



Expert Panel Recommendations

Medical Examiner Physical Qualification Standards and Clinical Guidelines for Cardiovascular Disease and Commercial Motor Vehicle Driver Safety

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Table of Contents

INTRODUCTION	1
CARDIOVASCULAR DISEASE AND FMCSA REGULATIONS	1
HISTORY SURROUNDING THE CURRENT CARDIOVASCULAR DISEASE STANDARD	1
PURPOSE OF THE CURRENT REVIEW	2
COMPOSITION OF THE MEDICAL EXPERT PANEL	3
METHODOLOGY	3
BRIEF OVERVIEW OF RECOMMENDATIONS REVIEW METHODOLOGY	3
THE MEP MEETING AND OPINION FORMULATION	4
MEP RECOMMENDATIONS FOR THE PHYSICAL QUALIFICATIONS AND GUIDELINES	4
SPECIFIC MEP RECOMMENDATIONS FOR INSTRUCTIONS FOR MEDICAL EXAMINERS	5
<i>Guidance Statement 1: Fundamental Certification Issue</i>	5
<i>Guidance Statement 2: Disqualification</i>	5
<i>Guidance Statement 3: Single or Multiple Disorders</i>	5
<i>Guidance Statement 4: Cleared by a Specialist</i>	5
<i>Guidance Statement 5: Compliance</i>	6
APPENDIX A: RECOMMENDATIONS UPDATE 2013	7
ANEURYSMS	7
<i>Abdominal Aortic Aneurysm (AAA) <4 cm</i>	7
<i>Abdominal Aortic Aneurysm (AAA) Females: 4.0 to <5.0 cm</i>	7
<i>Abdominal Aortic Aneurysm (AAA) Females: >5.0 cm</i>	7
<i>Post-Intervention Repair of Aneurysm</i>	8
<i>Non-Atherosclerotic TAA</i>	8
ANTICOAGULANT THERAPY	9
AORTIC REGURGITATION	10
AORTIC STENOSIS	11
VALVE REPLACEMENT	12
CARDIOMYOPATHIES AND CONGESTIVE HEART FAILURE	13
<i>Hypertrophic Cardiomyopathy</i>	13
<i>Idiopathic Dilated Cardiomyopathy</i>	13
<i>Restrictive Cardiomyopathy</i>	13
<i>Arrhythmogenic Right Ventricular Cardiomyopathy with Dysplasia (ARVC/d)</i>	13
COMMERCIAL DRIVERS WITH KNOWN CORONARY HEART DISEASE (CHD)	14
<i>Unstable Angina</i>	14
<i>Post-Percutaneous Coronary Intervention</i>	14
<i>Post Myocardial Infarction (MI)</i>	14
<i>Post Coronary Artery Bypass Surgery (CABG)</i>	14
CONDUCTION SYSTEM DISORDERS	15
DEVICES	18
<i>Cardioverter Pacemaker (CRT-P)</i>	18
<i>Cardioverter Defibrillator (CRT-D)</i>	18

Implantable Cardioverter Defibrillator: Primary and Secondary Prevention:	18
Pacemaker Implantation	18
CONGENITAL HEART DISEASE	19
Patent Ductus Arteriosus (PDA) Small = Favorable	19
Patent Ductus Arteriosus (PDA) Moderate to large = Unfavorable	19
Coarctation of the Aorta	19
Coarctation of the Aorta	19
Coarctation of the Aorta after Intervention	19
Pulmonary Valve Stenosis (PS)	19
Other Causes of Right Ventricular Outflow Obstruction in Persons with CHD:	20
Marfan Syndrome, Loeys-Dietz Syndrome, and Related Disorders (Non-Atherosclerotic Thoracic Aortic Aneurysm (TAA)):	20
Ebstein Anomaly	20
Tetralogy of Fallot	20
Tetralogy of Fallot	20
Transposition of the Great Vessels	21
Congenitally Corrected Transposition (d-CCT)	21
Atrial Septal Defect (ASD): Ostium Secundum	21
Atrial Septal Defect (ASD): Ostium Secundum	21
Atrial Septal Defect (ASD): Ostium Primum	21
Atrial Septal Defect (ASD): Ostium Primum	21
Sinus Venosus Atrial Septal Defect	22
Sinus Venosus Atrial Septal Defect	22
Ventricular Septal Defect	22
Ventricular Septal Defect	22
HEART TRANSPLANTATION.....	23
HYPERTENSION	24
Essential Hypertension	24
Hypertension (<160/109mm Hg):	24
Hypertension \geq170/110	24
Secondary Hypertension	24
PULMONARY HYPERTENSION.....	25
MITRAL REGURGITATION.....	26
Mitral Valve Repair for Mitral Regurgitation	26
MITRAL STENOSIS.....	27
Mild Mitral Stenosis MVA \geq1.6 cm² or Moderate Mitral Stenosis MVA 1.0 to 1.6 cm²	27
*Severe Mitral Stenosis MVA \leq1.0 cm²	27
Post-Percutaneous Balloon Mitral Valvotomy or Post-Surgical Commissurotomy	27
Pulmonary Hypertension	28
PERIPHERAL VASCULAR DISEASE	29
Peripheral Vascular Disease; Intermittent Claudication	29
SYNCOPE.....	30
Neurocardiogenic Syncope	30
Hypersensitive Carotid Sinus Syndrome with Syncope	30
Single Episode Typical Vasovagal Syncope	30

<i>One or More Episodes Vasovagal Syncope</i>	30
VENOUS DISEASE.....	32
<i>Acute Deep Vein Thrombosis (DVT)</i>	32
<i>Pulmonary Emboli</i>	32
APPENDIX B: GUIDELINES AND LITERATURE CITATIONS	33
APPENDIX C: CURRENT STANDARDS AND GUIDELINES FOR CARDIOVASCULAR DISEASE	39
CURRENT U.S. MEDICAL FITNESS STANDARDS AND GUIDELINES FOR CMV DRIVERS	39

Introduction

The primary mission of the U.S. Department of Transportation's (DOT) Federal Motor Carrier Safety Administration (FMCSA) is to reduce crashes, injuries and fatalities involving commercial motor vehicles (CMVs), including large trucks and buses, in the United States of America. One mechanism by which the FMCSA aims to meet this commitment is to ensure that individuals who drive CMVs are physically qualified to do so. Physical qualification standards do exist and all CMV drivers must be certified by a qualified medical examiner as meeting these standards on a biennial basis. To ensure that current standards and guidance for medical examiners continue to be appropriate, FMCSA routinely reviews them to ensure that they are consistent with the most current available information and evidence.

