the experiences and the marked anxiety or distress they cause. These symptoms must be differentiated from simple excessive worrying about real-life problems. Panic attacks may also be present.

Fitness for duty: OCD is a serious and debilitating illness. A preoccupation with worrying or repetitive behaviours can occupy large portions of time and attention. Individuals suffering from active OCD can not work in an SCP because their ability to perform their duties may be unpredictable.

Individuals who have been treated by psychotherapy (including cognitive behavioural therapy) and/or pharmacotherapy must be documented as asymptomatic for three months before they can return to work in an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. The examiner must also address the individual's flexibility, the degree of stress in the individual's life, his/her level of insight, and his/her level of subjective control over thoughts

and behaviours. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.2 Mood Disorders

3.2.1 Depressive disorders

Description: Mood disorders, including depression, are very common. Feelings of depression are universal but are usually transient. If feelings of depression are severe or prolonged, they constitute a depressive episode. Problematic symptoms include social withdrawal, lack of motivation, low frustration tolerance, easy fatigability and sleep disorder. Insight and judgement are impaired because of distortions of self-perception.

Fitness for duty: Individuals suffering from mild depression, whose symptoms do not interfere with function at work may work in an SCP at the discretion of the CMO. Individuals suffering from a major depressive episode can not work in an SCP because of concerns about consistency, judgement and predictability. Individuals who have been treated for a major depressive episode by psychotherapy and/or pharmacotherapy must be stable before they can return to work in an SCP. If judged necessary by the CMO, they may be assessed by a psychiatrist who is required to submit a written report. This report must include an assessment of the individual's judgement, attention, insight, alertness, and also on the side effects of any medication. Variables to be considered are intensity or length of illness and response to medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.2.2 Bipolar disorders

Description: Bipolar disorders are characterized by cycles of alternating depressive feelings, and mania and hypomania. Mania is characterized by excessive energy, erratic and disinhibited behaviour, low frustration tolerance and lack of insight and judgement.

Fitness for duty: Individuals with bipolar disorder, maintained on medication, must be documented as asymptomatic for at least one year before being considered fit to work in an SCP. The CMO may extend this one year aymptomatic period if there is medical evidence that a longer period is indicated.

An asymptomatic individual who is withdrawn from medication must continue to be asymptomatic for at least one year before returning to work in an SCP.

The CMO may extend this one year asymptomatic period if there is medical evidence that a longer period is indicated.

Before returning to work, individuals with bipolar disorder must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication, if applicable. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO

Since bipolar illness will present alternately as depressive or hypomanic phases, the follow-up for each phase must be individually tailored. Once the individual has had manic episode and is stable, he/she must be followed up periodically by the family doctor and have at least semi-annual checks of blood levels of medication.

3.3 Psychoses

3.3.1 Schizophrenia and delusional disorders

Chronic psychoses including but not limited to schizophrenia and delusional disorders are addressed in Section 4.

3.3.2 Brief psychotic disorder

Description: In brief psychotic disorder, an individual suffers from psychosis for a period of less than one month, and there is complete resolution following the episode with return to full prior level of mental functioning.

Fitness for duty: Individuals suffering from brief psychotic episode can not work in an SCP. They must be asymptomatic and off medication for six months before they can return to an SCP. They must be assessed by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement, attention and the stability of mental function. Attention must also be paid to the cause or precipitant of the episode. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO

3.4 Personality Disorders

Description: These disorders are characterized by pervasive, persistent, maladaptive patterns of behaviour that are deeply ingrained. They are disorders of trait rather than state. Maladaptive traits can be behavioural, emotional, cognitive, perceptual or

psychodynamic. They cause difficulty by diminishing the individual's ability to react flexibly and adaptively in social or professional situations. They usually come to light because of conflict with others. The maladaptive patterns of behaviour become exaggerated at times of acute or chronic stress. Personality disorders exhibit a very large range of symptoms from mild to severe.

Fitness for duty: In the majority of cases, people with personality disorder only rarely suffer from significant intellectual or emotional disorder. They are thus responsible for their own behaviour and can be expected to perform or behave in a manner acceptable in the workplace. If the presence of a personality disorder is confirmed by overt acts in the workplace, the individual should be assessed by a psychiatrist and a report forwarded to the CMO. This course of action will be necessary before a decision concerning work in an SCP can be made. The examiner must pay particular attention to the assessment of the individual's ability to function appropriately under stress.

3.5 Adjustment Disorders

Description: An adjustment disorder is characterized by an overly intense response to a psychosocial stressor which is within the range of normal experience. This results in impaired social or vocational function.

Fitness for duty: Individuals who have been treated by psychotherapy and/or pharmacotherapy must be documented as asymptomatic before they can return to work in an SCP. The severity of symptoms can be highly variable for individuals with adjustment disorders. There is no specific time limit for post-morbid normal behaviour. They must be assessed by their own physician or by a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

3.6 Substance Related Disorders

Description: Substance related disorders include disorders related to the taking of a drug of abuse (including alcohol), to the side effects of a medication, and to toxin exposure.

Fitness for duty: Substance abuse frequently coexists with other psychiatric conditions, particularly with certain personality disorders. Depressed, anxious or psychotic patients may self-medicate with prescribed or non-prescribed substances. Substance abuse disorders should always be considered in the evaluation of depression, anxiety or psychosis. Individuals with co-existent psychiatric conditions must also be treated for

those conditions. Individuals with documented substance abuse will be treated through the appropriate employee substance abuse assistance program.

3.7 Attention deficit disorder

Description: Attention Deficit Disorder (ADD) can only be diagnosed in the adult if there is a positive childhood history of Attention Deficit Disorder with Hyperactivity Disorder (ADDHD). The syndrome never develops *de novo* in the adult. Criteria include motor hyperactivity, attention deficits, emotional lability and overreactivity, short-lived explosive hot temper, disorganization on task with inability to complete tasks, and impulsivity. These symptoms are pervasive and may vary from minimal to severe. A diagnosis of attention of ADD adult variety can only be accepted from a psychiatrist. Individuals with this disorder are at high risk for substance abuse and depression.

Fitness for duty: Individuals suffering from ADD can not work in an SCP if their symptoms affect their ability to perform their duties in a safe, predictable manner. Individuals who have been treated with appropriate psychotherapy must be documented as stable before they can return to work in an SCP. They must be assessed by their own physician or a psychiatrist who is required to submit a written report to the CMO. This report must include an assessment of the individual's judgement and attention and also on the side effects of any medication. Regular follow-up reports indicating fitness for duty may be requested at the discretion of the CMO.

4. Exclusions from SCP

The following mental disorders are absolute contraindications to work in an SCP:

4.1 Chronic psychosis (current or on history).

4.2 Personality disorder severe enough to have repeatedly manifested itself by overt acts.

4.3 Disorder usually first diagnosed in infancy, childhood, or adolescence resulting in sub-normal intelligence.

4.4 Organic (physical) brain damage which results in an impaired performance.

4.5 Treatment-resistant depression.

5. Monitoring and follow-up

The length of the monitoring period follow-up, the frequency of assessments and the stringency of observation required may vary depending on the individual's diagnosis and degree of disability. Individuals with major mental disorders will require monitoring for as long as they continue to work in an SCP. Individuals with minor mental disorders, including adjustment reactions, depression or anxiety disorders will require monitoring for a period of at least two years to ensure that their condition remains under control.

Appendix I - Background Information on Mental Disorders

Mental disorders and abnormal mental function must be described in a consistent way. The Diagnostic and Statistical Manual IV (DSM-IV) of the American Psychiatric Association is the most widely recognized and accepted attempt at standardizing the description of mental disorders. This manual is a work in progress.

Currently, the definitions of many mental disorders are only approximations. When assessing an individual with a mental disorder, it is crucial that their surroundings, responsibilities, history, attitudes and expectations are taken into consideration. This acknowledged, reporting of employees with mental disorders must use DSM-IV terminology to ensure consistency.

There is an enormous variation between individuals with respect to their mental function or balance. The word "normal" has no real relevance. The main issue is whether the individual's mental state compromises her/her function, judgement, ability to deal flexibly with the environment and, ultimately, everyone's safety.

Mental illnesses the individual's ability to function in the workplace. This may occur acutely or chronically and may be unpredictable. Long-term illnesses such as dysthymia or depression can affect function over months or years. Other mental illnesses, including some personality disorders, panic disorder, phobic disorder or a brief psychotic episode, may diminish an individual's ability to function within minutes or hours.

Mental disorders can be divided into several large groups – major disorders, minor disorders, developmental disorders and personality disorders.

DESCRIPTION OF DISORDERS

MAJOR DISORDERS

Psychosis

Psychosis represents a profound disruption of an individual's ability to relate to his/her own internal and external environment. Sensation and perception are disorganized and disrupted. False sensations such as hallucinations (hearing voices, seeing images) and delusions (fixed beliefs not supported by reality) are common. There is disorganization of both thought and emotion. The individual's ability to integrate information about the outside world and bear judgement on it is severely compromised. Psychosis may be very short term or very long term. It can occur as a manifestation of schizophrenia, manic-depressive (bipolar) disorder, and/or illicit or prescription drug toxicity. It can also occur as a result of physical brain damage or of some overwhelming emotional crisis in an individual's life.

The presence of psychosis or a history of recurrent psychotic episode is an absolute contraindication to employment in an SCP. A history of a single brief circumscribed psychotic episode requires individual assessment.

MINOR DISORDERS

The minor mental disorders include anxiety disorders, depressive disorders, disorders usually first diagnosed in infancy, childhood, or adolescence (developmental), and adjustment disorders.

In the anxiety disorders, anxiety-related symptoms predominate. In generalized anxiety disorder, the individual experiences a chronic high level of distress, characterized by agitation, distractibility, exaggerated startle response and overreaction. These symptoms may interfere with the ability of an individual to function in an SCP. By contrast, in panic disorder or post-traumatic stress disorder, the individual experiences sudden onset of catastrophic anxiety which paralyses mental function, judgement and the ability to react appropriately. These attacks may come on without warning, or may be associated with a particular stimulus.

The depressive disorders are extremely important and must be looked for in any individual working in an SCP. The onset of depression is usually slow and insidious. Depression is accompanied by a slowing of personal tempo and diminution of mental agility and initiative, as well as distorted judgement and a pervasive sense of hopelessness. Individuals suffering from depression function at a lower level of efficiency for long periods. Sudden decompensation is rare. In contrast to the anxiety disorders, individuals may not be aware that they are depressed and not functioning at an optimal level. Suicidal ideation or intent may be present.

The essential feature of an Adjustment Disorder is a psychological response to an identifiable stressor that results in the development of clinically significant emotional or behavioural symptoms. The symptoms must develop within three months after the onset of the stressor(s). The clinical significance of the reaction is indicated either by marked distress that is in excess of what would be expected given the nature of the stressor(s) or by significant impairment in social or occupational (academic) functioning (DSM-IV). Adjustment Disorders may occur in conjunction with depressed mood, anxiety, anger, disturbance of conduct or a combination of these.

DEVELOPMENTAL DISORDERS

Disorders usually first diagnosed in infancy, childhood, or adolescence (developmental) are characterized by any problem that begins in childhood and continues into adult life. They include mental sub-normality, attention deficit disorder with or without hyperactivity, Asperger's syndrome and learning disabilities. Mental Retardation is defined as intellectual function below an IQ of approximately 70. Individuals with this disorder tend to be concrete in thinking. Poor self-esteem is common.

Attention deficit disorder (with or without hyperactivity) is well documented in children. There is evidence that it is also in adults. The syndrome in adults and children is similar. Symptoms include distractability, irritability, impatience with details, and a tendency not to follow through with instructions or to forget assigned tasks. These individuals are often reluctant to engage in tasks that require sustained mental effort. There is evidence that individuals who show signs of adult attention deficit disorder are also at risk for personality disorders and substance abuse.

Asperger's syndrome is characterized by subtle lifelong impairment in social interaction. The individual is deficient in the use of non-verbal communication and lacks the ability to relate to others emotional states. He/She may also express unusual preoccupations. Intelligence may be normal or above average.

Learning disabilities are characterized by a relative inability to read, write, calculate, and/or Develop appropriate co-ordination.

PERSONALITY DISORDERS

Personality disorders represent the most subtle form of dysfunction. They are not considered primarily as a mental illness themselves. Rather they are a description of the individual in which a mental illness may occur. A personality disorder is defined as a fixed and maladaptive individual style. The individual's emotional and behavioural reactions always occur within a very narrow range of style. Though individuals suffering from a personality disorder look and sound superficially normal, their lack of adaptability produces problems in both work and social function. Their rigid and narrow style represents their attempts to cope with stress. Thus the problems of their characteristic style are exaggerated under stress. Personality disorders are often found in conjunction with major or minor mental disorders or substance abuse.

SUBSTANCE RELATED DISODERS

Substance related disorders are pervasive throughout society. They result in decreased work and school performance, accidents, and absenteeism. Men are more at risk than women. Substance related disorders must be looked for in any individual working in an SCP, often exist concurrently with other mental disorders, require assessment and a treatment plan from a specialist in abuse disorders, and long-term (often years) formal and informal support.

TREATMENT OF MENTAL DISORDERS

Mental disorders can be treated and significant improvement can be expected in the majority of cases. Treatment is three-pronged along biological, psychological and social lines (the so-called biopsychosocial approach).

Biological interventions include any treatment which is effected through physical means. There is a wide variety of such treatments, ranging from massage therapy or acupuncture to medications, electro-convulsive therapy (ECT) and even surgery.

Sedative, hypnotic, and anxiolytic drugs

This group includes the benzodiazepines: chlordiazepoxide, diazepam, alprazolam, clonazepam, lorazepam, and triazolam. A sedative drug reduces daytime activity, tempers excitement and decreases arousal. A hypnotic drug produces drowsiness, facilitating the onset and maintenance of sleep. An anxiolytic drug reduces pathological anxiety. The benzodiazepines generally act as hypnotics in high doses, as anxiolytics in moderate doses, and as sedatives in low doses. The benzodiazepines are the most commonly used anti-anxiety agents. Recent indications for their use include panic disorder, phobic disorder and bipolar disorder.

Chronic use may lead to problems. First, active metabolites of the drug may accumulate in the body, causing progressively heavier sedation. Second, tolerance or dependency may occur if a drug is used for more than a few weeks at a time.

Sudden withdrawal of benzodiazepines may result in a withdrawal syndrome. Abrupt discontinuation, especially of those with short half-lives, is associated with severe withdrawal symptoms, including depression, paranoia, delirium and even seizures. Alprazolam is particularly associated with immediate and severe withdrawal symptoms. Triazolam is associated with rapid dependence and antegrade amnesia.

The choice of benzodiazepine should be governed by a favourable sedative/hypnotic ratio, i.e. high efficacy as a sedative with low hypnotic potential. The use of alprazolam is to be discouraged. Clonazepam, however, does fit the above criteria and may be used long term by individuals in safety critical positions as long as they are closely supervised and judged not to be sedated. The dose of clonazepam must be individualized. Most individuals do well on 1 to 2 mg per day. A dose higher than 5 mg per day implies the presence of a significant disorder.

Benzodiazepines in hypnotic doses may be used in the short term for treatment of insomnia but they should not be taken within eight hours of the individual reporting to work.

Tricyclic anti-depressants (TCAs) and monoamineoxidase inhibitors (MAOIs)

This group represents the original anti-depressants. They are indicated for use in major depressions, minor depressions, panic disorders, some forms of generalized anxiety, obsessive-compulsive disorder and eating disorders. They have a limited application in the treatment of chronic pain syndromes as well.

The TCAs and the MAOIs have an inconveniently wide range of side effects including sedation, low blood pressure and anti-cholinergic effects. These latter effects include blurred vision, constipation, problems with memory, urination and sexual function and, rarely, delirium. In addition, the MAOIs require fairly close adherence to a particular diet. An individual taking an MAOI who is non-compliant with the diet runs the risk of experiencing a catastrophic hypertensive crisis characterized by blinding headaches and sudden incapacitation.

For these reasons, the TCAs and the MAOIs should not be used by individuals employed in an SCP.

Newer anti-depressants

This group includes the specific serotonin reuptake inhibitors (SSRIs), moclobemide, trazodone and venlafaxine. SSRIs are indicated in the treatment of depression, dysthymic disorder, obsessive-compulsive disorder, panic disorder, eating disorders and post-traumatic stress disorder. SSRIs have very specific effects in the brain. As a result, they have a much smaller side effect profile than the TCAs. There are minor variations in the side effect profile between them, with sertraline being the least sedating. Short-term side effects may include nausea and headache, restlessness and insomnia.

There is considerable evidence that people who respond positively to the SSRIs do not suffer from sedation or impaired psychomotor co-ordination. Similarly, mocobemide and venlafaxine do not appear to have any degrading effect on alertness and psychomotor function.

Because they have a lower side-effect profile and sometimes even improve alertness and psychomotor performance in individuals recovering from depression, the SSRIs may be considered for long-term use in individuals who work in an SCP. However, side-effect profiles can be idiosyncratic. Any individual who is being treated with one of these anti-depressants must be followed closely by a physician.

Neuroleptic drugs

This group includes the major tranquilizers used in the treatment of psychosis. Examples include pimozide, haloperidol and risperidone. On rare occasions, they can be used in very small doses to treat high anxiety in non-psychotic individuals. An individual who is being continuously treated with one of these neuroleptic drugs must be followed closely by a physician.

Anti-convulsants

The anti-convulsants valproic acid and carbazapine are both indicated in the treatment of mania and impulse control disorders. Individuals suffering from these disorders are not eligible to work in an SCP.

Sympathomimetics (Stimulants)

This group includes dextroamphetamine and methylphenidate. These drugs are used for the treatment of narcolepsy and attention deficit disorder with or without hyperactivity. Individuals suffering from these disorders and who require biological treatment must be regularly supervised by a psychiatrist.

Electroconvulsive therapy

Electroconvulsive therapy (ECT) is an effective but rarely used treatment for depression. It is seen as an alternative therapy when treatment with anti-depressants has failed. With ECT, an electrical current passes through the brain to induce a seizure. The seizure actually changes brain chemistry in a way that lightens depression. Individuals treated with ECT must be documented as asymptomatic for six months before they may be assessed for possible return to an SCP.

Psychological interventions

All the psychotherapies aim to alter the individual's patterns of thinking and feeling. Many different kinds of psychotherapy are designed to improve insight and to introduce alternative patterns of behaviour. Cognitive behavioural therapy (CBT) works differently. Here, the focus is on altering the individual's perception and reaction to distress in the here and now. The underlying whys and wherefores are not addressed. CBT is an extremely effective treatment for panic disorder, obsessive-compulsive disorder and some forms of depression.

Social Interventions

In Appendix I, the effect of stressors on a variety of mental disorders was discussed. Those stressors usually occur in the individual's social milieu: marital, occupational, financial, etc. Effective therapy for such disorders will take into consideration the individual's surroundings.

Appendix II - ACKNOWLEDGEMENTS

The RAC would like to acknowledge the contribution of:

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4.6 – Cardiovascular Disorders

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH CARDIOVASCULAR DISORDERS IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Cardiovascular disorders (CVD) can cause gradual or sudden impairment. Due to the nature of their work, the latter is of particular importance for employees working in an SCP. Special attention should be paid to individuals whose medical condition puts them at risk of syncope, of significant physical incapacitation, or of sudden cardiac death.

Medical guidelines have been developed in order to evaluate and monitor the fitness for duty of individuals with cardiovascular disorders employed in an SCP in the Canadian railway industry.

CVD are common in North America. Accordingly, there are numerous physicians who have an interest in the diagnosis and treatment of these illnesses. In this document, the term specialist refers to a cardiologist or an internist.

When available, references are provided in Appendix I.

2. Basic considerations

The employment of individuals with a CVD in an SCP shall be guided by the following considerations:

2.1 Their medical history and physical examination;

2.2 The results of functional testing;

2.3 The nature of treatment; and

2.4 Their job description.

3. Global risk assessment

Many factors must be taken into consideration when assessing fitness for duty of individuals working in an SCP and specifically their risk of sudden impairment. For example, there are numerous risk factors for ischemic heart disease (IHD). Some risk factors are modifiable and others are not. In an individual with IHD, the number of risk factors, the control of modifiable risk factors, the degree of left ventricular dysfunction and the number of coronary vessels involved must all be taken into consideration when assessing the risk for impairment.

