ACOEM Commercial Driver Medical Examiner Training Program

Module 3: Cardiovascular, Hypertension - Pre-Read

Cardiovascular - 49 CFR 391.41(b)(4)
"A person is physically qualified to drive a commercial motor vehicle (CMV) if that person;
Has no current clinical diagnosis of myocardial infarction, angina pectoris, coronary
insufficiency, thrombosis, or any other cardiovascular disease (CVD) of a variety known to be
accompanied by syncope, dyspnea, collapse, or congestive cardiac failure."

Relevance to Driving
The fundamental question when deciding if a commercial driver should be medically certified is whether
the driver has a CVD that increases the risk of sudden death or incapacitation and creates a danger to the
safety and health of the driver, as well as the public sharing the road.

A number of concerns beyond the typical cardiac risk factors predispose commercial drivers to an
increased risk of CVD:
• According to the Commercial Driver’s License Information System, in 2009 the average age of a
driver is 39 years.
• Obesity and a sedentary lifestyle increase the risk of CVD. Both are more common in the
commercial driving population than in the general population.
• Driving stressors, such as traffic congestion, erratic shift work, a sense of responsibility for
others, and emotional distress due to belligerent passengers, can lead to increased
neurosympathetic and adrenocortical catecholamine and cortisol release. This increases the
likelihood of changes in arterial tone, myocardial excitability and contractility, and thrombogenic
propensity, particularly given the aging workforce in the United States.
• Drivers are exposed to other environmental stressors that may be detrimental to the
cardiovascular system, such as excessive noise, temperature extremes, air pollution, and whole
body vibration.

The effect of CVD on the commercial driver is significant now and will increase in the future.

The major clinical manifestations of CVD are acute myocardial infarction, angina pectoris, sudden death,
and congestive heart failure. Arrhythmia is the most likely cause of sudden driver incapacitation.
However, coronary heart disease (CHD) is the most common etiology. Estimated frequencies of initial
presentation of CHD are approximately 50% acute myocardial infarction, 30% angina, and 20% sudden
death. Sudden cardiac dysfunction is particularly relevant to safety-sensitive positions, such as pilots,
merchant marines, and commercial drivers. In these jobs, policies are expected to protect against gradual
or sudden incapacitation on the job and harm to the public.

The effect of heart disease on driving must be viewed in relation to the general health of the driver. Other
medical conditions may exacerbate a cardiovascular condition. Thus, medical certification to drive
depends on a comprehensive medical assessment of overall health and informed medical judgment about
the impact of single or multiple conditions on the whole person.

Disqualification requires that the CMV driver exhibit a higher than acceptable likelihood of acute
incapacitation from a cardiac event, resulting in an increased risk to the safety and health of the driver and
the public.

Health History and Physical Examination
The general purpose of the history and physical examination is to detect the presence of physical, mental, or organic conditions of such character and extent as to affect driver ability to operate a CMV safely. This examination is for public safety determination and is considered by the Federal Motor Carrier Safety Administration (FMCSA) to be a “medical fitness for duty” examination.

As the medical examiner, the fundamental obligation during the cardiovascular assessment is to establish whether a driver has a cardiovascular disease or disorder that increases the risk for sudden death or incapacitation, thus endangering driver and public safety and health.

The examination is based on information provided by the driver (history), objective data (physical examination), and additional testing requested by the medical examiner. The assessment should reflect physical, psychological, and environmental factors.

Medical certification depends on a comprehensive medical assessment of overall health and informed medical judgment about the impact of single or multiple conditions on the whole person.

During the physical examination, the ME should ask the same questions the ME would of any individual who is being assessed for cardiovascular concerns. The FMCSA Medical Examination Report form includes health history questions and physical examination checklists. Additional questions should be asked to supplement information requested on the form. The ME should ask about and document cardiovascular symptoms.