Cardiovascular Disease and FMCSA Regulations

Cardiovascular disease such as arrhythmia, ischemic heart disease, and vasovagal syncope is a potential causative factor in motor vehicle crash because it increases the risk of sudden incapacitation. It is estimated that 83.6 million Americans have 1 or more cardiovascular disorders, with 26.5 million Americans currently have a cardiovascular disease diagnosis. Of a total US resident population of approximately 314 million, it is estimated that 359k individuals each year experience an emergency medical personnel assessed out-of-hospital cardiac arrest.

At the present time the FMCSA has physical qualification standards directly pertaining to cardiovascular disease status. The current vision standard, per §49 CFR 391.41(b)(4)(6)(7) states that:

A person is physically qualified to drive a commercial motor vehicle if that person:

- Has no current clinical diagnosis of myocardial infarction, angina pectoris, coronary insufficiency, thrombosis, or any other cardiovascular disease of a variety known to be accompanied by syncope, dyspnea, collapse, or congestive cardiac failure.
- Has no current clinical diagnosis of high blood pressure likely to interfere with his/her ability to operate a commercial motor vehicle safely.
- Has no established medical history or clinical diagnosis of rheumatic, arthritic, orthopedic, muscular, neuromuscular, or vascular disease which interferes with his/her ability to control and operate a commercial motor vehicle safely.

History Surrounding the Current Cardiovascular Disease Standard

The current cardiovascular disease standard was codified in 1970 when the Federal Highway Administration (FHWA) published its amendments to Parts 391 and 392 of the Motor Carrier Safety Regulations.

In 2007 FMCSA commissioned a systematic evidence review regarding cardiovascular disease standards for CMV drivers, which was conducted by Manila Consulting Group and ECRI

Institute. An expert panel was subsequently convened to review the evidence report, and to provide opinions to FMCSA regarding whether or not changes should be made to the current cardiovascular disease standard.

With regard to the evidence report findings, the authors concluded the following for the question that specifically addressed whether or not cardiovascular disease is associated with an increased risk for motor vehicle crash.

For commercial motor vehicle drivers:

A paucity of data from studies that enrolled CMV drivers with CVD precluded determining whether CMV drivers with the disorder are at an increased risk for crash.

For non-commercial motor vehicle drivers:

Drivers with cardiovascular disease are at an increased risk of crash when compared with comparable drivers who do not have the disorder (Strength of Evidence: Acceptable).

- **The magnitude of increase in risk is small but statistically significant (RR = 1.45, 95% CI: 1.11 – 1.84).**

The expert panel that was convened in 2007 following the preparation of the 2007 evidence report considered the evidence and recommended a number of changes with respect to the cardiovascular disease standard. These changes may be reviewed in the online document on the FMCSA website <http://www.fmcsa.dot.gov/rules-regulations/TOPICS/mep/report/CVD-Commentary-prot.pdf>.

Purpose of the Current Review

As part of its mission to improve highway safety, the FMCSA Office of Medical Programs is responsible for creating and updating the physical qualification standards and clinical guidelines for the use of the trained medical examiners that perform commercial motor vehicle driver certification examinations. In 2013, FMCSA requested that Manila Consulting convene an panel meeting (henceforth termed the Medical Expert Panel, or MEP) of four experts to review the physical qualification standards and clinical guidelines that were used by medical examiners to determine whether, and under what conditions, individuals with cardiovascular disease may be considered physically qualified to drive a CMV. This panel was specifically charged with making recommendations for revisions to the standards and guidelines that would reflect current evidence reports and guidelines.

This report summarizes the considerations and opinions of the MEP with regard to the current physical qualification standards and guidelines for cardiovascular disease for CMV drivers.

Composition of the Medical Expert Panel

Members of the MEP charged with making recommendations to the FMCSA pertaining to whether current physical qualifications guidelines and standards for the CVD guidelines required revision, and to suggest revisions, are listed in Table 1.

Table 1: Members of the Medical Expert Panel

Name	Current Position
Heidi M. Connolly, MD	Heidi M. Connolly, M.D. is a professor of medicine at the Mayo Medical Center, Rochester, MN. Board certified in Internal Medicine and Cardiovascular Disease, has served as the Director of the Mayo Clinic Congenital Heart Center. Dr. Connolly's research interests and expertise include adult congenital heart disease, carcinoid heart disease, drug-induced heart disease, pregnancy and heart disease, echocardiography, and Marfan syndrome and related disorders. Dr. Connolly was one of authors of the 2002 FMCSA "Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Vehicle Drivers"
Andrew E. Epstein, MD	Andrew E. Epstein, M.D. is a professor of medicine at the Hospital of the University of Pennsylvania. Board certified in Internal Medicine, Cardiovascular Disease, and Clinical Cardiac Electrophysiology, his research interests and expertise include defibrillation and cardioversion, devices for the treatment of arrhythmias (implantable cardioverter-defibrillators, pacemakers), electrophysiology and treatment of atrial and ventricular arrhythmias (Interventional electrophysiology/ablation, surgical, pharmacologic), and clinical trials in arrhythmia treatment. Dr. Epstein was one of authors from 2002 "Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Vehicle Drivers", and served on the FMCSA CVD expert panel in 2006.
Richard E. Kerber, MD	Richard E. Kerber, M.D., is a professor of medicine and academic cardiologist at the University of Iowa. Board certified in Internal Medicine and Cardiovascular Disease, his research expertise and interests include general cardiology, cardiac imaging by ultrasound (echocardiography) and cardiac defibrillation and resuscitation from cardiac arrest. Dr. Kerber served on the FMCSA CVD expert panel in 2006.
Chris Simpson, MD	Chris Simpson, M.D. is professor of medicine and chief of Cardiology at Queen's University and Medical Director of the Kingston General Cardiac Program. His research expertise and interests include access to care, medical fitness to drive, cardiac resynchronization therapy, and inherited heart rhythm diseases. Dr. Simpson was the lead author of the CCS Consensus Conference 2003: Assessment of the cardiac patient for fitness to drive and fly.

Methodology

Brief Overview of Recommendations Review Methodology

The recommendations of the MEP presented in this report were informed in part on the interpretation and assimilation of information presented in an expedited review documenting the proposed changes to the CVD guidelines and standards and the references which informed the proposed changes.

The MEP Meeting and Opinion Formulation

On May 15 – 16, 2013, FMCSA, Manila Consulting, and the three members of the MEP convened a two-day conference to discuss available evidence related to driver safety and cardiovascular disease. The specific objectives of this meeting included the following:

- To review the proposed changes to the guidelines and standards suggested by the expert panelists and collated into a single document of tables prepared by Manila Consulting on the topic of cardiovascular disease and commercial motor vehicle driver safety
- To achieve consensus on the MEP's opinions regarding driver safety and a wide variety of topics in cardiovascular disease, including:
 - Aneurysms
 - Cardiomyopathies
 - Coronary heart disease
 - Pacemakers and Defibrillators
 - Hypertension
 - Valvular disease

In developing their opinions or guidance for FMCSA, members of the MEP were guided by three central principles. Specifically, they should be based on scientific evidence whenever possible¹, they should be concise and explicit, and they should be actionable.