This assessment of risk (global risk assessment) also applies to individuals without known IHD but who are at risk of developing IHD and to individuals with non-ischemic heart disease or other CVDs. Finally, the specific demands of the SCP must also be considered.

In certain circumstances, the Chief Medical Officer (CMO) of a railway company may require an individual with a CVD, who does not meet the requirements of these guidelines, to undergo an individualized fitness for duty assessment. The CMO must take into consideration the individual's medical history and physical examination, the results of functional testing, the nature of treatment, any relevant ability, skill or experience of the individual and the specific requirements of the position. All relevant information from the individual's treating physician(s) and specialist(s) must also be taken into consideration. The specific information to be provided to assist in an individualized global risk assessment is detailed in Appendix II. In some cases, the CMO may require that an individual be assessed by an independant physician or specialist appointed by the CMO.

4. Functional testing

4.1 Blood pressure measurements (1a)

An accurate assessment of blood pressure (BP) is important to determine whether anti-hypertensive therapy is required and to help determine the risk of CVD. Consequently, the use of a standardized measurement technique is highly recommended. Deviations from optimal BP measurement techniques such as incorrect arm position and support, leg crossing, talking, exposure to cold, ingestion of alcohol and inappropriate cuff size will result in significant variations in BP values from those observed using standardized methods.

Individuals demonstrating features of a hypertensive emergency should be diagnosed as hypertensive at their first visit.

Individuals with initial high BP should have at least two (2) readings at first visit and scheduled for further visits.

Individuals with target organ damage can be diagnosed as hypertensive after three (3) visits.

In the absence of target organ damage and/or increased cardiovascular risk, if at visit three, systolic BP remains 160 mmHg or higher and/or diastolic BP 100 mmHg or higher, an individual can generally be diagnosed as hypertensive. Two or three more visits may be added if the trend in BP values is downward.

If at visit three, systolic BP is between 140 and 159 mmHg and/or diastolic BP between 90 and 99 mmHg, up to two or three further vists over a period of up to six (6) months may be required to diagnose hypertension.

4.2 Ambulatory BP monitoring

Physicians should only use ambulatory BP monitoring devices that have been validated independently using established protocols.

Ambulatory BP monitoring should be considered for untreated individuals whenever an office-induced increase in BP is suspected, including individuals with mild to moderate BP elevations in the clinic, without target-organ damage. **(1c)**

It should also be considered for treated individuals suspected of having an office-induced increase in BP, including those with apparent resistance to drug therapy, symptoms suggestive of hypotension and fluctuating office BP readings.

4.3 Resting electrocardiography (ECG) abnormalities

Resting ECG may show abnormalities that justify additional medical evaluation. The most pertinent are:

- Non-sinus rhythm and extrasystoles. **(8a)**
- Right or left bundle branch block. **(2a)**
- Abnormal Q waves suggesting myocardial infarction **(2b)** and repolarisation abnormalities with ischemic changes. **(2c)**
- Left ventricular (LV) hypertrophy and /or strain. **(2d)**

ECG abnormalities should be part of an individualized global risk assessment with respect to sudden impairment.

Other ECG abnormalities are discussed under Section 5.2 on arrhythmias.

4.4 Echocardiography

Assessment of CVDs with ultrasound technique is a method currently widely used in numerous clinical settings. It is reliable, non-invasive and easily accessible.

The technique is useful in individuals with:

- Suspected remote silent myocardial infarction;
- Baseline ECG changes suggesting left ventricular (LV) hypertrophy and strain; and
- A history of LV systolic dysfunction.

Individuals with:

- Left ventricular end systolic (LVES) diameter of 5.0 cm or more; **(4a);**
- Left ventricular ejection fraction (LVEF) equal to or less than 35%; **(4b);**
- An echocardiogram showing 2+ or more of mitral or aortic valvular regurgitation; **(4c)**, or
- Significant valvular stenosis,

are at higher risk of sudden impairment.

4.5 Stress tests

4.5.1 Stress electrocardiography (ECG)

Functional status is often expressed by measuring the maximal exercise capacity using a treadmill or a bicycling ergometer. The most commonly used treadmill exercise protocol is the Bruce protocol.

Exercise capacity may be expressed in ml/kg/min. of oxygen consumption, in watts, or in metabolic units called mets, one met being the basal energy requirement at rest. The oxygen cost per stage for the commonly used Bruce treadmill protocol is shown in Appendix III.

There is an accepted relationship between the average energy requirement of a job and the maximal level of exercise capacity shown by an individual. The average energy requirement for an 8 hour working period corresponds to 40% to 50% of the maximal exercise capacity of an individual. **(3a)** As an example, to qualify for a job requiring an average of 4 to 5 mets, a maximal exercise capacity of 10 mets is required. (See Appendix IV)

Based on the above, the expected maximal exercise capacity of individuals in an SCP has been set to 10 mets. (3b) Stress ECG should be clinically and electrically negative at 10 mets or at 9 minutes of the Bruce protocol (end of stage III). Individuals with a maximal exercise capacity of less than 10 mets require an individualized fitness for duty assessment by the Chief Medical Officer (CMO) of their railway company with input from their treating physician.

A blood pressure (BP) drop of 10 mm Hg or more in systolic BP on maximal exercise capacity warrants investigation with a stress MIBI or a stress echocardiography to rule out silent coronary disease. (3c)

An abnormal BP response (BP rise of more than 8 mm Hg/met) must be reported as hypertension occurring on effort.

Ventricular arrhythmia occurring during exercise and increasing during the last 3 minutes of a stress test justifies a Holter monitoring and a stress MIBI or stress echocardiogram. (3d)

4.5.2 Stress echocardiography

Exercise echocardiography is an excellent way to observe ventricular function directly. Such information has been shown to add significantly to the diagnosis and often the localization of coronary artery disease (CAD).

The technique is especially useful in individuals with:

- Suspected remote silent myocardial infarction (MI).
- Baseline ECG changes that confound the evaluation of the ST segment such as severe LV hypertrophy and strain, left bundle branch block (LBBB), Wolf-Parkinson-White (WPW) syndrome.
- Cardiomyopathy, and
- Prior bypass graft surgery or MI.

4.5.3 Stress MIBI

Nuclear techniques are more and more used to improve the diagnostic certainty of CVDs and help to localize the diseased vessels. Tc 99m Sestamibi (MIBI) is becoming the preferred nuclear marker for stress testing. It is a flow marker that requires viable myocardial cells to take up the delivered tracer. Images reflect the myocardial perfusion at the time of injection rather than at the time of imaging. Discordance between stress and rest images can underline underperfused myocardial perfusion post stress, similarly to the stress

echocardiogram which will delineate areas of reversible hypokinesis post stress. Sensitivity and specificity are similar with the two techniques.

4.6 Radionuclide cardiography

Radionuclide cardiography is a reliable method that is not affected by left ventricular (LV) remodeling and it should be obtained to confirm measurements in case of borderline abnormal LVEF following echocardiography.

5. Clinical Disorders

This section discusses individual cardiovascular disorders.

5.1 Abnormal Blood Pressure (BP)

5.1.1 Hypertension

Mild hypertension does not preclude an individual from working in an SCP. However, end organ damage to the heart, kidneys and brain as a result of chronic hypertension may affect an individual's ability to perform his/her duties in a safe manner. Individuals with end organ damage should be assessed on an individual basis.

Severe or uncontrolled hypertension can be associated with symptoms of dizziness, headaches and blurred vision. Severe or uncontrolled hypertension also increases the risk of stroke. Individuals with a systolic BP of 170 mm Hg or more and/or a diastolic BP 110 mm Hg or more, who have been diagnosed as suffering from hypertension, are considered unfit to work in an SCP until their hypertension is under control **(1b-1d).** These individuals require follow up for at least 6 months to ensure appropriate management and control of their condition.

5.1.2 Hypotension

Individuals with symptomatic hypotension are considered unfit to work in an SCP until their hypotension is under control. Symptomatic individuals require follow up for at least 6 months to ensure appropriate management and control of their condition.

An isolated systolic BP of less than 95 mm Hg in an asymptomatic individual should be investigated further to minimize the risk of developing symptomatic disease.

5.2 Arrhythmias

5.2.1 Atrioventricular conduction abnormalities

Individuals with first degree AV block or Mobitz I heart block should be investigated with an Holter monitoring to rule out AV block of higher degree.

Individuals with a complete heart block or a Mobitz II heart block, that do not have a permanent pacemaker, are considered unfit to work in an SCP.

Asymptomatic pauses of 3 seconds or more during waking hours, or symptomatic pauses of 2 seconds or more are incompatible with employment in SCP.

5.2.2 Bradyarrhythmias

Individuals with symptomatic bradyarrhythmias are considered unfit to work in SCPs. **(8b)**

Asymptomatic individuals with bradycardia of 40 beats/minute or less should be investigated to rule out an underlying medical condition. They should be assessed according to their medical condition.

Asymptomatic individuals with bradycardia of 40 beats/minute without an underlying medical condition require an individualized fitness for duty assessment by the CMO of their railway company with input from their treating physician.

5.2.3 Tachyarrhythmias

Individuals with symptomatic tachyarrhythmias or individuals with a history of ventricular tachycardia (VT) with or without a permanent implanted cardiac defibrillator (ICD) are considered unfit to work in an SCP.**(8e)**

Individuals who have been successfully treated with catheter ablation may be considered fit to work in an SCP provided Holter monitoring reveals no significant residual tachyarrhythmias. Prior to their return to wotk, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

Individuals with runs of tachyarrhythmia of 5 seconds or more detected on Holter monitoring require an individualized fitness for duty assessment by the

Chief Medical Officer of their railway company with input from their treating physician.

5.2.4 Wolf-Parkinson-White (WPW) Syndrome

Individuals with symptomatic WPW Syndrome are considered unfit to work in an SCP. **(8c)**

Individuals that have been successfully treated with catheter ablation may be considered fit to work in an SCP provided Holter monitoring reveals no significant residual tachyarrhythmias. These individuals require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

5.2.5 Pacemakers

Due to the risk of sudden impairment secondary to pacemaker failure, pacemaker dependant individuals are considered unfit to work in an SCP

Individuals with a medical condition who require a permanent pacemaker, who are not pacemaker dependant, can work in an SCP provided there is no risk of pacemaker dysfunction from exposure to electromagnetic fields in the workplace as demonstrated by an Holter monitoring while performing their regular duties. (8d)

5.2.6 Ventricular tachycardia (VT) and implanted cardiac defibrillators (ICD)

Individuals with history of VT, with or without permanent ICD, are unfit to work in an SCP. **(8e)**

5.2.7 Sick sinus syndrome (SSS)

Individuals with symptomatic SSS are considered unfit to work in an SCP.

Individuals with SSS associated with a bradycardia of 40 beats/minute or less or a pause of greater than 3 seconds during waking time are also considered unfit to work in an SCP unless they have been treated with a permanent pacemaker. Prior to return to work in an SCP, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

5.2.8 Atrial fibrillation (AF) and atrial flutter

Atrial flutter is often associated with AF and should be managed similarly. **(8f)**

Individuals with AF and with underlying medical condition must be evaluated according to the underlying disease (diabetes, hypertension, valvular disease, enlarged left atrium, coronary disease, age above 65, past history of cardiovascular accident (CVA)/transient ischemic attack (TIA), and congestive heart failure) and their associated risk of sudden impairment. In these individuals, Coumadin reduces the risk of emboli from 4.5% to 1.4% (a reduction of 68%) and it should be used.

Individuals with chronic AF without underlying medical condition (lone AF) require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician. In these individuals, ASA decreases the risk of emboli by 44% and it should be used.

5.2.9 Extrasystoles

Extrasystoles can be disregarded if they are asymptomatic and are not associated with underlying heart disease. **(8g)**

Individuals with frequent extrasystoles associated with an underlying heart disease require an individualized fitness for duty assessment by the CMO of their railway company with input from their treating physician.

5.3 Ischemic heart disease

IHD is by far the most common CVD. It is common for the terms IHD and coronary artery disease (CAD) to be used interchangeably.

The spectrum of IHD covers:

- individuals with risk factors for IHD
- asymptomatic disease (silent ischemia)
- stable angina,
- unstable angina,
- myocardial infarction and,
- post revascularisation procedures.

5.3.1 Risk factors to develop IHD

Individuals with multiple risk factors for IHD are at risk of developing symptomatic disease. They are also at risk of sudden impairment due to a coronary event.

The Framingham calculation of a 10 year risk of coronary disease is shown in Appendix IV. This algorithm is used to calculate the 10-year risk of an individual developing angina pectoris, unstable angina, non- fatal and fatal myocardial infarction (MI). The algorithm is used for individuals without diabetes mellitus or clinically evident cardiovascular disease. The calculation is conservative as it does not take into account individuals with new risk factors such as homocystein, abdominal obesity and insulin resistance. **(5j)**

Using this algorithm, any individual with a 10 year risk of a coronary event greater than 20% (2%/year) should have a global risk assessment. High risk individuals are candidate for intensive risk factors intervention. They may require further assessment including stress echocardiography or stress MIBI. **(5a)**

The algorithm should not be used for individuals with diabetes mellitus. These individuals are considered to be at very high-risk of developing an ischemic event **(5b).** Consequently, all individuals with diabetes mellitus ideally should have a global risk assessment including a stress echocardiogram or a stress MIBI.

5.3.2 Silent coronary artery disease **(5f)**

a) Electrically positive stress ECG associated with either reversible hypoperfusion or reversible hypokinesis at 10 mets or less in absence of clinical angina precludes an individual from returning to work in an SCP.

b Individuals with known IHD should be submitted, every 4 years, to a stress echocardiogram or a stress MIBI in order to rule out residual ischemia.

c) Rest ECG abnormalities suggesting CAD (Q-waves, ischemic T waves, ST depression) should trigger an investigation to rule out silent CAD.

5.3.3 Stable angina

Individuals with symptoms of angina are unfit to work in an SCP. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesis or reversible hypoperfusion at 10 mets or less of

maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

5.3.4 Acute coronary syndrome (unstable angina or non-Q MI) and acute MI

Individuals with acute coronary syndrome or acute myocardial infarction are considered unfit to work in an SCP for a period of 3 months from the date of the event. Prior to their return to work they require an assessment by a specialist. As part of this assessment these individuals require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesis or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

5.3.5 Variant angina (Prinzmetal's angina)

Individuals with variant angina must be asymptomatic for 3 months before they can return to work in an SCP. **(5c)**. Prior to their return to work, they require an assessment by a specialist to confirm absence of symptoms.

5.3.6 Revascularisation procedures

5.3.6.1 Percutaneous coronary intervention (PCI)

Individuals who have undergone PCI are considered unfit to work in an SCP for a period of 2 weeks after the procedure. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesis or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

Individuals with minor abnormalities on stress testing require individual global risk assessment of their risk of sudden impairment due to an ischemic event.

A stress ECG should be performed 3 months after a PCI in order to rule out restenosis. **(5d)**

5.3.6.2 Coronary artery bypass graft (CABG)

Individuals who have undergone CABG are considered unfit to work in an SCP for a period of 3 months after the procedure. Prior to their return to work, they require an assessment by a specialist. As part of this assessment, they require a stress echocardiogram or a stress MIBI. Individuals with reversible hypokinesis or reversible hypoperfusion at 10 mets or less of maximal exercise capacity require an individualized global risk assessment by the Chief Medical Officer of their railway company with input from their treating physician. **(5e).** They also require an annual follow-up report from their specialist regarding their fitness for duty in an SCP.

Individuals with minor abnormalities on stress testing require individual global risk assessment of their risk of sudden impairment due to an ischemic event.

5.3.7 Global risk assessment for individuals with IHD

After an ischemic event, the risk of sudden impairment must be weighted by the medication used and the quality of the control of the risk factors. An average yearly risk of a new event after MI of 5% may decrease to 1% or increase to 10% and this has to be taken into consideration.

5.3.7.1 LV dysfunction and number of vessels involved

LV dysfunction and the number of vessels involved are the most powerful predictors of mortality and morbidity. The CASS registry reports a mortality rate 2.5 to 3 times greater for patients with abnormal LVEF. **(5g)**

5.3.7.2 Control of risk factors post MI

The subgroup analysis of the Coronary Artery Recurrent Event (CARE) study **(5h)** provides new information on the yearly event rate associated with the presence of risk factors following an MI.. Men treated with Pravastatine after a MI had a yearly event rate of 5.3%; hypertensive patients had a rate of 5.7% while non-hypertensive had a rate of 4.7%; similarly, the rate was 6% for smokers and 5% for non-smokers; the rate was reduced by 40% when the LDL cholesterol was

less than 3.2 mmol/l. The yearly mortality risk was 7.2% in individuals with diabetes and 4.8% in individuals without diabetes.

It appears that each major risk factor can alter the yearly rate of event by 5 to 10%, demonstrating that the post MI prognosis is mainly determined by LV function and extent of disease.

In the Secondary Prevention Reinfarction Nifedine Israeli Trial **(**SPRINT**)** study (**5i)** nevertheless, the yearly mortality rate post MI was 4% with no risk factor, 5.1% with 2 risk factors, 15% with 4 risk factors and 23% with 6 risk factors showing the additive effects of risk factors.

Any yearly risk of cardiac event greater than 5.5% must be carefully examined as to the risk of sudden impairment given the nature of the duties of the concerned individuals.

5.4 Non ischemic heart disease

Non-IHD is less common than IHD. However, there are individuals with non-IHD who work in an SCP. The nature of the non-IHD, its natural history, and the associated functional impairment need to be taken into consideration when assessing fitness for duty in an SCP.

5.4.1 Valvular heart disease

In general, individuals with the following medical conditions require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician:

5.4.1.1 Aortic stenosis with a valve area of less than or equal to 1.5 cm2 and/or maximal transvalvular pressure gradient greater than or equal to 25 mm Hg. **(6a)**

5.4.1.2 Aortic regurgitation of 2+ or greater, diastolic blood pressure of less than 55 mm Hg, left ventricular ejection fraction (LVEF) of 40% or less, left ventricular end systolic (LVES) diameter greater than 5.5 cm. **(6b)**

5.4.1.3 Mitral stenosis with a valve area of less than or equal to 1.5 cm2. **(6b)**

5.4.1.4 Mitral regurgitation (with or without mitral valve prolapse) of 2+ or greater, LVES diameter greater than 4.5 cm, LVEF of less 50%. **(6b)**

5.4.1.5 Left atrial dilation more than 45 mm. **(6c)**

Mitral valve prolapse with mitral regurgitation of less than 2 does not preclude employment in an SCP.

Once valvular disease is diagnosed, echocardiography should be performed every 2 years.

In order to monitor any progression of their disease, individuals with milder forms of valvular disease require an echocardiography at least every 3 years.

5.4.2 Valve replacement surgery

Individuals who have had valve replacement surgery are considered unfit to work in an SCP for a period of 3 months after the procedure. Prior to their return to work, they require an assessment by a specialist to determine their functional status. Regarding their fitness for duty, they require an individualized assessment by the Chief Medical Officer of their railway company with input from their treating physician.

Individuals who have had valve replacement surgery require an annual assessment by their specialist to rule out late complications of their surgery. They also require an echocardiogram every 2 years, showing no significant prosthetic valvular dysfunction and no significant (2+ or more) central or paraprosthetic leakage **(6d).**

5.4.3 Congenital heart disease

In general, individuals with the following medical conditions are considered unfit to work in an SCP. In order to determine their fitness for duty, they require an individualized assessment by the Chief Medical Officer of their railway company with input from their treating physician:

5.4.3.1 Atrial septal defect ASD with left to right shunt greater than or equal to 2. **(6e)**

5.4.3.2 Aortic coarctation or surgery for aortic coarctation associated with hypertension. **(6f)**

5.4.3.3 Pulmonary stenosis with maximal valvular gradient greater than or equal to 50 mm Hg. **(6g)**

5.4.3.4 Ventricular septal defect (VSD) with pulmonary/systemic flow greater than or equal to 1.5.

Individuals who have had surgery for a VSD are considered unfit to work in an SCP for a period of at least 6 months following the procedure. **(6h)** They require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

5.4.3.5 Residual pulmonary hypertension after congenital heart disease surgery with a pulmonary artery pressure as estimated by an echocardiogram greater than or equal to 40 mm Hg at rest.