The ME must review and discuss with the driver any "Yes" answers

Does the driver have:

- A current clinical diagnosis of myocardial infarction, angina pectoris, coronary insufficiency, or thrombosis?
- Syncope, dyspnea, or collapse?
- Heart failure?
- A history of heart disease or acute myocardial infarction?
- A history of other heart conditions?
- A history of heart surgery (valve replacement/bypass, angioplasty, implantable cardiac defibrillator, pacemaker)?
- Use cardiovascular medications that effectively control a condition without side effects that interfere with safe driving?

Questions that may be asked include:

Does the driver have:

- Chest pain?
- Chest pressure or ache with exertion?
- Pain, pressure, or dyspnea at rest or with exertion?
- Recurrent and/or severe palpitations?
- Pre-syncope (dizziness, light-headedness) or true syncope (loss of consciousness)?
- Medical therapy that requires monitoring?

The ME must evaluate:

On examination, does the driver have:

- Murmurs, extra heart sounds, or arrhythmias?
- An enlarged heart?
• Abnormal pulse and amplitude, carotid or arterial bruits, or varicose veins?

The ME must document discussion with the driver about:
• Any affirmative history, including if available:
  o Onset date, diagnosis.
  o Medication(s), dose, and frequency.
• Any current limitation(s).
• Potential negative effects of medication use, including over-the-counter medications, while driving.
• Any abnormal finding(s), noting:
  o Effect on driver ability to operate a CMV safely.
  o Necessary steps to correct the condition as soon as possible, particularly if the untreated condition could result in more serious illness that might affect driving.
• Any additional cardiovascular tests and evaluation.

Medical fitness for duty includes the ability to perform strenuous labor. Overall requirements for commercial drivers, as well as the specific requirements in the job description of the driver, should be deciding factors in the certification process.

**Cardiovascular Topics**

**Aneurysms, Peripheral Vascular Disease, and Venous Disease and Treatments**

The diagnosis of arterial disease should alert you to the need for an evaluation to determine the presence of other cardiovascular diseases.

Rupture is the most serious complication of an abdominal aortic aneurysm and is related to the size of the aneurysm. Deep venous thrombosis can be the source of acute pulmonary emboli or lead to long-term venous complications. Intermittent claudication is the primary symptom of peripheral vascular disease of the lower extremities.

**Abdominal Aortic Aneurysm**

The majority of abdominal aortic aneurysms (AAAs) occur in the sixth and seventh decades of life and occur more frequently in males than in females by a 3:1 ratio. The majority of AAAs are asymptomatic. An AAA can be associated with other cardiovascular disease.

The overall detection rate of AAAs on examination is 31%. Detection during a physical examination depends on aneurysm size and is affected by obesity. Clinical examination identifies approximately 90% of aneurysms greater than 6 cm. Auscultation of an abdominal bruit may indicate the presence of an aneurysm.

Rupture is the most serious complication of an AAA and can be life threatening. The risk of rupture increases as the aneurysm increases in size.

An AAA:
  • Less than 4 cm rarely ruptures.
  • Smaller than 5 cm has a 1% to 3% per year rate of rupture.
  • 5 cm to 6 cm has a 5% to 10% per year rate of rupture.
  • Greater than 7 cm has approximately a 20% per year rate of rupture.

Monitoring of an aneurysm is advised because the growth rate can vary and rapid expansion can occur.
Acute Deep Vein Thrombosis
The commercial driver is at an increased risk for developing acute deep vein thrombosis (DVT) due to long hours of sitting as part of the profession. DVT can be the source of pulmonary emboli that can cause gradual or sudden incapacitation or death. Adequate treatment with anticoagulants decreases the risk of recurrent thrombosis by approximately 80%.

Chronic Thrombotic Venous Disease
Chronic thrombotic venous disease of the legs increases the risk of pulmonary emboli; however, there is insufficient research to confirm the level of risk. As a medical examiner, you must evaluate on a case-by-case basis to determine if the driver meets cardiovascular requirements.

Intermittent Claudication
Approximately 7% to 9% of persons with peripheral vascular disease develop intermittent claudication, the primary symptom of obstructive vascular disease of the lower extremity. In cases of severe arterial insufficiency, necrosis, neuropathy, and atrophy may occur.