This document summarizes the key themes and opinions that emerged from the day-long, in-person meeting with the MEP.

MEP Recommendations for the Physical Qualifications and Guidelines

The MEP believes that some individuals with cardiovascular disease do pose an additional risk to road safety. The recommendations provided by the MEP reflect available scientific data and professional guidelines.

The cardiovascular disease (CVD) recommendations document is a collection of tables arranged by CVD subtopic area and subdivided into individual diagnosed disease states. The MEP achieved consensus for each of the CVD subtopic recommendations. Recommendations for medical examiners are provided for individual disease states. The CVD tables and MEP recommendations, together with citations, are found in Appendix A.

¹ Recommendations from the Medical Expert Panel, for which no supporting evidence was identified and which are thus based on expert opinion, are identified as such.

Specific MEP Recommendations for Instructions for Medical Examiners

The MEP recommended that a general introduction to the CVD Recommendation Tables supplied to medical examiners include a series of guidance statements to assist medical examiners as they determine an individual's medical qualifications for driving a commercial motor vehicle.

Guidance Statement 1: Fundamental Certification Issue

The fundamental certification issue the medical examiner must address is whether the commercial driver being examined has a CVD or combination of disorders that increases the risk of sudden incapacitation or death.

Guidance Statement 2: Disqualification

The Recommended Update is defined for individual disorders; however, any ***one*** may disqualify an individual from operating a commercial motor vehicle. For example, the presence of an implantable cardioverter defibrillator is not what necessitate a driving exclusion; exclusion would be based on the left ventricular ejection fraction (LVEF) < 40%, regardless of ICD presence.

Guidance Statement 3: Single or Multiple Disorders

The effect of a CVD on driving must be considered in relation to the overall general health of the driver being examined, because other medical conditions present in the same individual may exacerbate a CVD condition and change the potential risk for sudden incapacitation or death. This consideration acknowledges common medical phenomena, which is that individuals with one CVD often present with other related or comorbid conditions.

- a. In the presence of more than one condition, it is recommended that medical examiners should consider each condition separately and in combination in determining medical fitness to drive. Any one medical condition may be severe enough to consider disqualification. Likewise, conditions which independent of each other would not call for disqualification, when combined, may warrant disqualification from operating a commercial motor vehicle.
- b. The medical certification to drive should depend on a comprehensive assessment by the medical examiner of overall health and informed medical judgment about the impact of single or multiple conditions on the whole person.

Guidance Statement 4: Cleared by a Specialist

The phrase "cleared by a specialist" in the CVD Recommendation Tables (see Appendix A) implies that documentation required by the medical examiner to make a determination of an individual driver's medical fitness has been provided by a specialist for the condition(s) of interest. This does ***not*** mean that the specialist is making a determination regarding that individual's medical fitness to drive.

- c. The Medical Expert Panel recommends that FMCSA provide clear descriptions of the type of information that is required from a specialist in specific situations that can be used by the medical examiner in making medical fitness to drive determinations.

Guidance Statement 5: Compliance

Maintenance of good health in some CVD diagnoses requires that the driver comply with a particular medical or treatment protocol.

- d. When making a determination about that individual's medical fitness to drive, the medical examiner should attempt to assess that a driver is compliant in all such instances.

Appendix A: Recommendations Update 2013

This Appendix presents the recommendations for physical qualification standards and guidelines for cardiovascular disease agreed upon by the MEP at the May 15 – 16, 2013 meeting.

Aneurysms

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Abdominal Aortic Aneurysm (AAA) <4 cm	Asymptomatic	Symptomatic Fails to meet the certification criteria	Maximum – 1 year Individual must have an annual: Blood pressure measurement Assessment of the AAA size by board certified internal medicine specialist or cardiologist	[1-4]
Abdominal Aortic Aneurysm (AAA) Males: 4.0 to ≤5.5 cm Abdominal Aortic Aneurysm (AAA) Females: 4.0 to ≤5.0 cm	Asymptomatic Documentation of AAA size verified by board certified internal medicine specialist or cardiologist ²	<i>Regardless of AAA size, if:</i> Symptomatic Recommended for repair from a board certified internal medicine specialist or cardiologist AAA has increased more than 1 cm during a 6 month period		
Abdominal Aortic Aneurysm (AAA) Males: >5.5 cm Abdominal Aortic Aneurysm (AAA) Females: >5.0 cm	Minimum 3 months after repair Meets post-intervention repair of aneurysm guidelines Cleared by board certified internal medicine specialist or cardiologist	Fails to meet the certification criteria		
Thoracic Aortic Aneurysm (TAA) (Atherosclerotic only)* ≤5.0 cm	Asymptomatic Documentation of TAA size verified by board certified internal medicine specialist or cardiologist ³ OR Minimum 3 months after repair Meets post-intervention repair of aneurysm guidelines Cleared by board certified internal medicine specialist or cardiologist	Symptomatic Fails to meet the certification criteria	Maximum – 1 year Annual TAA size assessment performed by board certified internal medicine specialist or cardiologist	[5-7]
Note: Individuals <60 years of age must be cleared by a cardiovascular specialist prior to certification. Refer to Marfan's Syndrome guidance				

² Appropriate documentation of the size of the aneurysm has been provided by a board certified internal medicine or cardiologist specialist

³ Appropriate documentation of the size of the aneurysm has been provided by a board certified internal medicine or cardiologist specialist

Thoracic Aortic Aneurysm (TAA) (Atherosclerotic only)* >5.0 cm	Minimum 3 months after repair Meets post-intervention repair of aneurysm guidelines Cleared by board certified internal medicine specialist or cardiologist	Fails to meet the certification criteria	Maximum – 1 year Individual must have an annual: Blood pressure measurement TAA size assessment by a board certified internal medicine specialist or cardiologist	[5-7]
Note: Individuals <60 years of age must be cleared by a cardiovascular specialist prior to certification. Refer to Marfan's Syndrome guidance				
Aneurysm (Non-Cerebral) of Other Vessels	Minimum 3 months after repair Meets post-intervention repair of aneurysm guidelines Cleared by board certified internal medicine specialist or cardiologist	Unrepaired despite recommendation by appropriate treating specialist.	Maximum – 1 year Individual must have an annual: Blood pressure measurement Assessment by a board certified internal medicine specialist or cardiologist	[8-10]
Note: Individuals <60 years of age must be cleared by a cardiovascular specialist prior to certification. Refer to Marfan's Syndrome guidance				
Post-Intervention Repair of Aneurysm	Asymptomatic Minimum 3 months after intervention repair Compliant with follow-up protocols after intervention Meets monitoring guidelines for anticoagulant therapy (if applicable) Cleared by cardiologist	Symptomatic Unrepaired despite recommendation by appropriate treating specialist.	Maximum – 1 year	[10-12]
Non-Atherosclerotic TAA	See Congenital Heart Disease section: Marfan Syndrome, Loeys-Dietz Syndrome, and Related Connective Tissue Disorders			