5.4.4 Cardiomyopathies

The cardiomyopathies include idiopathic hypertrophic subaortic stenosis, hypertrophic cardiomyopathy, non-ischemic congestive cardiomyopathy and restrictive cardiomyopathy. Individuals with symptomatic cardiomyopathy of any type are unfit to work in an SCP. Individuals with the following conditions are also considered unfit to work in an SCP.

5.4.4.1 Idiopathic hypertrophic subaortic stenosis **(7a)**

5.4.4.2 Hypertrophic cardiomyopathy with any intraventricular gradient, if:

- the LV mass is greater than 150 grams/m2 **(7a)** or;
- the septum and the posterior wall measure both 15 mm or more in end diastole. **(7a)**.

5.4.4.3 Non ischemic congestive cardiomyopathy if:

- LVEF is less than or equal to 35%, **(4b)** or;
- LVES diameter is greater or equal to 5.0 cm. **(4a)**

5.4.4.4 Restrictive cardiomyopathy or any other form of infiltrative cardiomyopathy. **(7b)**

5.4.5 Pericardial disease

Individuals with acute pericarditis incompatible with employment in an SCP cannot return to work in an SCP until the pericardial fluid effusion is less than 3 mm.

Individuals with chronic pericarditis require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician before they can return to work in an SCP. **(7c)**.

5.4.6 Heart transplant

Individuals who have had a heart transplant are generally considered unfit to work in an SCP. Prior to their return to work, they require an individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician. **(7d)**

5.4.7 Congestive heart failure

Individuals with a LVEF of less than or equal to 35% **(4b)** and/or a LVES diameter greater than or equal to 5.0 cm **(4a)** are considered unfit to work in an SCP.

5.4.8 Abdominal aortic aneurysm

Individuals with an abdominal aortic aneurysm greater than or equal to 4 cm are considered unfit to work in an SCP. **(9)**

Individuals who have had surgery to correct an abdominal aortic aneurysm are considered unfit to work in an SCP for a period of 3 months after the procedure.

5.4.9 Vaso-vagal syndrome

Individuals with syncope, dizziness or other symptoms that are of vaso-vagal origin are considered unfit to work in an SCP. **(10)**

Asymptomatic individuals with a past history of vaso-vagal syndrome are fit to work in an SCP provided they have been treated, a tilt-test is negative, and they have been asymptomatic for at least 6 months. These individuals also require an

individualized fitness for duty assessment by the Chief Medical Officer of their railway company with input from their treating physician.

Appendix I – References

1. Blood pressure (BP)

1a) www.chs.md (Website of the Canadian Hypertension Society)

1b) If 40% or more of the BP readings are above 135/85, there is a 5 fold likelihood of developing cardiac vascular events

American Heart Journal 1989; 118 : 782 and Hypertension 1998; 31 : 712

1c) Office-induced increase in BP affects 20 to 25% of individuals with diastolic BP between 90 and 104 mm Hg.

Ref.: JAMA, 1998; 255 : 225

1d) Framingham data showed that a systolic BP of 170 mm Hg corresponds to the 90th percentile and to a 2 fold increase in overall mortality.

Ref.: Lancet 2000; 355 : 175-180 and Journal of Inst. Actuaries 1979; 196 : 15

A diastolic BP of > 110 mm Hg is associated with a 2.5 fold increase in all-cause mortality

Ref.: Society of Actuaries and ALIMBA, Blood Pressure Study,
Boston, 1980

2. Resting ECG abnormalities other than arrhythmias

2a) Bundle Branch Blocks (BBB)

Left or right BBB is associated with a 1.5 to 2 times normal mortality.

New onset of left BBB is associated with a 10 times normal mortality.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

BBB on ECG justifies medical assessment in order to rule out significant CVD.

2b) Silent myocardial infarction

A new Q wave on ECG without any other clinical manifestation is associated with a 4.5 times normal mortality and therefore justifies an echocardiogram (see 3.3)

Ref.: European Heart Journal, 2000; 21 : 1052-1067

2c) Ischemic T waves are associated with a 2 to 3 times normal mortality and justify assessment in order to rule out significant coronary disease.

Ref.: Whitehall study

2d) Left ventricular hypertrophy and/or strain is associated with 1.5 to 6 times normal mortality.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

3. Stress ECG

3a) L.N. Matheson, Functional Capacity Evaluation in Disability Evaluation,
American Medical Association
Demeter, Anderson, Smith Ed.
Mosby Publishing – St-Louis, USA.
pp: 168-188

3b) The normal maximal exercise capacity varies with age, gender, and fitness level. For an average fitness level, age-dependant maximal capacity in the general population can be predicted form the formula:

Predicted Mets = 18.0 – 0.15(age). (See Table 1)

Ref.: JACC, 1993; 22 : 175-182

Table 1

AGE		METS	AGE		METS
20	=	15	45	=	11.2
25	=	14.3	50	=	10.5
30	=	13.5	55	=	9.75
35	=	12.5	60	=	9
40	=	12			

Table 1 is consistent with the 1% decrease in exercise capacity per decade
After age 25, published many years ago

Ref.: JAP, 1981; 51 :634-64

The performance standard of maximal exercise capacity for a SCP has been set to 10 mets. According to a field study performed during the fall season at CN on 10 individuals (average age: 42) in yard positions, it has been found that the average energy expenditure of these individuals was 3 mets. Among 19 different tasks, 10 (53%) were requesting more than 4 mets. The maximum energy level of exercise during a 8 hour shift was 8 mets.

3c) A decrease of 10 mm Hg or more of systolic BP may indicate transient LV dysfunction and justifies further assessment.

Ref.: Braunwald's Heart Disease, WB Saunders Publication, 2001, p.152.

3d) New England Journal of Medicine 2000; 343: 826-833

4. Echocardiogram

4a) LVES diameter

A LVES diameter above 5.0 cm is associated with a 2.7 fold increase in all-cause mortality.

Ref.: JACC, 2000; 35 : 1237

4b) LVEF

A LVEF of less than 35% is associated with, at least, a 1.8 fold increase in all-cause mortality

Ref.: JACC, 2000; 35 : 1237

4c) 2+ mitral or aortic regurgitation is associated with an increase of all-cause mortality.

Ref.: Circulation 2001; 103 : 1759

5. Ischemic Heart Disease

5a) The Canadian recommendations to treat dyslipidemia consider risk above 2%/year as a high risk.

Ref.: CMAJ 2000; 162 : 1441.

High risk asymptomatic individuals have a risk for coronary event equal or greater than 20% in 10 years (25% of US adult population).

Ref: Circulation, 2001; 104: 1863-1867.

5b) Individuals with diabetes have similar yearly rate of CV events (4%) as those who already have CV symptoms.

Among the 9,297 individuals of the HOPE study, those without diabetes but with known cardiovascular disease had a 16.5% rate of cardiovascular events in 4 years. The 3,577 individuals with diabetes had a 19.8% rate of cardiovascular events during the same period.

Ref.: New England Journal of Medicine 2000; 3423: 145-153.

5c) In most individuals with Prinzmetal's angina who survive an infarction or the initial 3 to 6 month period of frequent episodes, the condition stabilizes and symptoms and cardiac events tend to diminish with time.

Braunwald's Heart Disease, 6th Ed. Saunders, 2001; p. 1328.

5d) Most restenosis after PCI usually occur within the first 3 month period following the procedure

Ref.: Circulation, 1988, 77: 361-371.

5e) Coronary artery bypass graft (CABG)

MIBI stress test showing reversible hypoperfusion is associated with a 2.9 fold increase in CV events. These occur within 1 year in .5% of individuals with normal MIBI and in 7% of those with abnormal MIBI.

Ref.: Circulation 1994; 89 : 615

5f) Silent Coronary Disease

The 7 year risk of myocardial infarction is 20% in individuals with silent myocardial ischemia and 18% in individuals with both ischemic changes and angina during exercise testing

Ref.: American Journal of Cardiology 1988; 62 : 1155.

Asymptomatic ischemia has a significance similar to that of symptomatic ischemia.

Ref.: Braunwald's Heart Disease, Saunders, 2001, p. 1332.

The prognosis "warranty" for normal stress myocardial perfusion images is believed to expire after 1.5 to 2 years.

Ref.: Journal of American College of Cardiology, 1988: 32-57

5g) Cass Registry 15 year follow-up

Ref.: JACC, 1995; 25 : 1000

Yearly Event Rate

	Extent of disease		
LV Function	1 vessel	2 vessels	3 vessels
Normal	1.5%	2.1%	3.5%
Abnormal	3.5%	6.2%	10.5%

5h) CARE Study
Ref. : NEJM, 1996; 335 : 1001

Probabilities of CV events post MI

Average risk	=	5.3% per year
Hypertension	=	+ or - .5%
Smoking	=	+ or - .5%
LDL at 3.2 mmol/l	=	+ or – 1%
Diabetes	=	x 2

5i) SPRINT Study
Ref.: European Heart Journal 1988; 9 : 354-364

Yearly post MI mortality rate

Average	=	4.8%
No risk factor	=	4.0%

2 risk factor	=	5.1%
4 risk factor	=	15%
6 risk factor	=	23%

5j) Abdominal obesity associated with high triglycerides is a marker for an atherogenic metabolic triad (hyperinsulinemia, elevated apoB and small dense LDL) and is associated with a high risk of CAD.

Circulation 2000; 102: 179-184

6. Non ischemic Heart Disease

6a) Aortic stenosis

Mild aortic stenosis has a faster course towards reduction of the valve area. Faster progression was observed in individuals with valve area of 1.4 cm2, peak valvular pressure gradient of 22 mm Hg and peak velocities across the valve area of 2.8 m/sec.

Ref.: Circulation, 2000; 101 : 2497

6b) ACC/AHA Guidelines for the management of individuals with valvular heart disease

Ref.: JACC, 1998; 32 : 1486

6c) Prognosis of left atrial dilation

Ref.: JACC, 2000; 35 : 1237

6d) Valvular surgery

Prosthetic valve dysfunction occurs more frequently with biological prosthesis and should be carefully monitored.

Leakage of prosthetic valve is rare (< 1%/year) but can lead to symptoms and sudden impairment.

Complications of prosthetic valve average 5%/year.

Ref.: Current Problems in Cardiology, 2000; : 1-154

6e) Atrial septal defect (ASD)

75% of individuals with significant left to right shunt are symptomatic when reaching the 5th decade and significant ASD should be closed as soon as diagnosed in the adult.

Ref.: Braunwald's Heart Disease, 6th Ed., Saunders 2001; p. 1593.

6f) Aortic coarctation

Residual hypertension is common after correction of aortic coarctation due to a reset of the baroreceptors.

Ref.: Braunwald's Heart Disease, 6th Ed. Saundesr 2001; p.1601.

6g) Pulmonary stenosis

Peak pressure gradient across the aortic valve of 50 mm Hg or more is an indication for surgical correction or balloon intervention.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1602

6h) Ventricular septal defect (VSD)

A pulmonary/systemic flow ratio greater than 1.5 is an indication for surgical correction in the absence of irreversible pulmonary hypertension.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1595

7. Cardiomyopathies

7a) Idiopathic hypertrophic subaortic stenosis and hypertrophic cardiomyopathy.

Death is most often sudden in hypertrophic cardiomyopathy

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p.1770.

7b) Restrictive cardiomyopathy

Syncope and arrhythmia are common in infiltrate or restrictive Cardiomyopathy.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1779.

7c) Pericardial disease

Acute pericarditis

Pain is associated with acute pericarditis. Large pericardial effusion might be associated with sudden impairment due to cardiac tamponnade.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p 1835

Chronic pericarditis

Dyspnea and right sided heart failure are observed in chronic pericarditis.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 1852

7d) Heart transplant

Heart transplant may be associated with early or late rejection and complication of immuno-suppressive therapy add to the risk, even in the absence of rejection.

7e) Congestive heart failure

Heart failure secondary to systolic or diastolic dysfunction share a common symptomatology and risk of sudden impairment due to dyspnea or arrhythmia.

Ref.: Braunwald's Heart Disease, 6th Ed, Saunders 2001; p.538

8. Arrhythmias

8a) Non sinus rhythm is associated with a mortality of 1.75 to 2 times normal.

Extrasystoles might be secondary to undiagnosed cardiopathy and justify assessment in order to rule out CVD. If no underlying disease is found, isolated extrasystoles carry a normal prognosis.

Ref.: Brackenridge's Medical Selection of Life Risk, Stockton Press Publication, 1998.

8b) Bradyarrhythmia

A permanent pacemaker is indicated for symptomatic individuals with heart rate of less than 40/minute or pauses longer than 3 seconds during waking hours

Ref.: Braunwald's Hear Disease, 6th Ed. Saunders 2001: p. 777

8c) Wolf-Parkinson-White (WPW)

Paroxysmal tachycardia occurs in 20 to 36% of individuals with WPW and rapid atrial fibrillation may lead to sudden impairment. Catheter abaltion of the Kent bundle is the treatment of choice.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 855

8d) Pacemakers

Many reports on interference of pacemaker function with electromagnetic fields (EMF) (mainly anti-theft devices) do not represent the safety of such devices implanted for over 40 years.

Field tests are recommended for pacemakers recipients working in EMF environment.

Ref.: Cardiac arrhythmia and device therapy, I.E. Ousyshcher, Ed. Futura Publishing Comp., 2000.

8e) Ventricular tachycardia and defribrillation

The nature of arrhythmia justifying implantation of cardiac defibrillators, the underlying LV function and the possible device dysfunction are associated with a risk of sudden impairment.

Ref.: Current Problems in Cardiology 1997 : 22

8f) Atrial fibrillation/flutter

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 834.

8g) Extrasystoles

Frequent extrasystoles may be associated with the occurrence of sustained supraventricular or ventricular tachyarrhythmia which might cause sudden impairment.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders 2001; p. 829

9. Abdominal aortic aneurysm

Abdominal aortic aneurysm is the most frequent. Recommendation of the Society for Vascular Surgery and the International Society for Cardiovascular Surgery is for elective repair of aneurysm of 4 cm or larger although many surgeons still consider 5 cm or more to be the indication for surgery.

Ref.: Journal of Vascular Surgery 1992; 15 : 1046

Mayo Clinic Proc. 2000; 75 ; 395.

10. Vaso-vagal syndrome

In vaso-vagal syncopes, it is considered that if the individual remains asymptomatic, driving can be resumed several months later, 6 months being the commonly recommended waiting period.

Ref.: Braunwald's Heart Disease, 6th Ed. Saunders, 2001: p. 939.

Appendix II - Global Risk Assessment Inventory

a) Family history of 1st degree relatives as pertaining to coronary artery disease.

b) Lipid profile.

c) Smoking.

d) Diabetes mellitus.

e) Hypertension.

f) Body mass index.

g) Abdominal girth measurements in cms.

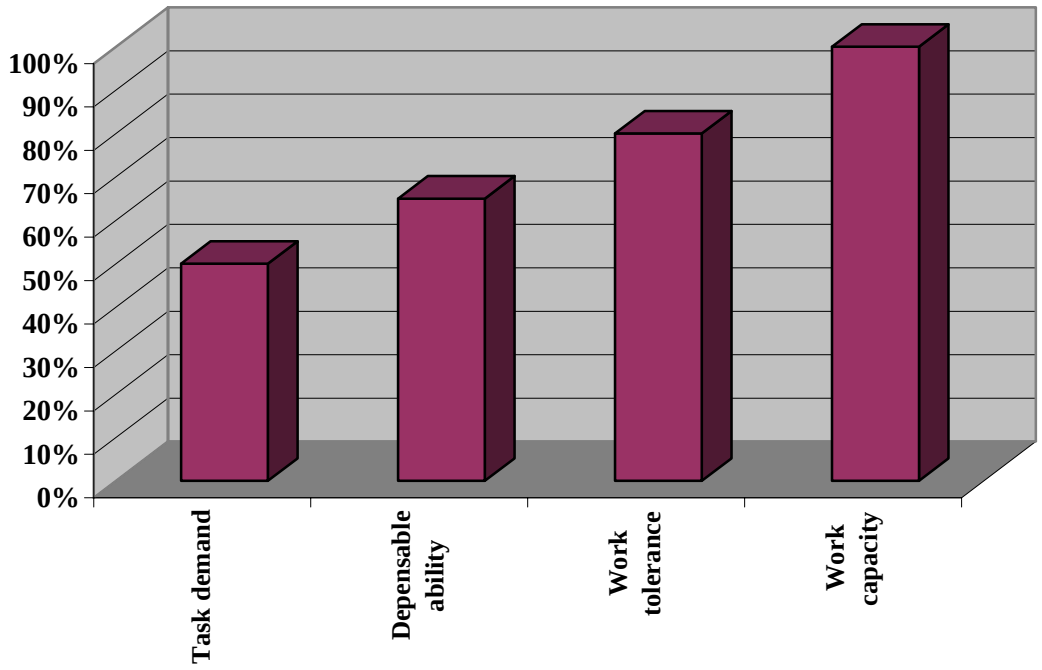
h) History regarding lifestyle as it applies to activity level.

i) Estimation of compliance with treatment and recommendations

Appendix III - The Oxygen Cost Per Stage For The Commonly Used Bruce Protocol

O^2 COST ml/kg/min	METS	BRUCE PROTOCOL		
		3 MIN STAGES		
		mph	% gr	Stage
		5.5	20	
56.0	16	5.0	18	5
52.5	15			
49.0	14			
45.5	13	4.2	16	4
42.0	12			
38.5	11			
35.0	10	3.4	14	3
31.5	9			
28.0	8			
24.5	7	2.5	12	2
21.0	6			
17.5	5	1.7	10	1
14.0	4			
10.5	3			
7.0	2			
3.5	1			

Appendix IV - Distinctions among work capacity, work tolerance, dependable ability, and task demand.



Appendix V - Framingham calculation of 10-year risk of coronary disease

Use to calculate short-term CHD risk in patients without diabetes mellitus or clinically evident cardiovascular disease.

STEP 1: AGE	RISK POINTS	
YEARS	MEN	WOMEN
30-34	-1	-9
35-39	0	-4
40-44	1	0
45-49	2	3
50-54	3	6
55-59	4	7
60-64	5	8
65-69	6	8
70-74	7	8
STEP 2: TOTAL CHOLESTEROL		
(mmol/L)		
<4.14	-3	-2
4.15-5.17	0	0
5.18-6.21	1	1
6.22-7.24	2	2
≥ 7.25	3	3
STEP 3: HDL-C		
(mmol/L)		
<0.90	2	5
0.91-1.16	1	2
1.17-1.29	0	1
1.30-1.55	0	0
≥ 1.56	-2	-3
STEP 4: SYSTOLIC BLOOD PRESSURE		
(mm Hg)		
<120	0	-3
120-129	0	0
130-139	1	1
140-159	2	2
≥ 160	3	3
STEP 5: SMOKER		
No	0	0
Yes	2	2

STEP 6: (SUM 1-5)	POINTS
Age	
Cholestrol	
HDL-C	
Blood Pressure	
Smoker	
TOTAL POINTS	

STEP 7: CALCULATE RISK *		
RISK POINTS	10 YR RISK MEN	10 YR RISK WOMEN
1	3%	2%
2	4%	3%
3	5%	3%
4	7%	4%
5	8%	4%
6	10%	5%
7	13%	6%
8	16%	7%
9	20%	8%
10	25%	10%
11	31%	11%
12	37%	13%
13	45%	15%
14	≥ 53%	18%
15		20%
16		24%
17		≥ 27%

STEP 8: COMPARE CHD RISK **		
	MEN	
AGE	AVERAGE	LOW
30-34	3%	2%
35-39	5%	3%
40-44	7%	4%
45-49	11%	4%
50-54	14%	6%
55-59	16%	7%
60-64	21%	9%
65-69	25%	11%
70-74	30%	14%
	WOMEN	
30-34	<1%	<1%
35-39	<1%	<1%
40-44	2%	2%
45-49	5%	3%
50-54	8%	5%
55-59	12%	7%
60-64	12%	8%
65-69	13%	8%
70-74	14%	8%

Note that the Framingham tables underestimate CHD risk if LDL-C>6.0 mmol/L

* Risk of CHD outcomes including angina pectoris, unstable angina, nonfatal MI and coronary death over subsequent 10 years for a Framingham Study participant with that specific risk score.
** Risk of a participant with "optimal" risk factors.