Other Aneurysms
Aneurysms can develop in visceral and peripheral arteries and venous vessels. Rupture of any of these aneurysms can lead to gradual or sudden incapacitation and death. Much of the information on aortic aneurysms is applicable to aneurysms in other arteries.

Peripheral Vascular Disease
Obstructive vascular disease of the lower extremities is a widely recognized peripheral vascular disease (PVD) in adults. PVD is usually a slow, progressive disease with a benign course that carries little to no risk for gradual or sudden incapacitation.

For the driver, pain at rest represents a critical degree of ischemia and is disqualifying because of the likelihood of reduced dexterity in the affected limb. PVD can necessitate surgical revascularization, angioplasty, or amputation.

Post-Surgical Repair of Aneurysm
With improved surgical outcomes, and without contraindication for surgery, aneurysms can be electively repaired to prevent rupture. The decision by the treating provider not to surgically repair an aneurysm does not mean that the driver can be certified to drive safely. However, a recommendation to surgically repair an aneurysm disqualifies the driver until the aneurysm has been repaired and a satisfactory recovery period has passed.

Pulmonary Emboli
Deep vein thrombosis can be one of the sources of pulmonary emboli (PE). PE can cause gradual or sudden incapacitation and significant morbidity and mortality.

Superficial Phlebitis
Although superficial phlebitis is a benign and self-limited disease, deep vein thrombosis (DVT) is often a coexisting condition and needs to be excluded during the course of examination.

Thoracic Aneurysm
While relatively rare, thoracic aneurysms are increasing in frequency. Size of the aorta is considered the major factor in determining risk for dissection or rupture of a thoracic aneurysm.

Varicose Veins
Varicose veins with the associated symptoms and complications affect more than 20 million people in the United States. Complications include chronic venous insufficiency, leg ulcerations, and recurrent deep vein thrombosis.

The presence of varicose veins does not medically disqualify the commercial driver.

**Cardiac Arrhythmias and Treatments**
The majority of sudden cardiac deaths are thought to be secondary to ventricular tachycardia or ventricular fibrillation and occur most often when there is no prior diagnosis of heart disease.

Risk determination is difficult because of the number of variables that must be considered. The prognosis is generally determined by the underlying heart disease. While defibrillation may restore a normal rhythm, there remains a high risk of recurrence.

When the driver has a history of arrhythmia or uses an anti-arrhythmia device, you, as a medical examiner, should consider the following:
- Is the underlying heart disease disqualifying?
- What is the risk for sudden death?
- What is the risk for cerebral hypoperfusion and loss of consciousness?

**Implantable Cardioverter-Defibrillators**
Implantable cardioverter-defibrillators (ICD) are electronic devices that treat cardiac arrest, ventricular fibrillation, and ventricular tachycardia through the delivery of rapid pacing stimuli or shock therapy.

ICDs treat but do not prevent arrhythmias. Therefore, the driver remains at risk for syncope. The management of the underlying disease is not effective enough for the driver to meet cardiovascular qualification requirements. Combination ICD/pacemaker devices are also ineffective in preventing incapacitating cardiac arrhythmia events.

**Pacemakers**
A pacemaker is an implantable device designed to treat bradycardia. When assessing the risk for sudden, unexpected incapacitation in a driver with a pacemaker, the underlying disease responsible for the pacemaker indication must be considered.

Both sinus node dysfunction and atrioventricular (AV) block have variable long-term prognoses, depending on the underlying disease.

Cerebral hypoperfusion is usually corrected by support of heart rate via the implantation of a pacemaker.

Currently, pacemakers and the lead systems are reliable and durable over the long term.

**Supraventricular Arrhythmias**
Supraventricular arrhythmias fall into two main categories: supraventricular tachycardia (SVT) and atrial fibrillation.

SVT is a common arrhythmia that is usually not considered a risk for sudden death. On occasion, SVT can cause loss of consciousness or compromise cerebral function. Treatment by catheter ablation is usually curative and allows drug therapy to be withdrawn.
The major risk associated with atrial fibrillation is the presence of an embolus which can cause a stroke. Anticoagulant therapy decreases the risk of peripheral embolization in individuals with risk factors for stroke.