Anticoagulant Therapy

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Anticoagulant Therapy (Warfarin)	Stabilized on Warfarin for a minimum of 1 month Provides a copy of anticoagulation therapy results at the examination. Receiving attendant anticoagulant monitoring Cleared by cardiologist	Warfarin therapy is not being monitored	Maximum – 1 year	[5, 6, 13, 14]
Anticoagulant Therapy (Novel Therapies)	Stabilized on medication for a minimum of 1 month No evidence of noncompliance with medication regimen Cleared by cardiologist	Fails to meet the certification criteria	Maximum – 1 year	[13, 15, 16]

Aortic Regurgitation

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Aortic Regurgitation – Mild or Moderate	Asymptomatic LVEF \geq 50% Cleared by cardiologist OR Minimum 3 months post-aortic valve repair Meets post-aortic valve repair/replacement guidelines Has normal LV function	Symptomatic Fails to meet certification criteria	Maximum – 1 year Echocardiography and other diagnostics should be repeated as deemed appropriate by the treating cardiologist	[17, 18]
Aortic Regurgitation – Severe (with LV Dsyfunction)	Asymptomatic Minimum of 3 months post-aortic valve repair Meets post-aortic valve repair/replacement guidelines LVEF \geq 50% LV dilatation: LVEDD \leq 75 mm / LVESD \leq 55 mm Cleared by cardiologist	Symptomatic Fails to meet certification criteria	Maximum – 1 year if surgically repaired Echocardiography and other diagnostics should be repeated as deemed appropriate by the treating cardiologist.	[2, 19]
Post-Aortic Valve Repair/Replacement †	Minimum 3 months post aortic valve repair/replacement Meets asymptomatic aortic stenosis or aortic regurgitation requirements Cleared by cardiologist	Thromboembolic complications	Maximum – 1 year Echocardiography and other diagnostics should be repeated as deemed appropriate by the treating cardiologist.	[17-19]

†For valve replacement, please go to Valve Replacement section

Aortic Stenosis

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Mild Aortic Stenosis (AVA >1.5 cm ²)	Asymptomatic Cleared by cardiologist	Symptomatic Does not meet certification criteria	Maximum – 1 year Echocardiography and other diagnostics should be repeated as deemed appropriate by cardiologist OR a minimum of every 3 to 5 years.	[20]
Moderate Aortic Stenosis (AVA ≥ 1.0 - 1.5 cm ²)	Asymptomatic Minimum 3 months after surgery/repair Cleared by cardiologist	Symptomatic (has one or more of the following): Angina; Heart failure; Syncope LVEF <50% OR Symptomatic Unrepaired/unreplaced despite recommendation by appropriate treating specialist.	Maximum – 1 year Echocardiography and other diagnostics should be repeated as deemed appropriate by cardiologist OR a minimum of every 1 to 2 years.	[17-22]
Severe Aortic Stenosis (AVA < 1.0cm ²)	Asymptomatic Minimum of 3 months after surgery/repair Cleared by cardiologist Meets monitoring guidelines for anticoagulant therapy (if applicable)	Symptomatic Fails to meet the certification criteria	Maximum – 1 year Echocardiography and other diagnostics should be repeated as deemed appropriate by cardiologist OR a minimum of every 1 to 2 years	[17-21]

Valve Replacement

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Prosthetic Valves (Mechanical and Biologic)	Asymptomatic Minimum 3 months post-op LVEF is $\geq 40\%$ Compliant with anticoagulation therapy (if applicable) Cleared by cardiologist	Symptomatic Persistent symptoms exist LVEF $< 40\%$	Maximum – 1 year	[17-19]

Cardiomyopathies and Congestive Heart Failure

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Hypertrophic Cardiomyopathy	No history of cardiac arrest No spontaneous sustained VT No non-sustained VT No family history of premature sudden death No syncope Left ventricular septum thickness <30 mm Cleared by cardiologist	Provokable/resting peak gradient ≥ 50 Medical examiner believes the nature and severity of the medical condition may interfere with safe driving ability and is a risk to public safety	Maximum – 1 year Low-risk individuals must be followed closely for changes in risk status	[22, 23]
Idiopathic Dilated Cardiomyopathy	Asymptomatic No sustained ventricular arrhythmias LVEF >40%	Symptomatic Sustained ventricular arrhythmias LVEF $\leq 40\%$ Individual has an implantable ventricular assist device	Annual Requires annual cardiology evaluation including echocardiography	[22, 24-26]
Restrictive Cardiomyopathy	No	Not applicable	Driver should not receive certification until a diagnosis of restrictive cardiomyopathy has been ruled out.	[27]
Arrhythmogenic Right Ventricular Cardiomyopathy with Dysplasia (ARVC/d)	No	Not applicable	Not applicable	[28]

Commercial Drivers with Known Coronary Heart Disease (CHD)

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Asymptomatic Coronary Heart Disease (CHD) and Stable Angina CHD risk-equivalent conditions* CHD Risk factors‡	No other exclusionary diagnoses LVEF >40%	Fails to meet the certification criteria LVEF ≤ 40% <i>NOTE: The decision not to medically certify a commercial driver should not depend solely on the detection of multiple risk factors.</i>	Maximum – 2 years	[29-31]
Unstable Angina	Has converted to stable angina Tolerance to medications LVEF >40% Clearance from a cardiovascular specialist	Develops unstable angina within 3 months of examination.	Annual	[29]
Post-Percutaneous Coronary Intervention	Asymptomatic Minimum 3 weeks after elective procedure LVEF >40% Adherence to cardiovascular specialist-recommended appropriate medical therapy for a minimum of 1 year after receiving drug-eluting stent Clearance by cardiologist	Symptomatic Incomplete healing or complication at vascular access site	Maximum – 1 year	[30, 32, 33]
Post Myocardial Infarction (MI) Risk of recurrent major cardiac event highest within the first month post-MI Drivers in a rehabilitation program can receive comprehensive secondary prevention therapy	Minimum 2 months post-MI Minimum 3 months post-MI if CABG has been performed Tolerance and adherence to medications LVEF >40% Clearance by a cardiovascular specialist	Fails to meet certification criteria	Annual	[30, 31, 34, 35]
Post Coronary Artery Bypass Surgery (CABG) Delay in return to work to allow sternal incision healing	Minimum of 3 months after CABG Post-CABG LVEF >40% Sternum has healed Tolerance and adherence to medications Clearance by a cardiologist	Fails to meet certification criteria	Maximum – 1 year	[29, 31, 33]

*CHD risk-equivalent conditions: Diabetes; Peripheral vascular disease; Chronic kidney disease; Abdominal aortic aneurysm; Carotid artery disease; Framingham risk score predicting a 20% CHD event risk over the next 10 years; Being over 45 years of age with multiple risk factors for CHD.