USE OF FRAMINGHAM CALCULATION

A man aged 52 (+ 3 points) with a total cholesterol of 5.2 mmol/L (+ 1 point), with a HDL cholesterol of 0.8 (+ 2 points), with a systolic blood pressure of 160 mmHg (+3 points) who smokes (+ 2 points) is totaling 11 risk points.

According to the calculate risk in step 7, this man has a 10 year risk of ischemic event of 31% which is 2.2 times the average risk of a man of his age who has, according to the compare CHD risk of 14% as seen in step 8.

Appendix VI - Acknowledgements

The RAC would like to acknowledge the contribution of:

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4.7 - Diabetes

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH DIABETES IN A SAFETY CRITICAL POSITION IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment.

Diabetes, if not well controlled, can cause sudden or gradual impairment of alertness, judgement, the senses or motor function. Hypoglycemic episodes and hypoglycemia unawareness are of particular concern. A severe hypoglycemic episode is defined as one which results in an impairment of alertness, judgement, the senses and/or motor function, a loss of consciousness or one requiring outside assistance.

Medical guidelines have been developed in order to evaluate and monitor the fitness for duty of individuals with diabetes employed in an SCP in the Canadian railway industry.

Individuals with diabetes working in an SCP must be monitored closely. They must report any changes in the treatment of their diabetes to the Chief Medical Officer (CMO) of their railway company. This includes changes in the type and dose of their medication and a change in the number of insulin injections. They must also report any severe hypoglycemic episode. All employees with diabetes will be assessed individually with respect to their suitability for a particular SCP.

Background information on diabetes and fitness for duty issues are provided in Appendix I, II and III.

2. Basic considerations

The employment of an individual with diabetes in an SCP shall be guided by three considerations:

2.1 The diabetes history (e.g., type of diabetes, presence of complications, adherence to treatment protocols, reaction to treatment).

2.2 The method of treatment of the diabetes (e.g., diet, oral anti-hyperglycemic agents and insulin).

2.3 The nature of the job.

3. Fitness for duty criteria

Individuals with diabetes will be eligible to work in an SCP provided they meet the following criteria:

3.1 All severe hypoglycemic episodes, as defined in the introduction, occurring in the past 12 months, have been investigated by the treating physician.

3.2 Not experiencing hypoglycemia unawareness.

3.3 Must be in a stable state. An unstable state is defined as:

a) an A1C equal or greater than 200% of the upper limit of the normal laboratory range;

b) more than 10% of blood glucose self-monitoring values below 4 mmol/L. To provide evidence of this, the individual must comply with all monitoring requirements applicable to employees with diabetes; and

c) a recent change in the number of insulin injections and/or a change in the type of insulin. The unstable state will be considered to last at least one month after such a change. The individual will need to be assessed at monthly intervals and cannot return to work in an SCP until a stable state has been reached.

3.4 Perform adequate blood glucose self-monitoring as specified in these guidelines.

3.5 Demonstrate a knowledge of managing diabetes, particularly insulin adjustment and understand how to avoid and treat hypoglycemic events.

3.6 Be free of diabetic complications which might impair ability to work safely, including significant vascular or neurological complications, and significant visual impairment.

3.7 An individual who is commencing insulin must attain a stable state (as defined in Section 3.4), for a period of at least 1 month before being considered fit to work in an SCP.

The individual must also meet all of the above fitness for duty criteria. To provide evidence of this, the individual must comply with all monitoring requirements applicable to individuals with diabetes treated with diet and insulin.

4. Monitoring requirements

Each of the following three categories of individuals with diabetes requires specific medical monitoring:

4.1 Individuals treated by diet alone, or by diet and oral anti-hyperglycemic agents except insulin secretagogues (sulfonylureas and meglitinides)

4.2 Individuals treated with diet and insulin secretagogues (sulfonylureas and meglitinides)

4.3 Individuals treated with diet and insulin.

5. Essential monitoring requirements for individuals treated with diet alone, or with diet and oral anti-hyperglycemic agents except insulin secretagogues (sulfonylureas and meglitinides)

5.1 Attendance at a diabetes education centre since the onset of disease or within the six months prior to commencing work in an SCP

5.2 Annual ophthalmic examination with a report (by an ophthalmologist or optometrist) including visual acuity, colour vision, visual fields and a retinal examination through dilated pupils

5.3 Annual review by their treating physician including:

a) the completed medical report for employees with diabetes working in an SCP (Appendix IV);
b) a physical examination;
c) the yearly ophthalmic report (as described above at Section 5.2);
d) a review of A1C level(s);
e) a review of yearly resting ECG; and
f) the treating physician's opinion regarding the individual's fitness for duty in an SCP (based on the criteria described in Section 3).

5.4 The individual shall report immediately to the CMO the initiation of any insulin secretagogue or insulin therapy (as this may increase the risk of an unstable state), and any severe hypoglycemic episode as defined in the introduction.

5.5 The individual must meet the fitness for duty criteria of Section 3.

6. Essential monitoring requirements for individuals treated with diet and insulin secretagogues (sulfonylureas and meglitinides)

In addition to the essential monitoring requirements of Section 5, the following are additional requirements for these individuals:

6.1 Blood glucose monitoring as follows:

a) using a memory meter that can be down-loaded for further review;

b) glucose readings performed at least 8 times per week. The measurements must cover the whole day, by including measurements before or after each meal, and at bedtime. At least half the measurements must be done during a working shift;

c) the individual must maintain a record of down-loaded glucose meter logs from the previous six months; and

d) glucose values must be maintained above 4 mmol/L, with additional food being taken when glucose is less than 4 mmol/L.

6.2 Annual review and comment by the treating physician of the previous 3 months down-loaded glucose meter logs to be done at the annual review as per Section 5.3.

6.3 The individual shall report immediately to the CMO any modification in oral anti-hyperglycemic agent regimen (including initiation, dosage increase, change in monotherapy, or initiation of/or change in combination therapy), initiation of insulin therapy, and any severe hypoglycemic episode as defined in the introduction. Consideration should be given to utilizing antihyperglycemic drugs that have a low risk of hypoglycemia such as metformin and/or thiazolidinediones (TZD) (rosiglitazone, pioglitazone). Recommendations for the treating physician on the use of oral hypoglycemic medications are included at Appendix III.

7. Essential monitoring requirements for individuals treated with diet and insulin

In addition to the essential monitoring requirements of Sections 5 and 6, the following are additional and/or modified requirements for these individuals:

7.1 At the 6 month point of each year, the individual will require review and comment by the treating physician with submission of Part 1 of the medical report for employees with diabetes (Appendix IV) to the CMO. This should include review and comment by the treating physician of the previous 3 months down-loaded glucose meter logs.

7.2 At the 12 month point review and comment by a specialist in diabetes with submission to the CMO of the complete medical report for employees with diabetes (Appendix IV). This report must include all of the components specified in Section 5.3 and a review and comment of the previous 3 months down-loaded glucose meter logs.

7.3 The individual shall report immediately to the CMO any change in the number of insulin injections per day (including initiation). The individual must also report any severe hypoglycemic episode as defined in the introduction. Any individual commencing insulin must meet the fitness for duty criteria of Section 3.7.

8. Hypoglycemia Prevention Strategy

As a condition of employment in an SCP, each individual will be required to take every possible measure to avoid hypoglycemia. Individuals requiring insulin therapy must carry a source of rapidly absorbable glucose at all times. Hypoglycemia prevention strategies, including oral hypoglycemic medication recommendations, are discussed in Appendix III. These strategies must be tailored to the individual with the guidance of the treating physician.

Appendix I - Background Information On Diabetes

- INTRODUCTION

Diabetes is a complex disorder involving the elevation of blood glucose and the disturbance of other metabolic functions resulting in associated vascular complications. Diabetes is traditionally divided into two main groups based on the cause of the diabetes. Type 1 diabetes (previously known as insulin-dependent diabetes (IDDM)) is caused by the destruction of the pancreas with a total loss of insulin secretion. The initial damage to the pancreas may have commenced several years prior to initial diagnosis. As insulin levels fall, the individual may present with acute symptoms of excessive thirst, weight loss and eventually major deterioration and death. In the individual with Type 1 diabetes, insulin treatment is essential to maintain life.

Type 2 Diabetes (previously known as non-insulin dependent diabetes (NIDDM)) has a separate set of abnormalities that lead to an elevation of blood glucose. The body develops resistance to insulin, and a relative insulin insufficiency and eventually blood glucose levels become elevated. Type 2 diabetes is more common in the older age group and frequently these individuals are overweight. Type 2 diabetes, however, is increasingly being seen in younger obese people thus requiring appropriate testing for diabetes at an earlier age. Type 2 diabetes may remain undetected for many years without obvious symptoms.

In both Type 1 and Type 2 diabetes, the major concern relates to abnormal blood glucose levels and associated abnormalities. The individual with diabetes is susceptible to vascular complications. These exist in two major forms, macrovascular complications which involve the large blood vessels, and microvascular complications which involve small blood vessels. In macrovascular disease, the larger blood vessels will become altered and eventually occluded in a process known as atherosclerosis. This will affect key organs such as the heart (coronary artery disease), the brain (cerebrovascular disease), the aorta and the peripheral circulation (peripheral vascular disease). Coronary artery disease remains the predominant vascular disease of diabetes.

Microvascular disease involves the small vessels, which provide blood supply to major organs such as the eyes, kidneys and nerve. Damage to the eyes (diabetic retinopathy) is now the most common cause of blindness among young people in the western world. The back of the retinae will become progressively damaged and while sight is preserved initially, at a later stage, vision will decrease and there may be eventual blindness. Treatment requires early detection, thus necessitating regular review of the eyes by an eye specialist, and if retinopathy is present, laser surgery becomes essential to protect vision.

Damage to the kidneys (diabetic nephropathy) is identified by an initial leakage by the kidneys of small amounts of protein. Gradually, kidney function will fail associated with

excessive loss of protein and elevation of metabolic by-products. As the kidney fails, the individual may eventually require dialysis unless intervention can be made by renal transplantation. Diabetes now represents one of the most common causes of renal failure providing the greatest need for dialysis or transplantation.

Damage to the nerves (diabetic neuropathy) occurs due to poor blood supply to the smaller nerves. In the early stages, damage to the nerves may result in severe, unremitting pain in individual nerves, but later, nerve tissue dies and there will be a loss of function of the nerve. This is identified by loss of function of muscles, the bowel and/or genitourinary system. A loss of sensation and poor circulation, which are frequently found together, may lead to increased risk of infection in the lower limbs and the eventual development of gangrene and amputation of the limb.

These vascular complications are accelerated by associated risk factors that are frequently present with diabetes. Both hyperlipidemia (high fat levels) and hypertension (high blood pressure) are more commonly found in patients with diabetes and will lead to an increased rate of atherosclerosis and damage to eyes and kidneys.

- TREATMENT

The key goals of treatment include:

a) achieving the lowest possible glucose level without causing hypoglycemia
b) detecting and treating the associated risk factors, and
c) preventing, detecting and treating vascular complications at an early stage.

Glucose Control:

It has now been established that elevated blood glucose levels play an important role in the development of vascular complications of diabetes. A major research study, The Diabetes Care and Complications Trial (DCCT), proved that elevated levels of glucose are an essential component in the development of the vascular complications of diabetes. One of the key measurements used in the study was the A1C, which reflects an estimate of the previous three months of glucose levels. It was found that when intensive therapy reduced A1C from 9.0 to 7.1% (normal less than 6.1%), the risk of developing diabetic vascular complications and their rate of progression was reduced by 50 to 75%. Similar findings were found in the recently published United Kingdom Prospective Diabetes Study (UKPDS) of Type 2 diabetes. The results of the DCCT and UKPDS have further emphasized the need for the clinician to achieve the most ideal blood glucose control in each individual.

Education:

An essential component in the management of both Type 1 and Type 2 diabetes is the use of diabetes education programs where individuals will learn to understand all aspects of their diabetes and treatment.

The person with diabetes will be taught the key aspects of dietary management and how to take medications appropriately. Many learn sophisticated skills that will enable them to adjust their food, activities and medications to achieve satisfactory levels of glucose control. The diabetes centre will also teach the patient the use of one of the most important tools in managing diabetes, the self-glucose monitor. This requires the patient to prick the finger and place a drop of blood on a glucose strip where it is read in a small glucose meter. The technique is accurate to within 15% of the real value of blood glucose and readings can be completed within one minute. The equipment is small and can easily fit into a pocket or purse. The individual must be instructed as to how to use the meter and the meter should be calibrated at regular intervals against a laboratory plasma glucose value. Self-glucose readings can be done at any time of the day to determine the level of blood glucose and to anticipate changes in blood glucose resulting from different food intake and exercise levels.

Most new glucose meters have a data port which allows for down-loading of the glucose measurements taken in previous weeks. The dates and times of the glucose readings are recorded with the meter thus allowing for an independent review of the diabetes management and the frequency of the glucose testing by the patient.

Treatment of Type 1 Diabetes:

Injection of insulin is the key treatment for the person with Type 1 diabetes. Insulin is given in multiple injections to allow for different circumstances throughout the day. It has to be given prior to food to help dispose of the food after absorption. The dose of insulin will vary with the type of food being eaten. Prior to exercise, the insulin dose will need to be reduced as blood glucose will frequently fall after exercise. Insulin may need to be increased at times of stress or infection because blood glucose can rise at these times. Different types of insulin are often used either singularly or in combination. In general, the types of insulin can be divided into rapid-acting analogue insulins: insulin-lispro (Humalog), insulin-aspart (Novo-Rapid); fast-acting insulins: Novolin Toronto, Humulin R ; intermediate-acting insulins: Humulin N; Novolin NPH; long-acting insulin: Ultra-Lente (Humulin U); and extended long-acting analogue: insulin glargine (Lantus). Originally, insulin was given as a once or twice a day injection. It is now recognized with the use of glucose meters and the newer forms of insulin, that insulin can be administered to suit the needs of the patient.

More flexible routines such as three-four insulin injections/day permit tighter and more even glucose control. Fast-acting insulin is often mixed with intermediate-acting insulin at

breakfast to provide better glucose control between breakfast and supper. Fast-acting insulin is then given alone at supper and an intermediate or longer-acting insulin is given at bedtime. Many different insulin regimens are being employed to meet the individual needs of the person with diabetes. When individuals have varied lifestyles involving changing work, exercise and leisure activities, then more intensive insulin regimens may be more suitable. In these situations, rapid-acting insulin will be given before each meal with NPH or glargine at bedtime. The use of rapid-acting insulin analogues before meals has been shown to reduce the frequency of hypoglycemic episodes when compared to regular insulin, particularly at night. The use of insulin pumps can also be used for intensive insulin therapy.

Insulin can be drawn from an ampule by a syringe and mixed as necessary or it can be given by a small injection device, known as the insulin pen. The insulin pen is small and light, and can usually hold enough insulin for a week.

Treatment of Type 2 Diabetes:

A diabetes education program and an understanding of diabetes management and the risk of complications are important in the treatment of type 2 diabetes. In the overweight individual, every effort is made to achieve ideal weight and the individual is encouraged to take part in a suitable exercise program. Frequently, this is the only treatment required for many years. As blood glucose levels rise, however, oral medication will need to be introduced as the first phase of controlling the elevated blood glucose. Several drugs are now available and new therapies are expected in the near future. The following classes of drugs are used extensively in the management of Type 2 diabetes.

a) Insulin secretagogues: sulfonylureas (glyburide, gliclazide, glimepiride, tolbutamide, chlorpropamide) and meglitinide analogues (repaglinide, nateglinide). These drugs stimulate the pancreas to make extra insulin. They help control the rise in blood glucose. In some individuals, they may lead to the unfortunate side effect of weight gain. Because of the increased output of insulin, the patient is at increased risk of low blood glucose (hypoglycemia). The meglitinides, because of their shorter duration and earlier time of action, may have an advantage over the sulfonylureas in reducing the severity and frequency of hypoglycemic events, especially when meals are delayed or skipped.

b) Biguanides (metformin): This drug alters the sensitivity of the cells to insulin, thereby improving the action of insulin and also reducing the amount of extra glucose produced by the body. It can cause abdominal upsets but will rarely cause hypoglycemia.

c) Alpha-glucosidase inhibitor (acarbose): This drug delays the absorption of food after meals, thus reducing the high levels of glucose in the post-absorptive state. It also may cause abdominal upset but, when used as monotherapy, will rarely cause hypoglycemia.

d) Thiazolidinediones (TZDs) and specific insulin sensitizers: rosiglitazone and pioglitazone. These drugs increase the action of insulin leading to better glucose control but they can cause weight gain and fluid retention. When used as monotherapy, they will rarely cause hypoglycemia.

e) Insulin: When diet, exercise and oral agents fail to control blood glucose, insulin must be used to achieve good blood glucose control. Because of the insulin resistance in Type 2 diabetes, large quantities of insulin are required and this may place the patient at risk for hypoglycemia.

Management of type 2 diabetes

The 2003 CDA Clinical Practice Guidelines have provided a recommended approach to treatment:

a) If A1C is < 9% and the BMI is > 25:

- Diet and exercise therapy

  - If glucose targets are not reached within 2-3 months: commence antihyperglycemic agents commencing with metformin.
  - If glycemic targets are not attained with a single agent: commence a second agent from a different class of drugs with preference toward a TZD.

b) If A1C is > 9%:

  - Commence 2 agents from different classes of drugs with the recommendation of metformin and a TZD as first preference.

  - If individual treatment goals have not been reached, insulin secretagogues or insulin therapy should be initiated.

- COMPLICATION OF TREATMENT: HYPOGLYCEMIA

  Brain and nerve cells require a continuous supply of glucose as they cannot make their own. Any fall in blood glucose will compromise brain and nerve activity. The symptoms of hypoglycemia relate to both the changes in activity of these tissues and the physiologic responses of the body attempting to correct the developing hypoglycemia.

  As an individual develops hypoglycemia, several symptoms will become apparent, warning of the falling levels of glucose. Initially, the individual may feel hungry, weak and tired. Tingling in the extremities such as fingers, toes and the nose may be present as well as muscle weakness. Excess perspiration can occur and the individual may be shaky and anxious. As the levels of glucose fall, the individual will have difficulty in thinking, with increasing confusion, difficulty in speaking and blurred or double vision. If hypoglycemia persists, the individual may experience an epileptic seizure and/or become unconscious.

  The body has a series of hormones which will act to counter-regulate the fall of blood glucose and protect the person from severe hypoglycemia. These hormones help to provide the warning signals of impending low blood glucose thus enabling the person to take corrective action. Some individuals may lose the ability to recognize that their blood glucose is becoming low, which is a serious and dangerous condition known as hypoglycemia-unawareness. The key drugs that will precipitate hypoglycemia are insulin and the insulin secretagogues (sulfonylureas and meglitinides). Hypoglycemia unawareness may also be caused by the frequent occurrence of mild hypoglycemic events and damage to the nerves (autonomic neuropathy).

  Alcohol also may contribute to a sudden drop of blood glucose in the person with diabetes and may also prevent the normal recovery response of the body to hypoglycemia, causing a more severe and longer lasting hypoglycemic event to occur. Some blood pressure drugs (beta-blockers) may also prevent the person from recognizing the impending hypoglycemia.

Appendix II - Fitness For Duty Issues Related To Diabetes

- DOES THE PERSON WITH DIABETES PRESENT AN INCREASED SAFETY RISK AS AN EMPLOYEE?

  The major concern for the person with diabetes and the employer is hypoglycemia with the associated decrease in mental and physical functioning. In terms of general health, the modern aggressive approach to prevention, detection and treatment of vascular complications has considerably reduced the impact of diabetes on the affected individual.

  It has become a valid argument that the person with diabetes who follows a program of regular exercise, a proper diet, correct use of medications and regular physician reviews, can be considered at less risk than the employee who may smoke, be overweight, not exercise and not receive regular assessment for the vascular risk factors such as hypertension, hyperlipidemia or even diabetes.

- EMPLOYMENT OF THE WORKER WITH DIABETES IN A SAFETY CRITICAL POSITION

  A Safety Critical Position in the Canadian railway industry is one with the highest potential impact on public safety. They include those employees who operate trains or heavy on-track equipment operated as a train as well as those who control the routing of trains. As such, the occupational requirements do vary, ranging from physical work to the monitoring of a computer terminal or dispatching console.

  The key concern for the worker with diabetes in a Safety Critical Position is related to maintaining a stable blood glucose. This is particularly important during times of increased exercise, when blood glucose may fall, and when there may be a delay in access to food.

  People with diabetes are most at risk in the following circumstances:

  a) insulin users;
  b) users of secretagogues (sulfonylureas and meglitinides);
  c) hypoglycemia unawareness; and
  d) previous history of serious vascular concerns, e.g. coronary artery disease, retinopathy.

  Each Safety Critical Position will have specific demands related to the job description. In addition, different collective agreements exist as to specific hours of work, time off and recall schedules. Generally, the running trades employee is entitled to a minimum of six hours off after completing a shift and may claim up to twenty-four hours delay before commencing the next shift.

Appendix III - Hypoglycemia – Prevention Strategies

Hypoglycemia is one of the most important concerns for individuals working in a Safety Critical Position. It is well recognized that the sulfonylureas (insulin stimulating drugs) are the most potent of the oral therapies in promoting hypoglycemia. Recently, new drugs have become available for the management of Type 2 diabetes: the insulin secretagogues (meglitinides) and the insulin sensitizing drugs. These drugs are further described in Appendix I.

At the discretion of the treating physician, the following recommendations regarding treatment of Type 2 diabetes could be implemented:

a) When commencing oral drug therapies for the first time, the drugs of choice would be metformin or an insulin-sensitizing agent such as rosiglitazone or pioglitazone.

b) If an insulin secretagogue is required, the use of meglitinides (repaglinide or nateglinide) would be preferable.

c) If drug combinations are required, the ideal combination might include metformin/insulin sensitizing drugs/meglitinides.

Other hypoglycemic prevention strategies include any of the following:

a) The blood glucose must be kept at a level high enough that hypoglycemia does not occur but not so high as to lead to an increased incidence rate of vascular complications

b) The individual must have extensive knowledge regarding management of his/her own diabetes and understand the concerns of both hypoglycemia and hyperglycemia.

c) The individual will need to establish a routine that will include regular meals and snacks. This does not preclude shift work or irregular hours.

d) The individual must undertake regular self-glucose monitoring using a memory-equipped meter which will be done prior to meals and before reporting for duty.

e) The individual must know how to adjust medications, particularly the use of sulfonylureas, meglitinides and insulin in accordance with meal routine and activities.

f) Regular medical assessments must be undertaken to review glucose control, treatment, risk factor assessment and review of potential vascular complications, including retinopathy, nephropathy, hypertension and hyperlipidemia.

g) Individuals on an insulin secretagogue (sulfonylureas and meglitinides) should be encouraged to review their therapy with their diabetes physician to determine whether it is appropriate to be transferred to an equally efficacious and safe oral agent which only rarely causes hypoglycemia (i.e. other than insulin secretagogues (sulfonylureas and meglitinides)).

h) Supplies required at all times while working include self-monitoring equipment and a source of rapidly absorbable glucose.

Appendix IV - Medical Report For Individuals With Diabetes

EMPLOYEE INFORMATION (To be completed by employee)

Name: _____Employee Number: _____
Address: _____
_____
City: _____ Postal Code: _____
Tel. No. (Home): _____ Telephone No. (Work) : _____
Job Title: _____ Supervisor Name: _____
Job Location: _____

EMPLOYEE CERTIFICATE OF INFORMATION AND RELEASE FOR PHYSICIAN TO REPORT MEDICAL INFORMATION

I, the undersigned, acknowledge that the position which I hold is of a safety critical nature and that it is incumbent on me to report any medical condition that may constitute a threat to safe railway operations. I declare that the information that I have provided or will be providing to the treating physician is truthful and complete. I will report any serious new hypoglycemic episode to my physician and to the Chief Medical Officer. A significant hypoglycemic episode is defined as one which results in an impairment of alertness, judgment, senses and/or motor function, a loss of consciousness or which requires outside assistance. If I change positions, I will take a complete copy of my medical file related to diabetes with me for any further medical examination. I hereby authorize any physicians, hospital, medical clinic or other medical service provider to release to the office of the Chief Medical Officer any information concerning any medical condition that may be related to my diabetes that may constitute a threat to safe railway operations. I understand that this information will be reviewed for the purpose of making a fitness for duty determination.

Signature of Employee: _____ Date: _____

INSTRUCTIONS TO PHYSICIAN:

Physicians assessing individuals occupying a Safety Critical Position declared by Canadian Federal Regulations are responsible under the Railway Safety Act to notify the railway Chief Medical Officer if an employee has a medical condition that could be a threat to safe railway operations. This individual is a Railway employee that has been diagnosed with diabetes. You are asked to complete Part 1, Part 2 (except the 6 month treating physician submission for an individual using insulin), and the Conclusion.

PART 1 -

MEDICATIONS

Please include the name, start dose and current dose of each hypoglycemic oral medication

Name	Start Dose	Current Dose
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

For Insulin users, specify type(s) of insulin and schedule of injections

Type(s) of insulin	Schedule of injections
_____	_____
_____	_____
_____	_____
_____	_____

Any change in the number of injections in the last 6 months? **Yes:___** **No:___**

List all other current medications:

_____	_____
_____	_____
_____	_____
_____	_____

HYPOGLYCEMIA

Is the employee familiar with the symptoms of hypoglycemia?	Yes ☐ No ☐
Does the individual recognize them at the time of an episode (warning signs)?	Yes ☐ No ☐
Can the individual explain the cause of the episode?	Yes ☐ No ☐
Is the individual capable of treating it quickly?	Yes ☐ No ☐
What type of sugar does the individual have available while at work? _____	
Was the individual carrying that type of sugar at the time of your examination?	Yes ☐ No ☐

Have there been episodes in the past 12 months:

a) that have required hospitalization?	Yes ☐ No ☐
b) that have required an emergency visit?	Yes ☐ No ☐
c) that came on suddenly? (without warning signs)	Yes ☐ No ☐
d) that reduced concentration or readiness at work?	Yes ☐ No ☐
e) that have required someone else's assistance?	Yes ☐ No ☐

f) that caused a loss of consciousness? Yes ☐ No ☐

If you answered yes to any of questions (a) to (f), please describe the episodes, dates, causes and any of the other characteristics or circumstances:

_____
_____
_____

Average number of minor hypoglycemic episodes (recognized and treated by the patient) per month:

Average number of blood sugar level tests done per day and schedule:

_____
_____
_____

Is patient using a memory meter that can be downloaded for further review: Yes ☐ No ☐
If so,
using two to three week periods, are more than 10% of the results below 4 mmol/l or above 15 mmol/l?
Yes ☐ No ☐

_____

MEDICAL HISTORY

Is there a history, symptoms or signs of:

a) ophthalmic disease? Yes ☐ No ☐
b) cardiovascular disease? Yes ☐ No ☐
c) neurological impairment? Yes ☐ No ☐
d) renal disease? Yes ☐ No ☐
e) other? (specify) Yes ☐ No ☐

Comments:

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PART 2 – Must be completed as part of the 12 month report by the family physician or specialist:

OTHER REQUIREMENTS

a) **The following reports must be appended to this report:**

- Report of a recent resting ECG
- Report of an A1C[1] and a lipid profile[2] done during the last 3 months
- A vision report from the vision specialist (ophthalmologist/optometrist who has examined the individual within the the last year)

b) **If the Canadian Diabetes Association's (CDA) treatment guideline goals for A1C, lipid profile and blood pressure (refer to footnotes below) are not achieved, what will be your recommendations to your patient to help reach the treatment goals?**

_____
_____
_____
_____

PHYSICAL EXAMINATION **Weight: _____** **Height: _____**

Blood Pressure[3]: lying down: _____/_____ upright: _____/_____ HR: _____

Body System	Normal	*Abnormal	Not Examined	*If abnormal, please comment:
Retinae	☐	☐	☐	
ENT/Thyroid	☐	☐	☐	
Peripheral vascular	☐	☐	☐	
Cardiovascular/ carotid arteries	☐	☐	☐	
Respiratory	☐	☐	☐	
Abdomen	☐	☐	☐	
Neurological	☐	☐	☐	
Integumentary	☐	☐	☐	
Musculoskeletal	☐	☐	☐	
Lymph Nodes	☐	☐	☐	
Genital-urinary	☐	☐	☐	
Other – specify:	☐	☐	☐	

[1] CDA Guidelines goals: A1C ≤ 7.0% or if it can be achieved safely: ≤ 6.0%
[2] CDA Guidelines goals: LDL-C < 2.5 mmol/L and Total Cholesterol : HDL-C < 4.0
[3] CDA Guidelines BP goals: ≤ 130/80 mmHg

CONCLUSION

To the best of your knowledge, does this individual comply with medical advice? Yes ☐ No ☐

IMPORTANT: Canadian railway employees who work in a Safety Critical Position operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Your opinion on this individual's fitness to work in a Safety Critical Position would be appreciated.

Comments: _____

_____

_____

_____

_____

Name of Physician: (Print)

☐ Family Physician
☐ Specialist (Specify: _____)

Address:

Telephone: Fax:

Date of Examination:

Postal Code:

Signature:

Date:

Appendix V - Acknowledgements

The RAC would like to acknowledge the contribution of:

Dr. Stuart A. Ross Mb ChB FRACP FRCP(C)
Clinical Professor of Medicine
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4.8 – Substance Use Disorders

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH SUBSTANCE USE DISORDERS IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property or the environment. Impairment of their alertness, judgement or sensory or motor function can pose a serious safety threat.

Over ten (10) % of the population will experience a substance* use disorder at some point in their life.[1] It has been estimated that more than five (5) % of railway workers use mood altering drugs while at work[2]. Workers with alcohol or other drug problems are significantly more likely to have a time loss injury or a fatal workplace injury[3]. Employees with substance dependence*, because of denial or other psychological defence mechanisms, often are unaware of the magnitude of their problem, so are unwilling or unable to seek help.

Background information on substance use disorders is provided in Appendix I.

2. Scope

For the purpose of these guidelines, substance use disorders include substance abuse*and substance dependence**.** Both are medical conditions for which diagnostic criteria are those of the Diagnostic and Statistical Manual of Mental Disorders (DSM - IV)[4]. The guidelines are to be used by physicians in the assessment of fitness for duty of employees in an SCP.

[1] Eaton WW, Kessler LG,The NIMH Epidemiologic Catchment Area Program. Orlando, FL, Academic Press, 1985
[2] Task Force on the Control of Drug and Alcohol Abuse in the Railway Industry: Survey of Persons Employed in Positions Critical to Railway Safety: Final Report (Ottawa: Transport Canada, 1988)
[3] Soderstrom CA, Dischinger PC, Smith GS et al;, Psychoactive substance dependence among trauma center patients. Journal of the American Medical Association, 267(20):2756-2759, 1992
[4] Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision, American Psychiatric Association, 2000

3. Basic considerations

Employment of individuals in an SCP who may have a substance use disorder will be guided by the following considerations:

3.1 Medical history and physical examination.

3.2 Results of additional investigations as may be required (e.g. urine, blood, and/or breath tests).

3.3 Assessment performed by the treating physician and/or by an Addiction Medicine Physician*.

3.4 Medical diagnosis of a substance use disorder (e.g. substance abuse or substance dependence).

3.5 Presence of medical and/or psychiatric comorbidity.

3.6 Absence of necessary coping skills.

3.7 Response to treatment.

3.8 Establishment of a monitored Relapse Prevention Agreement*.

3.9 Ongoing compliance with a monitored Relapse Prevention Agreement.

4. Definitions

The terms used in these guidelines are initially identified with an asterisk (*) in the text.

Addiction Medicine Physician: A medical practitioner with formal certification[5] or peer recognition as having expertise in diagnosis and treatment of substance use disorders.

Addiction Treatment Program: Inpatient or outpatient treatment program providing intensive therapy using psychoeducation, motivational enhancement, cognitive/behavioural therapy, skills training, physical activities, mutual support group introduction and family therapy.

[5] Canadian Society of Addiction Medicine or American Society of Addiction Medicine

Monitoring Process: Process consisting of:

- Regularly scheduled face-to-face visits to provide support, observe for signs and symptoms of impending relapse and verify compliance with all components of the Relapse Prevention Agreement, and

- Medical investigations including breath and body fluid testing performed by professionals: - physicians (including treating physician), nurses, employee and family assistance professionals, other mental health professionals, certified addictions counsellors - with knowledge and skill in the treatment of substance use disorders, in order to verify compliance with all aspects of the Relapse Prevention Agreement.

Mutual Support Program: Programs - Alcoholics Anonymous, Narcotics Anonymous, Al-Anon, Women for Sobriety, Secular Organization for Sobriety, Rational Recovery and Smart Recovery - offering group support meetings, structured recovery activities, educational materials and relapse prevention techniques for people recovering from addictive disorders and for their families.

Relapse Prevention Agreement: Formal document listing all necessary behaviours expected of the individual with a diagnosis of substance use disorder including reporting of all incidents of non-compliance to the railway CMO.

In the case of substance abuse, the agreement must include at a minimum:

- Total abstinence from all substances for the duration of the Relapse Prevention Agreement.
- Regularly scheduled monitoring visits
- Substance testing arrangements, types and frequency of testing.
- Duration of agreement.
- Reporting arrangements to railway Occupational Health Services
- Acknowledgement of consequences for non-compliance

In the case of substance dependence, the agreement must include at minimum:

- Total abstinence from all substances as long as individual holds safety critical position
- Regularly scheduled monitoring visits
- Substance testing arrangements, types and frequency of testing.
- Duration of agreement.
- Reporting arrangements to railway Occupational Health Services
- Acknowledgement of consequences for non-compliance.
- Mutual Support Program involvement.
- Any ongoing treatment by other medical or psychiatric professionals and compliance with their treatment recommendations.

Substance: Any mood-altering drug (with the exception of nicotine and caffeine) with which the drug user may meet criteria for substance use disorders (abuse or dependence). Categories of substances include alcohol, stimulants *(cocaine, amphetamines, methylphenidate), cannabinoids, hallucinogens, solvents, opioids *(codeine, morphine, heroin, methadone, oxycocet, hydromorphone, methadone, pentazocine, meperidine, buprenorphine), sedative/hypnotics *(benzodiazepines {diazepam, lorazepam, alprazolam, clonazepam, triazolam, chlordiazepoxide, flurazepam, oxazepam} zopiclone, barbiturates).

* indicates partial list of examples

Substance Abuse: (DSM – IV):

A) A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period:

- Recurrent substance use resulting in a failure to fulfill major role obligation at work, or home
- Recurrent substance use in situations in which it is physically hazardous
- Recurrent substance related legal problems
- Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance.

B) The symptoms have never met the criteria for substance dependence for this class of substance.

Substance Dependence: (DSM – IV): A maladaptive pattern of substance use, leading to significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same 12-month period.

1) Tolerance, as defined by either the following:

   a) A need for markedly increased amounts of the substance to achieve intoxication or desired effect

   b) Markedly diminished effect with continued use of the same amount of the substance

2) Withdrawal, as manifested by either of the following:

   a) The characteristic withdrawal syndrome for the substance.

   b) The same (or closely related) substance is taken to relieve or avoid withdrawal symptoms

3) The substance is often taken in larger amounts or over a longer period than was intended

4) There is persistent desire or unsuccessful efforts to cut down or control substance use

5) A great deal of time is spent in activities necessary to obtain the substance, use the substance or recover from its effects

6) Important social, occupational or recreational activities are given up or reduced because of substance use

7) The substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance.

5. Fitness for duty

5.1 Substance Abuse

Individuals with substance abuse cannot be considered fit for duty in an SCP until:

- They are documented to have been abstinent from all substances for one month**.** This period may be adjusted based upon consultation between the railway Chief Medical Officer (CMO) and an Addiction Medicine Physician.

- A written report is provided to the CMO by a physician with recommendation that they be considered fit for duty .

- They sign and demonstrate compliance with a Relapse Prevention Agreement.

The CMO may require that a medical assessment, including a written report, be performed by an Addiction Medicine Physician with recommendation that they be considered fit for duty.

5.2 Substance Dependence

Individuals with substance dependence cannot be considered fit for duty in an SCP until:

- They are documented to have been abstinent from all substances for three months**.** This period may be adjusted based upon consultation between the CMO and an Addiction Medicine Physician.

- A written report is provided to the CMO by a physician with recommendation that they be considered fit for duty .

- They sign and demonstrate compliance with a Relapse Prevention Agreement.

- They have completed an initial intensive Addiction Treatment Program*.

The CMO may require that a medical assessment, including a written report, be performed by an Addiction Medicine physician with recommendation that they be considered fit for duty..

5.3 Individuals whose substance use has been detected at work **(**e.g. odour, intoxication, withdrawal symptoms, observed consumption) cannot be considered fit to work in an SCP until an assessment by an Addiction Medicine Physician has been performed in order to determine if their condition meets the criteria for substance abuse or substance dependence.

If, following assessment by an Addiction Medicine Physician**,** it is determined that an individual:

- Meets the diagnostic criteria for substance abuse or substance dependence, then Section 5.1 or 5.2 applies.

- Does not meet the diagnostic criteria for substance abuse or substance dependence, this individual may be considered fit to work after written recommendations are provided to the CMO from both the treating physician and the Addiction Medicine Physician.

6. Exclusions from SCP

6.1 Permanent

Substance dependent individuals with organic central nervous system damage due to chronic substance use (e.g. Korsakoff's psychosis, Wernicke's encephalopathy, cerebellar dysfunction, cocaine-induced cognitive impairment).

6.2 Temporary

a) Opioid dependent individuals currently receiving opioid agonist therapy (methadone, buprenorphine).

b) Individuals using medically-authorized marijuana.

c) Individuals not meeting the fitness for duty criteria as per section 5.

7. Assessment, Monitoring, Relapse Prevention

7.1 Individuals who may have substance abuse or substance dependence must undergo a comprehensive diagnostic assessment.

7.2 Individuals who meet the criteria for substance abuse must:

- Agree to participate in a Monitoring Process*

- Sign and demonstrate compliance with all components of a Relapse Prevention Agreement for a period of at least two (2) years with possible extension by the CMO if there is medical evidence indicating that further monitoring is required.

- Demonstrate total abstinence from all substances for the duration of the Relapse Prevention Agreement, documented through monitoring.

- Consent to a letter (See Appendix II) from the CMO to their treating physician, with a copy of the Relapse Prevention Agreement, advising the physician about the requirements for abstinence and the need for reporting to the CMO in the event of prescribing potentially addictive drugs.

7.3 Individuals who meet the criteria for substance dependence must:

- Complete an Addiction Treatment Program.
- Agree to participate in a Monitoring Process.
- Sign and demonstrate compliance with all components of a Relapse Prevention Agreement for a period of at least two (2) years with possible extension by the CMO if there is medical evidence indicating that further monitoring is required.
- Demonstrate total abstinence from all substances as long as they remain employed in a safety critical position.
- Consent to a letter from the CMO to their treating physician**,** with a copy of the Relapse Prevention Agreement, advising the physician about the requirements for abstinence and the need for reporting to the CMO in the event of prescribing potentially addictive drugs.
- Establish community supports (e.g. Mutual Support Program*, sponsor, home group, counsellor, exercise plan) as specified in the Relapse Prevention Agreement

8. Individual Assessment

Individuals with substance use disorders must be assessed with regard to their suitability for a particular position. The nature of the duties and responsibilities associated with their specific SCP must be closely evaluated before any final determination of their fitness for duty.

Appendix I – Background Information on Substance Use Disorders

General Nature of Substance Use Disorders

People with substance use disorders represent a significant risk to themselves and others especially when they work in safety critical positions. Physicians may play a vital and proven role in screening[6] and referral of these patients for comprehensive rehabilitation and return to work. Failure to detect or to refer for treatment, and to communicate with the railway CMO, results in a missed opportunity to intervene on a potentially fatal, chronic disease. It also can result in liability.

In the event that a possible substance use disorder is detected when a physician is treating an individual who works in a railway safety critical position (SCP), the physician, under the Railway Safety Act must, if the individual might pose a risk to safety, report this finding to the railway Chief Medical Officer (CMO)[7]
There are telltale "red flags" or clinical indicators that the patient might have a substance use disorder.