‡CHD Risk factors: Smoking; Family history; Adverse lipid profile; Hypertension; Age (men > 45 years; women > 55 years); Obesity

Conduction System Disorders

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Atrioventricular (AV) Block	Asymptomatic Pacemaker implanted A minimum 1 month post-pacemaker implantation Documented correct function Underlying disease not disqualifying Clearance by appropriate treating specialist	Symptomatic	Maximum – 1 year	[26]
Isolated 1st Degree AV Block Isolated Right Bundle Branch Block (RBBB)‡	Asymptomatic No disqualifying underlying heart disease Clearance from a cardiovascular specialist	Symptomatic	Maximum – 1 year	[26]
Left Bundle Branch Block (LBBB) Bifascicular Block 2nd Degree AV block; Mobitz I 1st Degree AV Block + Bifascicular Block	Asymptomatic No associated impairment of consciousness No disqualifying underlying heart disease Clearance from a cardiovascular specialist	Symptomatic	Maximum – 1 year	[26, 36-38]
2nd Degree AV block; Mobitz II (Distal AV Block) Alternating LBBB and RBBB; Acquired 3rd Degree AV block	No	No		[37, 38]
Congenital 3rd Degree AV block	Asymptomatic No associated impairment of consciousness QRS Duration ≤110 ms	Fails to meet certification criteria	Maximum – 1 year	[26, 36-38]
Sinus Node Dysfunction, including Sick Sinus Syndrome	Asymptomatic Minimum 1 month post-operative pacemaker implantation (see Pacemaker section in this document) Documentation indicating presence of normal pacemaker function Documentation indicating completion of routine pacemaker checks No disqualifying underlying disease Clearance from a cardiologist	Fails to meet certification criteria	Annual	[37, 39]
Atrial Fibrillation Atrial Tachycardia Atrial Flutter	Asymptomatic Anticoagulation where medical indication is present	Impaired level of consciousness Untreated WPW	Maximum – 1 year*	[26, 36-38]

Atrioventricular Nodal Reentrant Tachycardia (AVNRT) Atrioventricular Reentry (AVRT) Wolf-Parkinson-White with AFib Multifocal Atrial Tachycardia Junctional Tachycardia	1 month waiting period after anticoagulation therapy begins <i>if</i> risk factor for stroke <i>if</i> recommended by treating physician Adequate rate or rhythm control Clearance by a cardiovascular specialist	w/Afib		
Coronary Heart Disease (CHD): Sustained VT	No	Not applicable		[26, 36-38]
Coronary Heart Disease (CHD): NSVT, LVEF ≤ 40%	No	Not applicable		[26, 36-38]
Coronary Heart Disease (CHD): NSVT LVEF > 40%	Asymptomatic for one year Cleared by appropriate treating specialist	Fails to meet certification criteria	Maximum – 1 year	
Dilated Cardiomyopathy: Sustained VT	No	Not applicable		[26, 36-38]
Dilated Cardiomyopathy: NSVT, LVEF ≤ 40%	No	Not applicable		[26, 36-38]
Dilated Cardiomyopathy: NSVT LVEF > 40%	Asymptomatic for one year Cleared by appropriate treating specialist	Fails to meet certification criteria	Maximum – 1 year	[26, 36-38]
Idiopathic Ventricular Tachycardia (RVOT Ventricular Tachycardia and Idiopathic LV Tachycardia)	If symptomatic, must have been definitively treated Clearance by an appropriate treating specialist	Symptomatic	Maximum – 1 year	[26, 36-38]
Genetic Arrhythmias / Channelopathies Long QT Syndrome Brugada Syndrome CPVT Short QT Syndrome ARVC/d ([see Cardiomyopathy Section]; etc.)	No	Not applicable		[26, 36-38]
Isolated Left Anterior Fascicular Block	Asymptomatic (Depends on risk from underlying heart disease)	Symptomatic	Maximum – 1 year	[37, 38]

Isolated Left Posterior Fascicular Block	<i>OR</i> Treated for symptomatic disease (see Pacemaker section) No disqualifying heart disease Cleared by cardiovascular specialist			
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‡ Note: Progression of disease in the conduction system can lead to third degree heart block with total loss of electrical connection between the atria and ventricles causing syncope or sudden death.

* The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty.

Devices

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Cardioverter Pacemaker (CRT-P) Patient has a high risk for death and sudden incapacitation	Asymptomatic Postimplantation LVEF improves to >40%	Symptomatic Fails to meet the certification criteria	Maximum – 1 year	[26, 36-38, 40, 41]
Cardioverter Defibrillator (CRT-D) Patient has a high risk for death and sudden incapacitation	No Medical examiners do not certify drivers with a Cardioverter defibrillator combination device, which is often used for cardiac resynchronization therapy	Not applicable		[26, 36-38, 40, 41]
Implantable Cardioverter Defibrillator: Primary and Secondary Prevention: Patient has a high risk for death and sudden incapacitation	No <i>Appeal may be possible if:</i> Condition that precipitated implantation has been resolved The ICD was inappropriately implanted AND has been turned off	Condition that precipitated implantation remains ICD ICD/pacemaker combination device		[26, 36-38, 40, 41]
Pacemaker Implantation	Asymptomatic Minimum 1 month post-pacemaker implantation if disease identified is cause of syncope Minimum 3 month post-pacemaker implantation if pacemaker dependent Documentation of normal function Clearance by cardiovascular specialist.	Symptomatic An implantable cardiac defibrillator/pacemaker combination device present Disqualifying underlying disease	Maximum – 1 year	[26, 36-38, 40, 41]