Red Flags

The following lists of co-morbid factors, behaviours and clinical signs include many of the common indicators of possible substance use disorder:

Co-morbid Factors

- Presence of psychiatric disorders (e.g. anxiety and mood disorders)
- Family and psychosocial dysfunction
- Heavy smoking

[6] Haggerty, J.Early detection and counselling of problem drinking, the Canadian Guide to clinical preventive health care. The Canadian Task Force on Periodic Health Exam, 1995.
Dawe S, Mattick RP, Review of Diagnostic Screening Instruments for alcohol and Other Drug Use, Australian Government Publishing Service, (2001) www.health.gov.au/pubhlth/publicat/ document/diagrev, pdf
[7] Canadian Medical Association, Interface, Physicians must now report unfit railway workers, Vol.2, No 9, Sept. 4, 2001

Behaviours

- Changing doctors, multiple doctors, multiple pharmacies
- Early requests for psychoactive prescription refills
- Missed or late for appointments
- Abusive telephone calls, office staff concerns
- More than two jobs with different employers in the past 5 years
- Patient preference for short-acting opioid over sustained-release opioid
- Patient frequently requesting notes for workplace absences
- Patient requesting authorization for "medical marijuana"
- Patient requesting repeat prescriptions for opioids or benzodiazepines in usually acute, self-limiting conditions

Signs

- Advanced dental/periodontal disease
- Alcohol or drug related injuries (motor vehicle accident, fight, recreational activity)
- Erratic, volatile emotions
- Failure to respond to medical management of hypertension, depression or type 2 diabetes
- Jaundice
- Recurrent injuries, recurrent illnesses requiring time loss, repetitive short term/long term disability insurance claims
- Odour of alcohol/marijuana during patient office visit
- Pancreatitis
- Seizure
- Tremor
- Unexplained weight loss/gain

Investigations

- Elevated MCV, GGT, AST, ALT, uric acid

Screening for Substance Related Problems

1. Has alcohol or another drug ever caused any problems in your life?
2. When you use alcohol or other drugs do you sometimes use more than you intended?
3. C. A.G.E.[8] questions (modified for other drugs):
   - **C**: Have you ever decided you should **cut down** on your drinking/use of other drugs?
   - **A**: Have you felt annoyed or **angry** at someone when they commented on or criticized your drinking or use of other drugs?

[8] Ewing JA, Detecting alcoholism; the CAGE questionnaire. JAMA 1984;1905-1907

G: Have you felt bad or **guilty** about your drinking or use of other drugs?
E: Have you used alcohol or other drugs shortly after getting up as an **eye-opener** or to make you feel better?

Further Evaluation

Once screening (CAGE, AUDIT[9], DAST[10],UNCOPE[11]) or telltale warning flags noted during medical history, physical exam, and investigation have identified an individual with increased likelihood of a substance use disorder, it is imperative to determine whether the individual meets the diagnostic criteria for either substance abuse or substance dependence[12]. If dependence is present, then an Addiction Treatment Program must be completed and abstinence from all Substances must be part of the monitored Relapse Prevention Agreement. In the event that, after performing the assessment, the Addiction Medicine Physician is uncertain of the diagnosis (e.g. If there is clinical suspicion of dependence but only the criteria for abuse have been met) it is up to the discretion of the Addiction Medicine Physician in consultation with the railway CMO to determine the intensity and duration of treatment required. With individuals working in an SCP, if there is doubt with respect to the diagnosis, it is appropriate to err on the side of safety.

Essential Components of Assessment by Addiction Medicine Physician

- Signed, informed consent, including permission to communicate all findings to railway CMO
- Medical history and review of medical documentation
- Psychosocial history
- Addiction diagnostic evaluation
- Pain evaluation
- Mental status exam
- Review of systems
- Physical exam
- Labwork (including at least: MCV, GGT, urine, breath and/or blood toxicology)
- Collateral interviews
- Self-administered screening and diagnostic questionnaires
- Diagnostic formulation as per DSM - IV
- Coping skills evaluation

[9] Saunders JB, Aasland OG, Babor TF, et al: Development of the Alcohol Use Disorders Identification Test (AUDIT): Who Collaborative Project. Addiction 88:791-804, 1993
[10] Skinner HA, The Drug Abuse Screening Test, Addiction Research Foundation (Renamed Center on Addiction and Mental Health) Toronto, 1982
[11] Hoffmann NG, Hunt DE, Rhodes WM, & Riley KJ, UNCOPE: A brief screen for use with arrestees, 2002
[12] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Washington DC: American Psychiatric Press (1994)

- Initial treatment recommendations:
- Current recommendations on fitness for work
- Estimate of probable duration of disability
- Prognosis

Inpatient v. Outpatient Treatment of Substance Use Disorders

There is good evidence supporting the efficacy of outpatient treatment for substance dependence[13]. Since there is significant safety risk associated with relapse in individuals in SCP and because inpatient treatment provides significant improvement in outcomes with decreased risk for relapse, inpatient treatment should be the rule in treating individuals in SCP.

Medically Supervised Detoxification-

Brief treatment using longer-acting sedative-hypnotic or opioid drugs will sometimes be necessary. There is good evidence that using a clinical scale such as the CIWA-A[14] to match the intensity of pharmacological therapy with severity of withdrawal symptoms, will minimize both the duration of withdrawal and severity of adverse events. Medically supervised detoxification provides the opportunity to assure safety from complications such as seizures while motivating the patient to proceed with treatment for their addictive disorder. Detoxification should not be considered sufficient treatment to prepare a substance dependent person for sustained abstinence. Without further treatment, following a course of inpatient or outpatient detoxification, relapse and continued progression of substance dependence is to be expected.

Medications

Adjunctive Medications for Addiction Treatment

Although the most important components of the treatment of substance use disorders consist of education, motivational enhancement techniques, cognitive behavioural therapies and participation in Mutual Support Programs there is good evidence to support the use of adjunctive medications in selected cases. Just as bupropion (Zyban®) combined with psychotherapy almost doubles success rates in smoking cessation[15], naltrexone (Revia®) when combined with counselling decreases rates of relapse early in abstinence in severely

[13] Moos MR, Finney JW, Ouimette PC, et al. A comparative evaluation of substance abuse treatment: Treatment orientation, amount of care and 1-year outcomes. Alcoholism: Clinical & Experimental Research 23:529-536, 1999
[14] Sullivan JT, Sykora K, Schneiderman J, Naranjo CA, and Sellers EM. Assessment of alcohol withdrawal: The revised Clinical Institute Withdrawal Assessment for Alcohol scale (CIWA-AR). *Br L Addict* 84:1353-1357, 1989
[15] Hurt RD, Wolter TD, Rigotti N et al, A Comparison of Sustained Release Bupropion and placebo for smoking cessation, New England Journal of Medicine 337:1195-1202,1997

alcohol dependent individuals[16]. Although the evidence is less robust for disulfiram[17] (Antabuse®), this drug has also shown usefulness during early abstinence for individuals with alcoholism, especially if they must unavoidably be in a high risk situation. As yet there is no particular pharmacological therapy that has shown efficacy in the treatment of cocaine dependence.

For intravenous opioid dependent individuals, good evidence supports opioid agonist therapy using methadone[18] combined with psychosocial support and counselling. Because there is insufficient evidence to provide assurance that substance dependent individuals working in an SCP can safely perform their duties on opioid agonist maintenance therapy, individuals with opioid dependence will not be permitted to resume SCP until they have been successfully tapered from methadone maintenance and have completed outpatient or inpatient intensive treatment and entered into a Monitored Relapse Prevention Agreement demonstrating a period of successful abstinence.

Using anticonvulsant medication such as Dilantin® to prevent recurrence of alcohol related seizures has been proven ineffective[19].

Antidepressants

About 30% of abstinent substance dependent individuals will also suffer depression[20]. Because of the dysphoria/dysthymia commonly seen in addicted individuals, the diagnosis is difficult to make during active addiction and early abstinence. Sometimes individuals' depression is so severe that pharmacological treatment simply cannot wait until they have progressed beyond early abstinence. Antidepressants, if indicated, are appropriate for the treatment of depression in carefully selected abstinent recovering substance dependent individuals. Studies comparing cognitive behavioural therapy (CBT) to antidepressants and placebo in the treatment of depression have shown that CBT results in comparable outcomes to antidepressants.[21].

[16] Volpicelli J, O'Brien C, Alterman A et al. Naltrexone in the Treatment of Alcohol Dependence. Archives of General Psychiatry 49:867-880, 1992
[17] Brewer C, Meyers RJ, Johnsen J, Does Disulfiram Help to Prevent Relapse in Alcohol Abuse? CNS Drugs 14:329-341, 2000
[18] Ball JC & Ross A, The Effectiveness of Methadone Maintenance Treatment, New York, Springer-Verlag, 283, 1991
[19] ASAM Clinical Practice Guideline, Phenytoin and Withdrawal, www.asam.org/publ/dilantin.htm (1997)
[20] 2001 National Household Survey on Drug Abuse (NHSDA), US Department of Health, www.samhsa.fov/oas/nhsda/vol1/highlights.htm
[21] DeRubeis RJ, Gelfland LA, Tang TZ, Simons AD, Medications versus Cognitive Behavior Therapy for Severely Depressed Outpatients: Mega-Analysis of Four Randomized Comparisons, Am J Psychiatry 156:1007-1013, July 1999

Hypnotics

Sleep disturbances are ubiquitous in substance dependent individuals. Use of benzodiazepines and zopiclone should be avoided. If a thorough sleep hygiene program is ineffective in restoring sleep, a course of a low dose of a sedating antidepressant such as amitriptylline or Trazadone®, will usually suffice. During the course of successful abstinent recovery, most patients find their quality of sleep improves spontaneously.

Analgesics

Acute and chronic pain or elective surgery can present a crisis or trigger for relapse in individuals during abstinent recovery. This risk may be minimized by preparation, increasing the intensity of relapse prevention activities, providing support and avoiding prn doses of opioids. If opioid analgesics must be used because of severe pain, they should be prescribed in adequate amounts, using a frequent, fixed-dose schedule (e.g. Tylenol #3, 2 tabs. every 3 hours while awake) with a "sunset clause" – (e.g. discontinue on the 4th post-op day). Monitoring personnel and CMO must be informed and a decision reached as to fitness to continue safety critical duties while on opioid medication.

By far the majority of individuals suffering from chronic pain and chronic pain syndrome**s** are best managed using non-opioid treatments, including cognitive-behavioural therapy, physical therapy and non-addictive medications such as NSAIDs and antidepressant drugs. Individuals working in safety critical positions taking mood altering and/or potentially addictive medications pose a special risk. All individuals in an SCP must inform and receive clearance from both the prescribing physician and the CMO if they are to be prescribed opioids or benzodiazepines**.** Individuals in an SCP with a history of substance dependence with chronic pain conditions must be managed with special care and vigilance. Specialists in both Pain Medicine and Addiction Medicine must be consulted and involved in treatment planning and management of these employees and a therapeutic behavioural contract must be in place, listing all expectations of the individual/patient.

Medical Marijuana

The presence of Δ-9-THC in the body and brain of an individual, even if prescribed by a medical practitioner, renders that individual unfit to work in a safety critical position.

Other Medications

Symptoms of dysphoria, dysthymia and anxiety are seen in many substance dependent individuals during some stage of the disease and early in the course of abstinence. Physical activity, good nutrition, rest, reassurance and simple counselling are preferable to pharmacological intervention. Since, by definition, substance dependent individuals have

lost their ability to consistently control the ingestion of mood-altering drugs, prescribing potentially addictive medication to an individual with a history of addiction is hazardous. Benzodiazepines should generally be avoided. If a condition occurs that cannot be treated using a safer type of drug, then the railway CMO should be notified, and the benzodiazepine should be given using a fixed dose, rather than prn schedule for a brief and clearly predetermined period of time, much like one would prescribe a steroid.

Use of any Substances while in Recovery from Substance Dependence

All addictive drugs (stimulants, cannabinoids, alcohol, opioids, sedative/hypnotics) cause the mesolimbic system (nucleus accumbens, prefrontal cortex) to release dopamine resulting in a sensation of pleasure. When an addicted person's drug of choice becomes no longer available, they will often learn that other substances will serve the same function. For that reason, persons dependent upon alcohol or any other substance must, as part of their recovery, maintain abstinence from all other substances or categories of addictive drugs.

Alcohol is a particularly dangerous drug for people recovering from other substance dependencies. Not only does alcohol stimulate the same pleasure circuits previously activated by the other drugs, but it also, as a depressant, inhibits the parts of the cerebral cortex necessary for behavioural inhibition or the type of cautious judgment that results in avoidance of risky behaviour. The consumption of two or three alcoholic drinks causes the nucleus accumbens to release dopamine and the ventral tegmental area to release an endorphin. The dopamine begins the mood swing and often sets up craving. The endorphin is believed to cause 'priming" or the desire to continue ingesting the drug, in susceptible individuals. At the same time the part of the cortex most sensitive to depression by alcohol is mildly inhibited or suppressed, resulting in reduced vigilance, self-consciousness and a reduction in the normal anxiety one would experience over engaging in risk-taking behaviour. For this reason moderate alcohol consumption is a common cause of relapse in persons previously addicted to other drugs.

Body Fluid and Breath Testing

Employers whose employees perform functions that have the potential to endanger others have a responsibility to ensure that employees with medical conditions that could cause impairment, adhere to relapse prevention programs. Because of the nature of addiction, relapse might be denied and concealed by the relapsing substance dependent employee. For this reason a Monitoring Process must be established so that non-compliance by the recovering substance dependent worker, that could cause increased risk to others, is reported to the employer. Body fluid and breath testing is one component of the Monitoring Process. Certain drugs (alcohol, cocaine) are only detectable for very brief periods in the breath or urine, reducing the likelihood of detection during monitoring, even using a truly random testing schedule. Physicians who perform parts of the Monitoring Process may exercise clinical judgment with respect to the interview, examination and laboratory investigations, based upon the individual and the **clinical**

picture they provide. If a physician involved in the Monitoring Process suspects alcohol use in an abstinent cocaine dependent person, one way to help verify that the person has not consumed significant amounts of alcohol in the last several weeks is to perform serum GGT and or MCV. A physician suspecting alcohol use in an individual in an SCP previously dependent upon another type of drug should perform liver enzyme testing (GGT) and hematology (MCV).

Post -Treatment Re-evaluation and Relapse Prevention Agreement

Prior to returning substance dependent individuals to work in an SCP after completion of an Addiction Treatment Program, the abstinent individuals must be re-evaluated to determine if they are indeed in abstinent remission and if medical or psychiatric comorbidity or sequelae of the substance use disorder could interfere with safe performance of their duties. Persistent problems might include:

- Chronic pain syndromes
- Cerebellar dysfunction: ataxia, incoordination
- Cognitive impairment
- Diabetes
- Psychiatric illness (e.g. mood and anxiety disorders)
- Seizures
- Other serious medical conditions.

During the re-evaluation**,** the Addiction Medicine Physician must determine abstinence, stage of recovery, level of motivation, defence mechanisms, stability of the home situation, Mutual Support Program involvement, involvement with a counsellor, coping skills, relapse risk and ensure the recovering person has established a Monitoring Process. At this visit, the components of the monitored Relapse Prevention Agreement are determined, based on problems identified during both the assessment by the Addiction Medicine Physician and during the Addiction Treatment Program. It is essential that the individual be documented to have three months abstinence from all Substances and compliance with the Relapse Prevention Agreement prior to returning to safety critical work.

Disability Duration

It is generally accepted amongst Addiction Medicine professionals that the workplace consequences of substance dependence tend to occur later during the progression of alcohol and other substance dependencies than consequences affecting family, finances, emotions and other areas of the patient's life. The very fact that the workplace has become aware of a possible substance related problem must raise the clinician's index of suspicion of later stage illness. Sometimes even the most thorough assessment by an Addiction Medicine Physician will fail to reveal adequate diagnostic criteria to make the diagnosis of dependence, resulting in an

erroneous diagnosis of substance abuse. By insisting upon a period of documented, monitored abstinence, the clinician will be more assured that the employee has sufficient stability to allow them to reassume safety critical duties. In the event of a missed diagnosis of dependence, the individual's return to use of the same or another addictive, mood-altering drug during this period will allow the Addiction Medicine Physician to change the diagnosis and treatment plan.

Since relapse is most likely during the earlier stages of abstinent recovery[22], it is preferable to have the individual safely monitored and away from active safety critical duties during this time of highest risk.

The Monitoring Process

Monitoring is arguably the most important component in the treatment of individuals with substance use disorders. Like many other chronic illnesses, addictions are marked by early lapses or relapses[23], from which the recovering individual will learn valuable information and strengthen their recovery. Personnel providing components of the Monitoring Process provide accountability and support, seeing the recovering individual very frequently early in recovery and less frequently with prolonged abstinent stability. The risk of further relapse is greatly reduced after a period of two years of uninterrupted abstinent recovery.

During face-to-face visits**,** monitoring personnel observe for signs and symptoms of impending relapse and review all elements of the Relapse Prevention Agreement. Warning symptoms of possible relapse could include a change in attitude from grateful to negative, critical, or overconfident. During these visits support, feedback and reassurance are provided especially during periods of discomfort, common in early recovery, when in the past the substance dependent person might have used a mood-lifting substance for comfort. Personnel who undertake to offer services as part of the Monitoring Process will report on a regular time schedule to the railway CMO. In the event of gross non-compliance or serious relapse, they must report immediately.

Monitor Qualifications

Personnel who offer some or all components of the Monitoring Process must be properly trained. If offering face-to-face visits**,** they must be skilled in treatment and relapse prevention in people with substance use disorders. Addictions counsellors with recognized certification, certified EFAP counsellors, certified addictions counsellors, and health professionals (MD's, RN's) with training and experience in addictions may provide various components of the Monitoring

[22]Vaillant GE, Natural History of Addiction and Pathways to Recovery, in Graham AW, Schultz TK, Mayo-Smith MF et al (eds) Principles of Addiction Medicine 3rd Edition, American Society of Addiction Medicine, 3-16,(2003)
[23] American Psychiatric Association, Substance Dependence: Disease Definition, Epidemiology and Natural History, http://www.psych.org/clin_res/pg_substance_2.cfm#c

Process. Ongoing monitoring should not be performed by the Addiction Medicine Physician who performed the assessment. By signing the Relapse Prevention Agreement, the personnel participating in the Monitoring Process, under supervision of the railway CMO, assume significant responsibilities with potential liability.

The Family

Addictions have been termed family diseases. With time, the family system of the substance dependent individual often becomes dysfunctional as it adapts in order to continue to function in spite of the behaviours of the addict. Unfortunately, many of the behaviours of family members in an alcoholic family system serve to enable or perpetuate the addictive behaviour. Once the family system has been altered by addiction**,** it will often need some form of therapy such as education, mutual support group (Al-Anon, Nar-Anon)**,** participation of some of its members or family systems therapy provided by a psychotherapist knowledgeable about addictions. If the substance dependent individual is returned to a family unprepared for the attitudinal and behavioural changes of the recovering family member, there will be needless emotional tension and increased likelihood of relapse or marital failure[24].

Relapse

Especially during early recovery when the risk of relapse is greatest, more vigilence is needed by both the recovering individual and those providing relapse prevention support. Although all incidents of non-compliance must be reported to the CMO, not all episodes of substance use will necessarily result in maximum consequences. When the lapse has been brief and the individual demonstrates motivation, behaviour and an attitude consistent with recovery, the response of the CMO in consultation with the Addiction Medicine Physician will be more flexible, depending upon individual circumstances.

Role of Employee and Family Assistance Program (EFAP)

Canadian railway companies have either externally provided or internal, peer-led employee and family assistance programs. EFAP counsellors provide confidential brief problem assessment, referral and supportive counselling to employees and family members experiencing a variety of emotional or stress-related problems, including addictions. The EFAP counsellor provides a good means of early identification as individuals with a substance use disorder will often seek counselling, not realizing the underlying cause of their emotional and interpersonal problems. They can also provide a vital source of support during the early months and years of recovery.

[24] Anon, How Al-Anon Works for Families and Friends of Alcoholics, Al-Anon Family Group Headquarters Inc. New York, 1995

Addictions cause serious family dysfunction. Often the EFAP counsellor will engage the family to help solve the problems commonly seen in the first year or two of abstinent recovery.