Congenital Heart Disease

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Patent Ductus Arteriosus (PDA) <i>Small = Favorable</i>	Small shunt Cleared by cardiovascular specialist knowledgeable in adult congenital heart disease	Fails to meet certification criteria	Annual	[42]
Patent Ductus Arteriosus (PDA) <i>Moderate to large = Unfavorable</i>	Minimum 3 months after surgery or 1 month after device closure Cleared by cardiovascular specialist knowledgeable in adult congenital heart disease None of the criteria in the "Not Approved" column are present	Symptoms of dyspnea or palpitations Pulmonary hypertension Right to left shunt Progressive LV enlargement or decreased systolic function	Annual Should have evaluation by cardiovascular specialist knowledgeable in adult congenital heart disease.	[19, 42]
Coarctation of the Aorta <i>Mild = favorable</i>	Mild and unoperated BP controlled No associated disqualifying disease Clearance by cardiovascular specialist knowledgeable in adult congenital heart disease recommended	Fails to meet certification criteria	Annual Evaluation by cardiovascular specialist knowledgeable in adult congenital heart disease recommended.	[19, 42]
Coarctation of the Aorta <i>Moderate or Severe = Unfavorable</i>	Minimum of 3 months after surgery or 1 month after intervention Clearance by cardiovascular specialist knowledgeable in adult congenital heart disease recommended	No intervention occurs	Annual Evaluation by cardiovascular specialist knowledgeable in adult congenital heart disease recommended.	[19, 42]
Coarctation of the Aorta after Intervention <i>Unfavorable prognosis with persistent risk of cardiovascular events</i>	Repaired Minimum 3 months after surgery or stent placement	Fails to meet certification criteria	Annual Reassessment by cardiovascular specialist knowledgeable in adult congenital heart disease required.	[19, 42]
Pulmonary Valve Stenosis (PS)	Pulmonary valve stenosis corrected by surgical valvotomy or balloon valvuloplasty Minimum 1 month post-balloon valvuloplasty Minimum 3 months post-surgical valvotomy Clearance by a cardiovascular specialist	Symptoms of dyspnea, palpitations, or syncope Pulmonary valve peak gradient >50 mm Hg in the presence of a normal cardiac output. Right ventricular pressure > 50 % systemic pressure Main pulmonary artery	Maximum – 1 year The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty.	[43]

		diameter more than 5 cm via echocardiography or other imaging modality		
Other Causes of Right Ventricular Outflow Obstruction in Persons with CHD: Double chambered right ventricle Infundibular pulmonary stenosis Supravalvar pulmonary stenosis Pulmonary artery Stenosis	Mild or moderate pulmonary valve stenosis Pulmonary valve stenosis corrected by surgical valvotomy or balloon valvuloplasty Minimum 1 month post-balloon valvuloplasty Minimum 3 months post-surgical valvotomy Clearance by an appropriate treating specialist.	Symptoms of dyspnea, palpitations, or syncope Right ventricular peak gradient > 50 mm Hg in the presence of a normal cardiac output. Right ventricular pressure > 50 % systemic pressure	Annual Recommend evaluation by Cardiovascular specialist knowledgeable in adult congenital heart disease.	[44, 45]
Marfan Syndrome, Loeys-Dietz Syndrome, and Related Disorders (Non-Atherosclerotic Thoracic Aortic Aneurysm (TAA)): Cardiovascular disorders are a major cause of mortality including risk of sudden death	No cardiovascular involvement Clearance by appropriate treating specialist	Any aortic root enlargement <u>OR</u> Severe aortic regurgitation <u>OR</u> Severe mitral regurgitation related to mitral valve prolapse <u>OR</u> LV dysfunction with EF <40% and no associated valve disease	Maximum – 1 year Evaluation by cardiologist knowledgeable in care of individuals with thoracic aortic aneurysmal (TAA) disease	[20, 42]
Ebstein Anomaly	Asymptomatic Minimal 3 months post-surgical repair Clearance from a cardiovascular specialist knowledgeable in adult congenital heart disease and who understands the functions and demands of commercial driving	Symptomatic Accessory pathway	Annual evaluation	[20, 42]
Tetralogy of Fallot Repaired = variable prognosis	Asymptomatic Repaired No arrhythmia	Symptomatic Unoperated	Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease required	[20, 42]
Tetralogy of Fallot Unfavorable in unrepaired state	Asymptomatic Repaired No arrhythmia	Symptomatic Unoperated	Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease required	[20, 42]

<p>Transposition of the Great Vessels Unfavorable if uncorrectable Atrial switch repair (Mustard or Senning procedures) After Rastelli repair After arterial switch repair, prognosis appears favorable</p>	<p>If operated and asymptomatic No history of sustained arrhythmias Systemic LVEF >40% Cleared by a cardiovascular specialist in adult congenital heart disease</p>	<p>Unoperated</p>	<p>Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease</p>	<p>[46]</p>
<p>Congenitally Corrected Transposition (d-CCT) 95% have associated intracardiac lesions. Conduction system is inherently abnormal.</p>	<p>None of the disqualifying criteria present <i>If evaluation includes surgery/prosthetic valve:</i> Asymptomatic Prosthetic valve—must meet requirements for that valve If surgery has occurred, must meet post-CV surgery criteria Cleared by cardiovascular specialist knowledgeable in adult congenital heart disease None of the disqualifying criteria present</p>	<p>Symptomatic Sustained arrhythmia Systemic LVEF ≤40% Severe tricuspid (systemic) valve regurgitation</p>	<p>Annual Required annual evaluation by cardiologist knowledgeable in adult congenital heart disease</p>	<p>[47]</p>
<p>Atrial Septal Defect (ASD): Ostium Secundum Small ASD = favorable prognosis</p>	<p>Asymptomatic</p>	<p>Fails to meet certification criteria</p>	<p>Annual Evaluation by cardiologist</p>	<p>[48]</p>
<p>Atrial Septal Defect (ASD): Ostium Secundum Moderate to Large ASD = unfavorable prognosis</p>	<p>Asymptomatic Minimum 3 months after surgery or at least 4 weeks after device closure Clearance by cardiovascular specialist</p>	<p>Symptoms of the following exist: Dyspnea Palpitations or a paradoxical embolus Pulmonary hypertension Right-to-left shunt Pulmonary to systemic flow ratio >1.5 to 1</p>	<p>Annual Evaluation by cardiologist</p>	<p>[48]</p>
<p>Atrial Septal Defect (ASD): Ostium Primum Small ASD = favorable prognosis</p>	<p>Asymptomatic</p>	<p>Fails to meet certification criteria</p>	<p>Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease required including echocardiogram.</p>	<p>[48]</p>
<p>Atrial Septal Defect (ASD): Ostium Primum</p>	<p>Minimum 3 months after surgical intervention if none of the certification criteria</p>	<p>Symptoms of the following exist: Dyspnea</p>	<p>Annual Evaluation by cardiologist</p>	<p>[48]</p>