Harm Reduction and Controlled Drinking

The concept of "harm reduction" refers to the approach of offering health services to the substance dependent individuals in an attempt to engage them in health-risk reduction without insisting upon abstinence as a condition of continued treatment. Physicians are expected to attempt to reduce harm to their patients in every patient interaction. In the case of individuals in an SCP**,** all the necessary components for effective, evidence-based physician interventions are in place. The most effective, safest approach with these individuals is to insist upon abstinence-based treatment modalities. Although a very small proportion of substance dependent individuals**,** including some alcoholics, can learn to control their ingestion of drug, there is no reliable way to predict which dependent individuals belong to that small minority. Because of the high level of risk to these individuals as well as to fellow employees and the public, any alcohol or other drug use by a recovering substance dependent safety critical individual is unacceptable.

Appendix II - Letter to Doctors/Dentists Example

Date

Dear Dr._____

Subject: Your patient, _____

Your patient, _____, is recovering from a substance use disorder and also holds a safety critical position (SCP) at (name of the railway company). According to the Railway Medical Guidelines for fitness to perform safety critical duties, SCP employees with a history of a substance use disorder must comply with a Relapse Prevention Agreement and maintain abstinence from the use of substances as specified in the agreement. The specific Relapse Prevention Agreement for your patient is enclosed.

Although the necessity for relapse prevention monitoring occurs because of safety concerns, it is important to remember that contingency behavioural management using monitored relapse prevention agreements such as the one signed by your patient results in superior rates of long-term abstinence recovery for people with a substance use disorder.

Because of the risk of relapse and the safety risks associated with an active substance use disorder we ask that you refrain from prescribing addictive medications (opioids, barbiturates, benzodiazepines, zoplicone, psychostimulants) to this individual unless you are unable to find any alternatives. In the event that you feel there is no alternative, please contact _____

_____.

We appreciate the care you continue to provide to your patient/our employee and anticipate your cooperation in this mater.

Yours truly,

Appendix III - Acknowledgements

The RAC would like to acknowledge the contribution of:

Dr Ray Baker, MD, FCFP, FASAM
Assistant Clinical Professor
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4.9 – Severe Sleep Apnea

MEDICAL GUIDELINES FOR THE EMPLOYMENT OF INDIVIDUALS WITH SEVERE SLEEP APNEA IN SAFETY CRITICAL POSITIONS IN THE CANADIAN RAILWAY INDUSTRY

1. Introduction

Canadian Railway employees who work in a Safety Critical Position (SCP) operate or control the movement of trains. Physical and mental fitness is mandatory. Impaired performance due to a medical condition could result in a significant incident affecting the health and safety of employees, the public, property, or the environment. Competent execution of duties by employees in an SCP requires complete wakeful vigilance and a high level of alertness. Such vigilance and alertness are promoted by sleep of adequate duration, continuity, and quality. Medical disorders can interfere with any one or all three of these critical sleep factors. This can lead to an impairment of sleep processes and to impairment of wakeful neurocognitive performance. References are provided in Appendix I.

Sleep apnea is such a medical disorder. This is a common disorder (1) caused by a partial or complete obstruction of airflow through the pharynx during sleep. (2,3) Sleep apnea is characterized by recurrent apneas and hypopneas that disrupt and fragment sleep and, consequently, impair wakeful neuropsychological performance.

Sleep apnea is associated with increased risk of motor vehicular accidents (4-12), which may result from a lapse of consciousness, from a slow or inappropriate reaction, or from impaired judgment. Sleep apnea is particularly common amongst commercial truck drivers (13,14) and may have a high prevalence amongst railway employees in an SCP.

Several clinical findings suggest the presence of sleep apnea (15,16). These are: a history of frequent reported snoring, choking, gasping and/or witnessed apneas, together with hypertension and a large neck circumference. The presence of excessive daytime somnolence is an important clinical symptom that impairs and deserves clinical attention. However, it does not predict the presence or absence of sleep apnea. Specifically, presence or absence of reported daytime sleepiness has not been found in most studies to significantly alter the probability of sleep apnea. In short, absence of daytime sleepiness should not be taken as indicating absence of sleep apnea (4,14).

Sleep apnea is a newly recognized medical disorder, and many physicians are not experienced in its diagnosis and management. Accordingly, these medical guidelines are intended to help the physician assess the probability of sleep apnea for individuals in an SCP as well as to provide guidance for employment of individuals with sleep apnea in an SCP. While the prevalence of sleep apnea in the railway industry has not yet been documented, the investigation of recent rail accidents suggests that sleep apnea has contributed to at least three accidents in North America during the period 2000 – 2003. These medical guidelines are intended to raise the awareness of sleep apnea amongst physicians and assist these physicians in evaluating individuals in an SCP with sleep apnea regarding their fitness to perform their duties.

The severity of sleep apnea can be judged by counting the number of respiratory disturbances (apneas or hypopneas) that occur per hour. This is referred to as the respiratory disturbance index (RDI) or apnea – hypopnea index (AHI) which are considered equivalent. For the purpose of these guidelines the term RDI will be used. An RDI of less than 5 is considered normal; RDI of 5–14 is commonly referred to as mild sleep apnea; RDI of 15–30 is moderate sleep apnea; and RDI greater than 30 is usually referred to as severe sleep apnea (17). The risk of car accidents amongst individuals with sleep apnea is higher in those drivers having higher RDI (12,18).

A theoretical construct that links severe sleep apnea to increased risk of accidents is shown in Figure 1, Appendix II, where a solid arrow indicates a good correlation based on published data and a dashed arrow indicates a lack of documented correlation. When clinical risk factors for severe sleep apnea are identified for individuals in an SCP, functional testing will identify those having severe sleep apnea. Because of the poor correlation between severe sleep apnea and excessive daytime sleepiness, some individuals with severe sleep apnea will have excessive daytime sleepiness (EDS) and some will not (14). In other words, individuals with severe sleep apnea may experience varying severities of EDS, whether estimated by self-report instruments or by objective testing. Similarly, the correlation between EDS and impaired neurocognition is uncertain. Finally, there is no evidence that severe sleep apnea with EDS conveys a greater risk of accidents than severe sleep apnea without EDS. EDS will not identify those individuals with severe sleep apnea in an SCP who are more likely to have impairments of neurocognition or are more likely to be at increased risk of accidents (12).

Overall, severe sleep apnea is associated with impairment of vigilance and neurocognitive performance (14, 19) and with increased risk of car accidents (12, 18). No evidence, however, is available at present to indicate that this increased risk is related to impairment of vigilance, concentration or alertness. Thus, the only current way to identify individuals in an SCP at higher risk of accidents is to identify those with severe sleep apnea. These individuals may or may not have EDS, but they are likely to have neurocognitive impairment. However,

neither the presence of EDS nor neurocognitive impairment will identify those individuals in an SCP with severe sleep apnea at increased risk of accidents. Accordingly, all individuals in an SCP who have severe sleep apnea must be considered at increased risk of accidents whether or not sleepiness or neurocognitive impairment is present. Detailed background on sleep apnea is provided in Appendix III.

2. Scope

These medical guidelines relate exclusively to severe sleep apnea in individuals in an SCP. These guidelines establish a practical process whereby all individuals in an SCP can be clinically screened for sleep apnea with subsequent management. They are to be used by physicians in assessing fitness for duty of individuals in an SCP who have been identified as having severe sleep apnea.

3. Basic Considerations

The employment of individuals having sleep apnea or suspected of having sleep apnea shall be guided by the following considerations:

3.1 Their medical history and physical examination including:

- History of frequent reported snoring
- History of frequent reported choking or gasping during sleep and/or witnessed apneas
- Systemic hypertension or history of hypertension
- Large neck circumference

The clinician can combine these findings to determine the probability of sleep apnea by calculating the adjusted neck circumference using a clinical prediction rule (Appendix IV).

3.2 The results of functional testing, including:

- Portable monitor
- Polysomnogram

3.3 Their response to treatment as indicated by:

- Effectiveness of treatment in eliminating sleep apnea
- Compliance to treatment

3.4 Their specific job description

4. Definitions

For the purpose of these guidelines, the following definitions have been used.

- **Adjusted Neck Circumference** (ANC) is a clinical prediction rule that combines four known clinical features that predict obstructive sleep apnea as follows:
  ANC = NC (neck circumference, in cm) + 4 (if history of hypertension) + 3 (if history of frequent reported snoring) + 3 (if history of frequent reported choking, gasping and/or witnessed apneas). "Frequent" means that the behaviour or event occurs on most nights.

- **Apnea** is cessation of breathing for 10 seconds or more.

- **Apnea-Hypopnea Index (AHI)** is the number of apneas and hypopneas per hour of sleep as determined by polysomnographic monitoring.

- **Continuous Positive Airway Pressure (CPAP)** is standard therapy for sleep apnea. A CPAP device pressurizes room air and delivers it via a patient interface (nasal mask, oral appliance or full face mask) to open the pharynx.

- **Daytime somnolence** is a functional state of excessive sleepiness, which may increase the likelihood of falling asleep, impair alertness and degrade the speed and appropriateness of reactions to external stimuli and events.

- **Glossal/mandibular protruders** are a broad class of devices used to protrude the mandible and/or the tongue to treat sleep apnea.

- **Hypopnea** is a 50% reduction in breathing movements or airflow followed by a desaturation or arousal.

- **Polysomnogram** is a sleep test performed in a laboratory under technician monitoring wherein sleep is recorded and staged by use of electroencephalogram (brain waves), electro-oculogram (eye movements), and electromyograms (muscle activity). As well, breathing is recorded by airflow at the nose and by movements of the rib cage and abdomen. Oxygen saturation, body position and snoring sounds are also recorded. The data are scored by a sleep technician and interpreted by a sleep physician.

- **Portable monitor** is a device that can be applied by an individual in the home to record oxygen saturation, respiratory airflow, snoring sound and body position. Some of these devices have adequate diagnostic accuracy to be used in diagnostic and therapeutic follow-up applications. A clinically valid portable monitor provides acceptable

diagnostic accuracy (sensitivity >95%, specificity >88%) (22). Technical proficiency studies of such monitors that provide level I evidence are relatively few. A summary of clinically valid portable monitors is included at Appendix IV.

- **Respiratory Disturbance Index (RDI)** is the number of respiratory disturbances (apneas and hypopneas) occurring per hour of monitoring. This index can be determined by a portable monitor.

- **Severe sleep apnea** is a condition where the respiratory disturbance index or apnea-hypopnea index is greater than 30 $hr.^{-1}$.

- **Sleep apnea** is a clinical disorder wherein breathing is repeatedly interrupted during sleep. Sleep apnea is classified into three degrees of severity: mild: RDI 5-14 $hr.^{-1}$, moderate: RDI 15-30 $hr.^{-1}$, severe: RDI > 30 $hr.^{-1}$.

- **Sleep physician**, for the purposes of these guidelines, is a physician with formal certification in sleep medicine by the American Board of Sleep Medicine or peer recognition as an expert in the diagnosis and management of sleep apnea.

5. Fitness for Duty

Individuals with severe sleep apnea (RDI > 30) cannot be considered fit to work in an SCP until written confirmation and appropriate data have been provided to the Chief Medical Officer (CMO) by the treating physician (primary care physician or sleep physician) indicating that effective treatment, as described in Section 7.2, has been achieved and that the individual is compliant with therapy.

6. Screening & Diagnostic Testing

6.1 Screening

A clinical prediction rule is used to screen for sleep apnea. The adjusted neck circumference (ANC) is a clinical prediction rule that combines four known clinical factors predictive of obstructive sleep apnea. The neck circumference (in cm) is incremented by 4 if there is a history of hypertension, by 3 if there is a history of frequent reported snoring, and by 3 if there is a history of frequent reported choking, gasping and/or witnessed apneas (Appendix IV). A score of less than 43 indicates a low probability of sleep apnea, a score of 43-48 indicates an intermediate probability of

sleep apnea, and a score greater than 48 indicates a high probability of sleep apnea (20). Individuals in an SCP with a score greater than 48 will undergo diagnostic testing.

6.2 Diagnostic testing

The diagnostic standard for sleep apnea is the polysomnogram. However, when this test is not readily available, a portable monitor can be used.

6.2.1 Polysomnography

In the polysomnogram, sixteen channels of data are recorded under technician surveillance. The data are analyzed by a technician and interpreted by a sleep physician. The polysomnogram has the advantage of recording variables related to sleep as well as breathing. Sleep is partitioned into stages to provide an overall picture of sleep architecture. While polysomnography is the recommended method of assessing individuals suspected of having sleep apnea, studies have indicated that recording sleep architecture and arousals is not essential for the correct diagnosis of individuals suspected of having sleep apnea. (21)

A respiratory disturbance during sleep is defined by a clear reduction in airflow or tidal volume, accompanied by a decrease in oxygen saturation or an arousal (an interval of wakefulness lasting at least three seconds). While a single definition of apnea is generally accepted (no airflow for 10 seconds or longer), the exact methods for recording airflow and the criteria for defining a hypopnea remain controversial (17). The RDI correlates poorly with daytime symptoms or quality of life.

6.2.2 Portable Monitor

Data gathered at night in the home using a clinically valid portable monitor can provide useful information regarding respiratory airflow, arterial oxygen saturation, snoring and body position (see Appendix IV). This data can be used to calculate an RDI. In individuals suspected of having sleep apnea in the absence of co-morbid conditions, e.g., heart failure, lung disease or neurological disease, this data can provide clinical information acceptable for diagnosing sleep apnea (20).

6.3 Quantitation of severity of sleep apnea

The results of functional testing provide the basis for the diagnosis of sleep apnea and for the estimation of its severity. The RDI, derived from polysomnogram or portable monitor study, is considered appropriate for this purpose.

7. Assessment, Treatment and Monitoring

7.1. Assessment: (see flow chart, Figure 2, Appendix II)

7.1.1. Individuals in an SCP will be evaluated by history for a prior diagnosis of sleep apnea or they will be screened for the probability of severe sleep apnea using the ANC (Appendix IV).
7.1.2. If there is a prior diagnosis of sleep apnea the individual will be evaluated for severe sleep apnea either from previous testing results or as described in 7.1.4.
7.1.3. If the ANC is greater than 48 cm, indicating a high probability of sleep apnea, the individual will be evaluated as described in 7.1.4.
7.1.4. Severe sleep apnea will be diagnosed by a portable monitor or a polysomnogram.
7.1.5. If the RDI is greater than 30 $hr.^{-1}$, the individual will be considered unfit to occupy an SCP.

7.2. Treatment:

Individuals in an SCP found to have severe sleep apnea (RDI > 30 $hr.^{-1}$) must receive and adhere to therapy proven to be effective in eliminating sleep apnea. This requires that:

- the RDI is less than 15 $hr.^{-1}$ by a portable monitor or polysomnogram, and,
- for those individuals on CPAP therapy, adequate compliance is demonstrated. This means that at least two weeks of compliance monitoring demonstrates greater than 80% use of the therapy.

7.3 Monitoring:

Monitoring will be performed on two groups of individuals after returning to work in an SCP:

- For those on CPAP therapy, the individual's primary care physician must provide yearly written confirmation to the CMO of compliance monitoring demonstrating greater that 80% compliance.
- For individuals using therapy other than CPCP (e.g., glossal-mandibular protruder or weight loss), a yearly portable monitor study will be performed, and the results will be provided to the CMO. For individuals using a glossal-mandibular protruder, the individual must also provide written confirmation of nightly use of this therapy.

For both of these groups, additional functional testing may be required when the individual has gained substantial weight and/or if frequent reported snoring, choking, gasping and/or witnessed apneas have reappeared.

8. Individual Assessment

Individuals with severe sleep apnea must be assessed with regard to their suitability for a particular position. The nature of the duties and responsibilities associated with their specific Safety Critical Position must be closely evaluated before any final determination of their fitness for duty.

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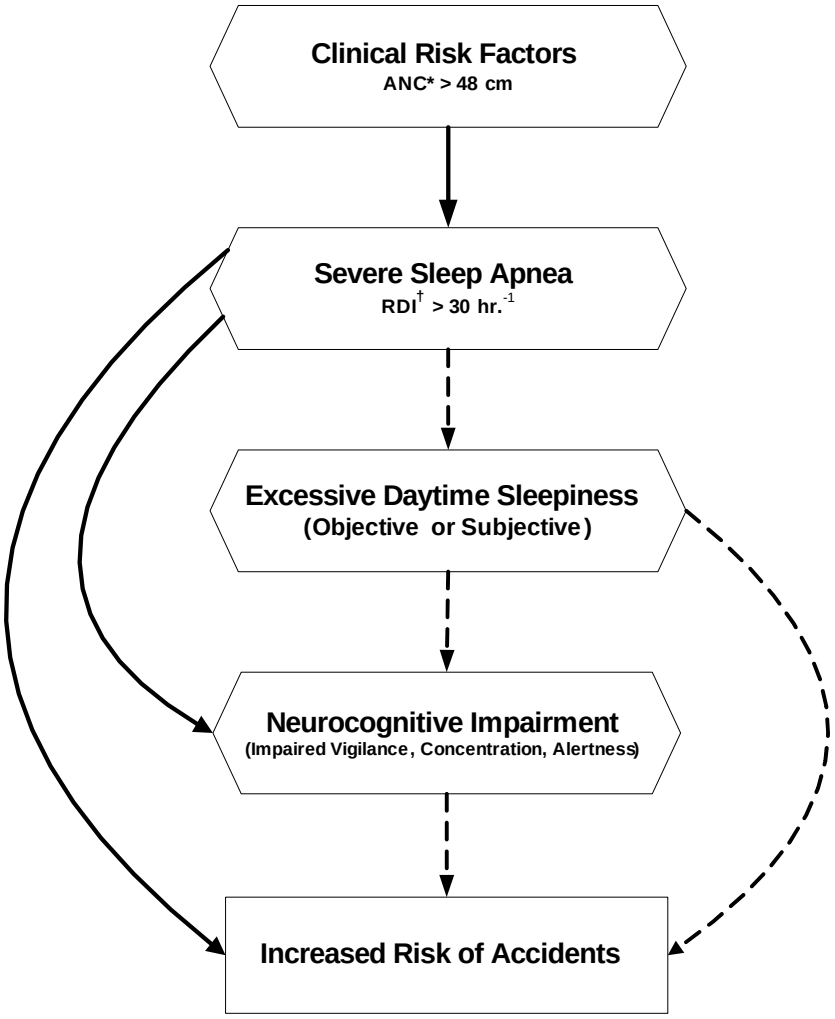
Appendix II - FIGURE 1. Conceptual Framework Linking Severe Sleep Apnea and Risk of Accidents



*** ANC - Adjusted Neck Circumference**

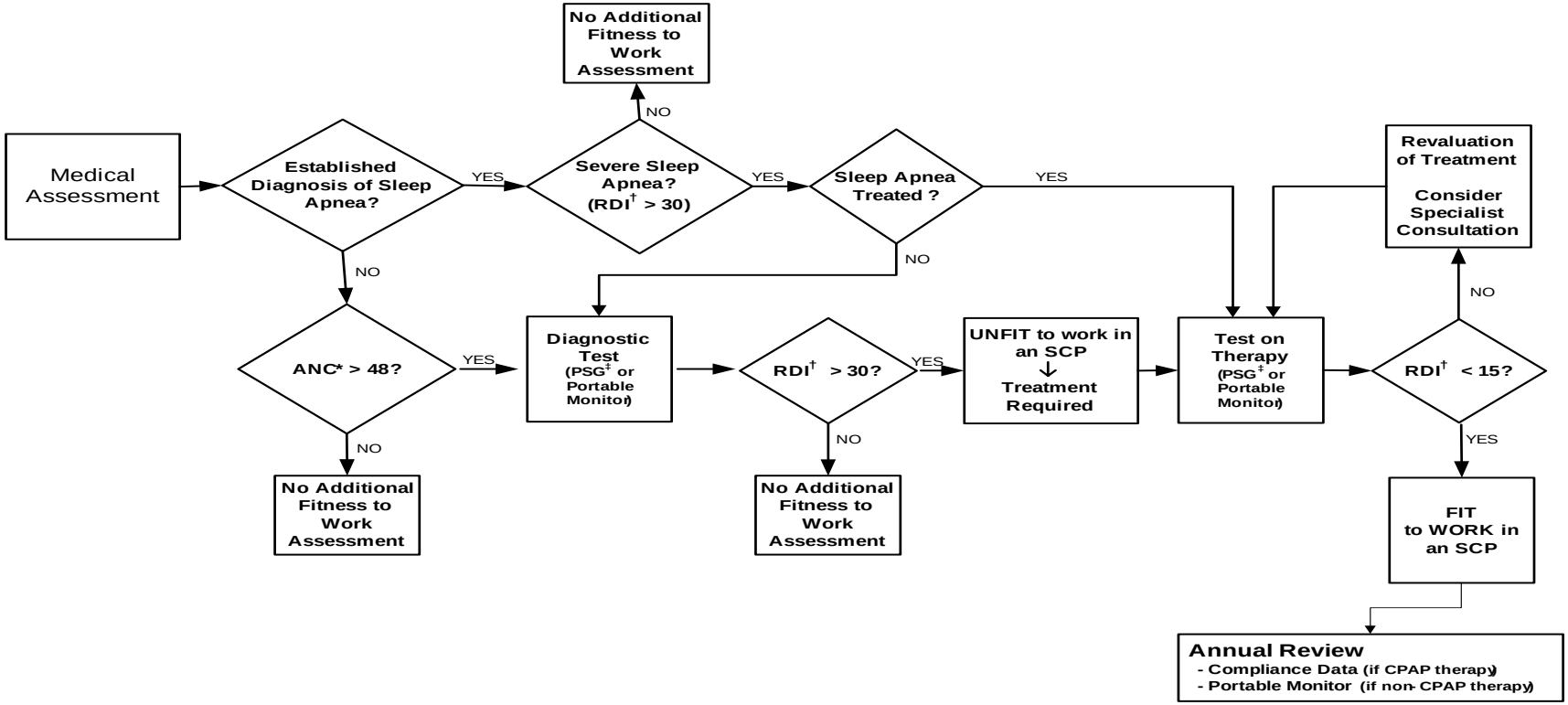
= neck circ (in cms) + 4 (if hypertension) **+ 3** (if reports of frequent snoring)
+ 3 (if reports of frequent choking/gasping/apneas at night)

† **RDI - Respiratory Disturbance Index** (number of respiratory disturbances per hour)

Established relationship from published data

Theoretical relationship without published data

FIGURE 2. Sleep Apnea Evaluation/Management Strategy for Individuals in an SCP



*** ANC - Adjusted Neck Circumference**
= neck circ (in cms) + 4 (if hypertension) + **3** (if reports of frequent snoring) + **3** (if reports of frequent choking /gasping /apneas at night)

† **RDI - Respiratory Disturbance Index** (number of respiratory disturbances per hour)

‡ **PSG - Polysomnography**

Appendix III – Background Information on Sleep Apnea

Sleep disordered breathing, usually referred to as sleep apnea, occurs in two forms, central and obstructive. Central sleep apnea is characterized by failure of respiratory efforts and usually is the result of co-morbid illness. Obstructive sleep apnea results from upper airway obstruction in otherwise healthy individuals. Using a definition of obstructive sleep apnea as RDI > 10 $hr.^{-1}$, obstructive sleep apnea is a common condition affecting 5% of females and 9% of males (1). When associated with complaints of excessive daytime sleepiness, the disorder affects 4% of middle-aged males and 2% middle aged females (1). In obstructive sleep apnea the pharynx closes or narrows severely during sleep. Such sleep-induced changes in the pharyngeal airway cause apnea (cessation of breathing for longer than 10 seconds), hypopnea (a 50% decrease in ventilation associated with a 3% drop in oxygen saturation or in arousal), or high upper airway resistance (HUAR) in which the pharynx narrows critically, producing inspiratory flow limitation.

In sleep apnea, the pharynx can be structurally narrowed by local anatomic abnormalities such as large tonsils, by facial bone abnormality such as mandibular hypoplasia, or by deposition of fat in patients who are obese (3). While awake, the structurally narrowed pharyngeal airway is held open by compensatory action of the pharyngeal dilators. Upon going to sleep, however, this compensatory or excessive activation of the pharyngeal dilator muscles is lost and the structurally narrowed pharynx of the individual with sleep apnea either closes completely or narrows severely.

In HUAR, the pharynx can narrow severely during sleep without closing completely. The pharynx becomes a flow-limiting airway during inspiration, such that inspiratory airflow rises abruptly and becomes fixed at a particular value or declines somewhat during the rest of inspiration. This limitation of airflow occurs even though the driving pressure for airflow continues to increase. In essence, the pharynx behaves like a critical orifice that narrows progressively, as inspiration proceeds. This behavior, referred to as inspiratory flow limitation occurs for a series of breaths, often over a period of 5-10 minutes. During this period, mild alveolar hypoventilation may occur and arterial oxygen saturation may fall slightly. The episode of high upper airway resistance is generally terminated by an arousal, together with activation of pharyngeal dilators and reestablishment of a normal pattern of inspiratory airflow. This type of obstructive sleep disordered breathing can cause symptoms of daytime somnolence, which resolve when the disorder is treated. The diagnostic criteria and significance of HUAR continue to be debated. However, HUAR can be treated by the same therapies as sleep apnea (Appendix V).

During sleep, the patient with apnea experiences repeated transient reduction in alveolar ventilation as a result of apneas and hypopneas. Each apnea or hypopnea causes the blood level of oxygen to fall and this drop in arterial P_{O2} is sensed by the peripheral chemoreceptors and ultimately arouses the patient from sleep. This arousal induces activation of pharyngeal dilator muscles, particularly the genioglossus, that re-opens the pharynx and allows ventilation to resume. As a consequence, sleep apnea is characterized by repeated respiratory disturbances leading to repeated arousals and awakenings that fragment and disturb sleep. The consequences of this can be neuropsychological impairments and sleepiness during
the waking hours. Accordingly, individuals with sleep apnea can be sleepy through the day. They may fall asleep inappropriately and may have impaired performance in tests requiring sustained vigilance and attention. However, it is important to realize that while sleep apnea is a risk factor for excessive daytime sleepiness and neuro-cognative impairment, not all individuals with sleep apnea are excessively sleepy.

Sleep apnea with symptoms of daytime somnolence comprises only about half of the cases with sleep apnea. Conversely, many people who are sleepy do not have sleep apnea. Accordingly, sleepiness is neither a specific nor a sensitive indicator of sleep apnea. A study of commercial truck drivers found a very high prevalence of sleep apnea in this population, but no relationship existed between the presence or severity of sleep apnea and the degree of sleepiness as reported by the drivers (16). However, it is important to realize that sleep apnea can degrade neural psychological performance whether or not it causes subjective daytime sleepiness, On tests designed to mimic the cognitive aspects of automobile driving, subjects with sleep apnea performed on average as poorly as individuals with blood alcohol concentrations over the legal limit (23).

Functionally, therefore, individuals with sleep apnea would appear to be at increased risk of car accidents, whether or not they are aware of daytime sleepiness (Appendix VII). This has been shown in several types of studies, including: 1.) patients attending sleep centers for evaluation and treatment; 2.) individuals in the general population who were found to have sleep apnea but were not treated; and 3.) subjects who had a major crash on rural highways where blood alcohol was not implicated. Together these studies indicate that individuals with sleep apnea have a 3 to 7 fold increased risk of car accidents and that this risk is greater in severe sleep apnea.

A recent study of a large number of commercial truck drivers (14) revealed that 17.6% have mild sleep apnea (RDI of 5 to 14), 5.8% have moderate sleep apnea (RDI of 15 to 30), and 4.7% have severe sleep apnea (RDI greater than 30). Overall, the prevalence of sleep apnea in commercial truck drivers is approximately 28%, far in excess of that in the general population of males. A short sleep duration was associated with increased prevalence of sleep apnea. In this study, the presence or absence of sleep apnea did not predict daytime sleepiness. However, severe sleep apnea was correlated with impaired neurocognitive performance. While similar studies have not

been performed in the railway industry, extension of the results to the railway industry would seem to be reasonable and prudent until such studies are available. Accordingly, medical examinations of individuals in an SCP should include careful assessment of signs and symptoms that may be indicative of sleep apnea (see Appendix V). Individuals with high probability of sleep apnea should receive appropriate sleep testing and those with severe sleep apnea should adhere to effective therapy (Appendix VI).

Appendix IV - Clinically Valid Portable Monitors for Diagnosing Sleep Apnea

A clinically valid portable monitor for diagnosing sleep apnea is one in which there is published evidence in a peer-reviewed journal that demonstrates that the monitor has the ability to diagnose the condition with a reasonable degree of specificity. The following criteria are used to establish that a portable monitor is clinically valid:

a Level 1 or Level 2 Evidence – as defined by the Evidence Review Committee of the American Academy of Sleep Medicine (AASM), The American Thoracic Society (ATS), and the American Academy of Chest Physicians (ACCP) (1)
b Specificity > 85% and a Likelihood Ratio > 5
c False positive rate < 15%
d Study sample > 50 patients

The AASM, ATS, and ACCP Evidence Review Committee Report reviewed 52 peer-reviewed research articles on portable monitors. A total of 15 studies on 12 different monitors met the above criteria and are listed below.

For the purposes of this guideline a clinically valid portable monitor would be one of those listed below or another monitor in which a more recent peer-reviewed journal article is available that fulfills the above criteria.

Primary Scoring Channel	Monitor	Secondary Scoring Channel	First Author(s)	Reference
Flow (Thermister)	Edentrace	Oxygen	Parra O	2
Flow (Thermister)	Poly-Mesam		Verse T	3
Flow (Thermister)	Edentrace 2700		Emsellem H	4
Flow (Thermister)	Somnocheck	Oxygen	Ficker J	5
Flow (Thermister)	PolyG		Man G	6
Flow (Thermister)	Oxiflow	Oxygen	Baltzan M	7
Flow (Nasal Pressure)	Autoset		Mayer P	8
Oxygen	SnoreSat		Vazquez J, Issa F	9, 10
Oxygen	Minolta Pulseox 7		Golpe R	11
Oxygen	Nelcor N200 oximeter*		Chiner E	12
Oxygen	Mesam IV	Heart rate	Stoohs R , Esnaola S	13,14
Oxygen	Ohmeda 3700 oximeter*		Gyulay S , Douglas N	15, 16

* requires manual review and scoring of oxygen saturation signal

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Appendix V – Clinical Screening for Sleep Apnea Using the Adjusted Neck Circumference

A number of important risk factors for sleep apnea have been identified (15,16). Obesity is a prominent risk factor, and the severity of sleep apnea increases with degree of obesity. The degree of obesity can be estimated as the body mass index (kg/meter), but the best obesity-related predicator of sleep apnea is neck circumference. Individuals suspected of having sleep apnea are referred to a sleep center where a diagnostic assessment can be performed using a polysomnogram or a clinically valid portable monitor. However, before performing this test, the likelihood of sleep apnea being present can be estimated by clinical features. In addition to neck circumference, three other clinical features predict sleep apnea. These are: 1.) history of reported frequent snoring, 2.) history of reported frequent choking, gasping or witnessed sleep apnea, and 3.) history of hypertension. "Frequent" means that the behaviour or event occurs on most nights. A simple combination of these four risk factors, referred to as the adjusted neck circumference (ANC), provides an estimate probability of sleep apnea (20). The ANC can be calculated as the observed neck circumference (NC) incremented by four if the patient is hypertensive or has a history of hypertension (HT), by three if frequent snoring (Sn) is reported, and by three if frequent choking, gasping, and/or witnessed apneas (C/G-WA) is reported. The equation for calculating the adjusted neck circumference is as follows:

ANC = NC	+4	+ 3	+ 3
(in cm)	(if HT present)	(if Sn present)	(if C/G-WA present)

The adjusted neck circumference predicts the probability of sleep apnea as follows:
< 44: low probability
44-48: intermediate probability
> 48: high probability.

Appendix VI - Management of Obstructive Sleep Apnea

A. Treatment Strategies

Three interventional therapies have been used in the treatment of obstructive sleep apnea.

1) Continuous Positive Airway Presence (CPAP)

The standard treatment of sleep apnea is Continuous Positive Airway Pressure (CPAP). In this therapy, a patient interface (nasal mask, oral appliance or full face mask) allows transmission of room air pressure in the range of 4-20 cm H_2O to the pharynx. This increase in pharyngeal luminal pressure distends the pharynx allowing the individual to breathe through an unobstructed upper airway. The therapy is effective so long as adequate pressure is supplied. This application of room air pressure through the nasal airway (nasal CPAP) has proven effective in eliminating all evidences of pharyngeal obstruction during sleep, i.e., polysomnographic studies before and during application of nasal CPAP at therapeutically adequate pressures clearly demonstrate an immediate resolution of all obstructive elements. In addition, randomized clinical trials have shown that nasal CPAP decreases daytime sleepiness and improves quality of life, mood and alertness compared to a placebo therapy.

The action of nasal CPAP is a simple physical process in which an increase in pharyngeal dilating pressure distends the pharynx and, thereby, maintains a patent pharynx during sleep. Because it uses only room air and because it provides no ventilatory assistance, the therapy is benign and associated with few side effects. Minor side effects include rhinitis, gas in the abdomen and facial abrasions. On the other hand, the therapy poses substantial logistical problems because of the cumbersome nature of the interface. As with any therapy, adherence is an important issue. Patients with more severe obstructive sleep apnea are more likely to be adherent to therapy. The severity of sleep apnea and the presence of symptoms are important predicators of adherence to therapy, i.e., apneics with a higher RDI, with more hypoxemia during sleep, and with more severe daytime sleepiness are more likely to be adherent than asymptomatic apneics with milder disease.

The level of nasal CPAP required to eliminate pharyngeal obstruction is traditionally determined during a polysomnogram wherein a trained technician progressively increases the pressure until apneas, hypopneas, inspiratory flow limitation, and snoring are eliminated. Such “titration” of the applied pressure must be carried out while supine since the pressure required to eliminate pharyngeal obstruction is likely to be highest in that posture. The highest “titration” pressure is then prescribed for nightly

use at home. "Smart" CPAP machines which automatically and continuously adjust the pressure to a value that produces a patent airway are now available. Such an auto CPAP device can be used to determine a therapeutic pressure to be prescribed for use with a constant pressure device, or the auto CPAP device can itself be used on a nightly basis as the therapeutic device. Whether used in an "auto-titration" approach or as auto CPAP therapy, the automatically adjusting CPAP devices would appear to have substantial promise in management of sleep apnea. Because the therapeutic pressures are likely to be dependent on body position, the mean pressure with auto CPAP devices is usually substantially lower than that prescribed for the supine posture using constant level CPAP.

2) Glossal/Mandibular Protruder

Application during sleep of an oral appliance to protrude the tongue and/or the mandible has been proposed as a treatment of sleep apnea. A variety of oral appliances are available and none have been shown to be highly effective in randomized clinical trials. However, individuals with mild sleep apnea probably are more likely to be successful in treatment with an oral appliance.

3) Surgery

Uvulopalatopharyngoplasty (UPPP) or Laser-assisted Uvulopharyngoplasty (LAUP) have not been shown to be effective in treating most patients with obstructive sleep apnea. More aggressive surgeries, such as, pharyngeal palatal reconstruction and maximal mandibular osteotomy, may be more effective, but the associated morbidity appears to be excessive in relation to the patient's symptoms and disability.

B. Measuring Success of Treatment

Of pivotal importance in assessing the fitness to work of an individual in an SCP with severe sleep apnea is the assessment of treatment outcome. This assessment has two components: 1.) assessment of the effectiveness of therapy, and 2.) determination of compliance with therapy. Before returning to work in an SCP, the therapy of the individual with severe sleep apnea should be shown to be effective with adequate compliance, and the primary care physician must report this to the CMO.

Effectiveness of therapy can be assessed by the RDI derived from an overnight polysomnogram or a portable monitor. Estimation of the RDI from data logged by the auto CPAP device is not considered adequate.

Compliance with therapy can be derived from respiratory data logged in a nasal CPAP device. Assessing compliance with glossal-mandibular protrusion appliances is more problematic, but some appliances have the ability to record temperature (the time the appliance was in the patient's mouth) and hence as an estimate of usage.

C. Considerations for Referral to a Sleep Physician

Individuals in an SCP with severe sleep apnea who are found to have severe arterial hypoxemia during sleep should be considered for referral to a sleep physician. Severe hypoxemia can be identified by a polysomnogram or a portable monitor and is manifested by transient decline in 0_2 hemoglobin saturation to very low values (<70%) during apneas or hypopneas. As well, a low mean oxyhemoglobin saturation (3% or more below normal) or failure of the saturation to recover to baseline values between successive respiratory disturbances can indicate the presence of alveolar hypoventilation during sleep. This may prompt a referral to a sleep physician particularly if the awake arterial PCO2 is greater than normal.

Individuals with severe sleep apnea and co-existing coronary artery disease, cerebral vascular disease, heart failure or lung disease should also be considered for referral to a sleep physician

Appendix VII – Sleep Apnea and Vehicular Safety

No study has been performed documenting the prevalence of sleep apnea in the railway industry or showing an association between railway accidents and sleep apnea. However one recent accident (Springfield Township, 2001) raised concerns about a link between sleep apnea and railway safety. This accident involved a collision of two trains and both the engineer and conductor of a Canadian train had documented sleep apnea. Such anecdotal accidents suggest that sleep apnea, perhaps compounded by disrupted sleep patterns, poses a safety problem for the Canadian railway industry.

As a result of its investigations into the Springfield Township railway accident, the U.S. National Transportation Board concluded that fatigue caused by sleep apnea played a key role in the accident. The board recommended that the railway industry require locomotive engineers and conductors to take fatigue awareness training, develop medical examination procedures that evaluate potential sleep disorders, and use that information to determine the medical fitness of individuals in an SCP. These medical guidelines respond to that suggestion by defining screening and testing methods for identifying severe sleep apnea, and by establishing fitness for duty criteria for individuals in an SCP who have severe sleep apnea.

Two studies of truck drivers found a very high prevalence of sleep apnea amongst commercial drivers (13,14). Lacking evidence regarding prevalence of sleep apnea in the railway industry, prevalence of the disorder in a related industry, commercial truck driving is of interest. Twenty-eight percent of drivers studied had apnea-hypopnea index greater than 5 events per hour, 10% had greater than 30 events per hour. A more recent study has shown that mild sleep apnea occurs in 17.6% of commercial drivers, moderate in 5.8% and severe sleep apnea in 4.7%. Thus, the prevalence of severe sleep apnea in commercial drivers may lie in the range of 5 – 10%. This high prevalence may relate to the high prevalence of obesity amongst the drivers. It is important to note that this study documented impaired neurocognitive performance in these drivers with severe sleep apnea.

The results of studies evaluating the risk of car accidents associated with sleep apnea shows that patients with sleep apnea are at an increased risk of having sleep apnea with adjusted odds ratios between 2 and 20. While, at present, there is no established neuropsychological testing for identifying individuals with sleep apnea at particular risk for car accidents, therapy with nasal CPAP has been shown to return the risk to normal levels. The risk of car accidents amongst individuals with sleep apnea is higher in those drivers having higher AHI (12,18). Thus, individuals with severe sleep apnea likely have a higher risk of having a car accident.

An employee in an SCP with severe sleep apnea, even though not subjectively aware of excessive daytime somnolence, may be at risk of falling asleep, or having impaired vigilance,

decreased alertness or degraded reaction to external events. In addition, such individuals may react poorly to changes in sleep cycle or short-term sleep deprivation. Studies on commercial truck drivers reveal a clear adverse interaction between sleep apnea and reduced time in bed (14).

Treatment of sleep apnea with nasal continuous positive airway pressure (CPAP) has been shown to return the risk of auto accidents in patients with sleep apnea to normal (24,25). Accordingly, the risk that sleep apnea might contribute to vehicular accidents would appear to be modifiable by adequate treatment with nasal CPAP. An important clinical feature is that the severity of sleep apnea as quantitated by the respiratory disturbance index correlates poorly with daytime sleepiness (26). In a population of commercial truck drivers, a large percentage had excessive levels of self-reported sleepiness, but no association with self-reported sleepiness and the presence of sleep apnea was apparent (16). Accordingly, self reported daytime sleepiness is not a useful predictor of the presence or absence of sleep apnea. However, a number of objective tests of neuro-behavioral performance, such as reaction time, performance lapses and lane tracking ability show relationships with the severity of sleep apnea (27). A conceptual scheme linking sleep apnea to safety is shown in Figure 1, Appendix II.

Appendix VIII – Acknowledgements

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