Moderate to Large ASD = unfavorable prognosis	No symptomatic arrhythmia and no significant residual shunt Cleared by cardiologist knowledgeable in adult congenital heart disease	Palpitations or a paradoxical embolus Echo-Doppler demonstrates pulmonary artery pressure >50% systemic Echo-Doppler demonstrates right-to-left shunt Pulmonary to systemic flow ratio greater than 1.5 to 1 Heart block on an electrocardiogram More than moderate mitral valve regurgitation Left ventricular outflow tract obstruction with a gradient >30 mm Hg.	knowledgeable in adult congenital heart disease.	
Sinus Venosus Atrial Septal Defect Small ASD = favorable	Asymptomatic	Fails to meet certification criteria	Annual Evaluation by cardiologist	[49, 50]
Sinus Venosus Atrial Septal Defect Moderate to Large ASD = unfavorable	Asymptomatic Minimum 3 months after surgery or at least 4 weeks after device closure Clearance by cardiologist knowledgeable in adult congenital heart disease	Symptomatic Pulmonary hypertension Right-to-left shunt Pulmonary to systemic flow ratio >1.5 to 1	Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease every 2 years.	[48]
Ventricular Septal Defect Small ASD = favorable	Small shunt PAP > 50% Minimum 3 months after surgery 1 month after percutaneous intervention Cleared by cardiovascular specialist None of the disqualifying criteria	Symptomatic Left ventricular enlargement	Annual Evaluation by cardiologist knowledgeable in adult congenital heart disease recommended.	[48]
Ventricular Septal Defect Moderate to Large ASD = unfavorable	Asymptomatic Minimum 3 months after surgery Minimum 1 month after percutaneous intervention None of the disqualifying criteria Cleared by cardiologist knowledgeable in adult congenital heart disease	Symptomatic Unrepaired with moderate to large shunt PAP >50% systemic	Annual Cleared by cardiovascular specialist knowledgeable in adult congenital heart disease	[48]

Heart Transplantation

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Special attention to: Accelerated atherosclerosis, transplant rejection, general health	Minimum 6 months post-transplant Is NYHA Class I or II LVEF >40% Have no signs of transplant rejection Meets all other qualification requirements Clearance from an appropriate treating specialist	Implanted ventricular assistance device	Maximum – 6 months for the first year post-transplant, then annually Re-assessment by an appropriate treating specialist who evaluates the: Possibility of atherosclerosis Status of the transplant General health of the driver	[51-55]

Hypertension

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
<p>Essential Hypertension</p> <p>Evaluate for other clinical CVD including TOD†</p> <p>Presence of TOD, CVD or diabetes may affect therapy selected.</p>	<p>Asymptomatic</p> <p>This disorder is rarely disqualifying alone</p>	<p>Symptomatic</p>	<p>Biennial</p>	<p>[56]</p>
<p>Hypertension (<160/109mm Hg):</p> <p>Presents with BP measurement of 140-169/90-109 mmHg</p> <p>Note: Low risk for hypertension-related acute incapacitation</p>	<p><i>For 1 year, if the following are satisfied:</i></p> <p>It is the first examination at which the driver has BP <169/109 and the driver: Has no history of hypertension</p> <p>Does not use antihypertensive medication to control BP</p>	<p>Hypertension and BP <169/109</p> <p>A history of stage 3 hypertension and BP <169/109</p> <p>BP ≥170/110, regardless of any other considerations</p>	<p>Maximum – 1 year if BP <169/109</p> <p>Note: except drivers with history of stage 3 hypertension.</p>	<p>[56-64]</p>
<p>Hypertension ≥170/110</p> <p>Presents with BP measurement of 170/110mmHg.</p> <p>Note: This stage of hypertension carries a high risk for the development of acute hypertension-related symptoms that could impair judgment and driving ability.</p>	<p><i>Yes, at recheck**, if:</i></p> <p>BP <169/109 mmHg</p> <p>Tolerates treatment with no side effects that interfere with driving</p>	<p>BP ≥170/110, regardless of history or treatment, is immediately disqualifying</p> <p>**Note: Advise driver that failure to maintain BP at <169/109 will render the driver medically unqualified in subsequent examinations</p>	<p>Maximum – 6 months if BP <169/109</p>	<p>[56, 64, 65]</p>
<p>Secondary Hypertension</p> <p>Information should be obtained that assesses the underlying cause, the effectiveness of treatment, and any side effects that may interfere with driving.</p>	<p>3 months post-intervention correction for related medical condition</p> <p>Blood pressure is <169/109</p>	<p>The medical examiner believes the nature and severity of the medical condition of the driver endangers the health and safety of the driver and the public.</p>	<p>Maximum – 1 year if BP <169/109</p>	<p>[64, 65]</p>

† Target organ damage

Pulmonary Hypertension

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Pulmonary Hypertension	Asymptomatic PAP ≤ 50% Clearance by an appropriate cardiovascular disease specialist	Symptomatic PAP >50%	Maximum – 1 year The driver should have follow-up dependent upon the clinical course of the condition and recommendation of the treating specialist, but at least annually. The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty.	[66, 67]

Mitral Regurgitation

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Mild, Moderate or Severe Mitral Regurgitation	<p>Asymptomatic</p> <p>Normal LVESD $\leq 55\%$</p> <p>Normal LVEF</p> <p>PAP $\leq 50\%$ systemic</p> <p>If surgery performed, meets guidelines for surgical mitral valve repair for mitral regurgitation: 3 months post-surgical repair; and asymptomatic</p> <p>Clearance by an appropriate treating specialist.</p>	<p>Symptomatic</p> <p>Less than 6 METs on Bruce protocol (when ETT is indicated by a physician)</p> <p>Atrial fibrillation (AF) and does not meet the AF requirements for certification</p> <p>LVEF $\leq 50\%$</p> <p>PAP is $>50\%$ of systolic arterial pressure</p>	<p>Maximum – 1 year</p> <p>Annual with a cardiovascular specialist</p>	[17, 18, 68]
Mitral Valve Repair for Mitral Regurgitation	<p>Asymptomatic</p> <p>Minimum 3 months post open repair/sternotomy</p> <p>Minimally invasive interventions require a minimum of 1 month post-intervention</p> <p>Meets certification criteria for mitral regurgitation</p> <p>Post-intervention clearance by an appropriate treating specialist</p>	<p>Symptomatic</p> <p>Post-intervention LVEF $<40\%$</p> <p>Thromboembolic complications</p> <p>Pulmonary hypertension</p> <p>PAP is $>50\%$ of systolic arterial pressure</p> <p>Inability to achieve >6 METS on Bruce Protocol (when ETT is indicated by a physician).</p> <p>Ruptured chordae or flail leaflet</p> <p>LV dysfunction</p>	<p>Maximum – 1 year</p> <p>The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty.</p>	[17, 18, 68]

Mitral Stenosis

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
<p>Mild Mitral Stenosis MVA \geq1.6 cm² or Moderate Mitral Stenosis MVA 1.0 to 1.6 cm²</p> <p>*Mild and Moderate mitral stenosis: In the presence of symptoms consistent with moderate to severe mitral stenosis but a calculated valve area suggesting mild mitral stenosis, the severity of the stenosis should be reassessed and an alternative explanation for symptoms should be considered.</p>	<p>Asymptomatic</p> <p>If receiving anticoagulant therapy, meets monitoring guidelines: is stabilized on medication for at least 1 month.</p> <p>Clearance by an appropriate treating specialist</p>	<p>Symptomatic</p>	<p>Maximum – 1 year</p>	<p>[19]</p>
<p>*Severe Mitral Stenosis MVA \leq1.0 cm²</p> <p>*Severe Mitral Stenosis MVA < 1.0 cm²: In the presence of symptoms consistent with moderate to severe mitral stenosis but a calculated valve area suggesting mild mitral stenosis, the severity of the stenosis should be reassessed and an alternative explanation for symptoms should be considered.</p>	<p>Asymptomatic</p> <p>Minimum 4 weeks post percutaneous balloon mitral valvotomy</p> <p>Minimum 3 months post-surgical commissurotomy</p> <p>No thromboembolic complications.</p> <p>PAP 50% systemic</p> <p>Clearance by an appropriate treating specialist.</p>	<p>Symptomatic</p> <p>Severe symptomatic mitral stenosis, until successfully treated</p> <p>Atrial fibrillation</p> <p>PAP >50% systemic</p> <p>Inability to exercise for >6 Mets on Bruce protocol (when indicated by a physician)</p> <p>Thromboembolic complications</p>	<p>Maximum – 1 year</p> <p>The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty.</p>	<p>[19]</p>
<p>Post-Percutaneous Balloon Mitral Valvotomy or Post-Surgical Commissurotomy</p>	<p>Asymptomatic</p> <p>Minimum 4 weeks post post-percutaneous balloon mitral valvotomy</p> <p>Minimum 3 months post-surgical commissurotomy</p> <p>Has clearance by an appropriate treating specialist</p> <p>Meets the certification recommendations for the underlying condition (see table</p>	<p>Symptomatic</p> <p>Does not meet certification criteria</p>	<p>Maximum – 1 year</p> <p>The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty</p>	<p>[69]</p>

	below)			
Pulmonary Hypertension	<p>Asymptomatic PAP ≤ 50%</p> <p>Clearance by an appropriate cardiovascular disease specialist</p> <p>The medical examiner believes the nature and severity of the medical condition does not interfere with safe driving ability and is not a risk to public safety</p>	<p>Symptomatic PAP >50%</p>	<p>Maximum – 1 year</p> <p>The driver should have follow-up dependent upon the clinical course of the condition and recommendation of the treating specialist, but at least annually.</p> <p>The medical examiner may, on a case-by-case basis, obtain additional tests and/or consultation to adequately assess driver medical fitness for duty</p>	[66, 67]

Peripheral Vascular Disease

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Peripheral Vascular Disease; Intermittent Claudication Evaluate for associated cardiovascular diseases	Absence of rest symptoms Minimal 1 month post-intervention Minimal 3 months post-surgical intervention Clearance by appropriate treating specialist	Does not meet the certification criteria	Maximum – 1 year	[70-73]

Syncope

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Syncope	Etiology defined and appropriate treatment provided	If etiology is unknown or unclarified	Maximum – 1 year	[74]
Neurocardiogenic Syncope Excellent long-term survival prognosis, but there is risk for syncope that may be due to cardioinhibitory (slowing heart rate) or vasodepressor (drop in blood pressure) components, or both. Pacemaker will affect only cardioinhibitory component, but will lessen effect of vasodepressor component.	Asymptomatic Minimal 3 months after intervention Relief of symptoms with intervention	Symptomatic	Maximum – 1 year Documented regular pacemaker checks. Absence of symptom recurrence.	[75, 76]
Hypersensitive Carotid Sinus Syndrome with Syncope Excellent long-term survival prognosis, but there is risk for syncope that may be due to cardioinhibitory (slowing heart rate) or vasodepressor (drop in blood pressure) components, or both. Pacemaker will affect only cardioinhibitory component, but will lessen effect of vasodepressor component.	Asymptomatic Asymptomatic with pacemaker implantation Clearance by cardiovascular specialist	Symptomatic	Maximum – 1 year Documented regular pacemaker checks. Absence of symptom recurrence.	[75, 76]
Single Episode Typical Vasovagal Syncope	Diagnosed and appropriately treated	Fails to meet certification criteria	Maximum – 1 year	[75-77]
One or More Episodes Vasovagal Syncope	Asymptomatic Minimal 1 month after etiology identified and treated Minimal 3 months after pacemaker implantation Documentation of normal function Clearance by cardiovascular	Symptomatic	Maximum – 1 year	[75-77]

	specialist			
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Venous Disease

Disorder/Procedure	Certification Approved if:	Not Approved if:	Recertification	Citation
Acute Deep Vein Thrombosis (DVT)	One month post-DVT with adequate anticoagulation treatment Clearance by an appropriate treating specialist	Fails to meet certification criteria	Maximum – 1 year	[15, 78, 79]
Pulmonary Emboli	Asymptomatic Minimal 3 months following appropriate anticoagulation therapy PAP <50% systemic Cleared by an appropriate treating specialist	Symptomatic Active DVT PAP >50% systemic	Maximum – 1 year	[80, 81]

Appendix B: Guidelines and Literature Citations

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Appendix C: Current Standards and Guidelines for Cardiovascular Disease

Current U.S. Medical Fitness Standards and Guidelines for CMV drivers

The FMCSA Regulations, found in 49 Code of Federal Regulations (CFR) 301 through 399, cover businesses that operate CMVs in interstate commerce. FMCSA regulations that pertain to fitness to drive a commercial vehicle are found in 49 CFR 391 Subpart E. Only motor carriers engaged purely in intrastate commerce are not directly subject to these regulations. However, intrastate motor carriers are subject to state regulations, which must be identical to or compatible with the federal regulations in order for states to receive motor carrier safety grants from FMCSA. States have the option of exempting CMVs with a gross vehicle weight rating of less than 26,001 pounds.

The current medical qualification standards for fitness to drive a CMV (49 CFR 391.41[b] subparts 4, 6, and 7) state the following (see: <http://www.fmcsa.dot.gov/rules-regulations/administration/fmcsr/fmcsrruletext.aspx?reg=391.41>):

A person is physically qualified to drive a CMV if that person:

Has no current clinical diagnosis of myocardial infarction, angina pectoris, coronary insufficiency, thrombosis, or any other cardiovascular disease of a variety known to be accompanied by syncope, dyspnea, collapse, or congestive cardiac failure;

Has no current clinical diagnosis of high blood pressure likely to interfere with his/her ability to operate a commercial motor vehicle safely;

Has no established medical history or clinical diagnosis of rheumatic, arthritic, orthopedic, muscular, neuromuscular, or vascular disease which interferes with his/her ability to control and operate a commercial motor vehicle safely.