**Ventricular Arrhythmias**

Ventricular arrhythmias are categorized as ventricular fibrillation and ventricular tachycardia and are responsible for the majority of instances of cardiac sudden death. Most cases are caused by coronary heart disease, but can also occur in people with hearts that are structurally normal.

Certification parameters include:
- Left ventricular ejection fraction (LVEF).
- Nonsustained ventricular tachycardia (NSVT).
- Ventricular tachycardia (VT).

**Coronary Heart Diseases and Treatments**

As a medical examiner, it is your decision whether the nature and severity of the condition of the driver will result in gradual or sudden incapacitation. The major clinical manifestations of coronary heart disease (CHD) are acute myocardial infarction, angina pectoris (either stable or unstable), congestive heart failure, and sudden death.

Sudden death occurs when an individual goes from a usual state of health to death within 1 hour. In some cases, those who suffer sudden death are asymptomatic with the first symptom of CHD being sudden death.

The incidence of crashes caused by sudden death is relatively low, primarily because of the length of time between the onset of the cardiovascular event and the incapacitation of the driver. Therefore, it is important that you educate the driver about warning signs of an impending CHD event. Emphasize that the driver may have only a short time following the onset of symptoms to safely stop the vehicle and call for medical assistance.

The major predictor of CHD is left ventricular function. Other indicators to be considered include:
- General heath.
- Age.
- Arrhythmias.
- Angina pectoris.
- Associated vascular disease.
- Severity of CHD.

The qualified driver with CHD should:
- Secure clearance from a cardiovascular specialist who understands the functions and demands of commercial driving.
- Tolerate cardiovascular medication and be:
  - Knowledgeable about medications used while driving.
  - Free from side effects that compromise driving ability.
  - Compliant with the ongoing treatment plan.

**Acute Myocardial Infarction**

The first few months following an acute myocardial infarction (MI) pose the greatest risk of mortality, with the majority of deaths classified as sudden death. Current opinion among clinicians states that post-
MI drivers may safely return to any occupational task provided there is no exercise-induced myocardial ischemia or left ventricular dysfunction.

**Angina Pectoris**
Angina pectoris is at the lower end of the spectrum for risk of adverse clinical outcomes among individuals with coronary heart disease (CHD). The presence of this condition usually implies that at least one coronary artery has hemodynamically significant narrowing.

When evaluating the driver with angina, the ME should distinguish between stable and unstable angina. The presence of unstable angina may be a precursor to a cardiovascular episode known to be accompanied by syncope, dyspnea, collapse, or congestive cardiac failure.

Stable angina may be precipitated by a predictable pattern, including:
- Exertion.
- Emotion.
- Extremes in weather.
- Sexual activity.

Unstable angina has an unpredictable course characterized by:
- Pain occurring at rest.
- Changes in pattern (i.e., increased frequency and longer duration).
- Decreased response to medication.

**CHD Risk-Equivalent — Multiple CHD Risk Factors**
The presence of one or more of these medical conditions may be insufficient to not certify a driver. However, the presence of these conditions can cause the driver to be at as great a risk of sudden death or incapacitation as the driver with known coronary heart disease (CHD).

CHD risk-equivalent conditions include:
- Presence of diabetes mellitus.
- Presence of peripheral vascular disease.
- A 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.

**Coronary Artery Bypass Grafting Surgery**
Coronary artery bypass grafting (CABG) surgery is frequently the preferred choice of therapy for individuals with multi-vessel coronary heart disease, narrowing of the proximal left main coronary artery, and extensive atherosclerosis in the presence of left ventricular dysfunction or debilitating angina.

Following CABG surgery, individuals are at less risk of sudden death than those who are treated medically. Most drivers who undergo CABG surgery are able to return to work. A longer waiting period is recommended to allow sternal incision healing. The sternum should be completely healed before certifying a driver.

A significant risk associated with CABG surgery is the high long-term reocclusion rate of the bypass graft.

**Heart Failure**
The prognosis for heart failure (HF) depends on the underlying disease; however, the driving risks for HF do not. Sudden death is responsible for 10% to 30% of all deaths in individuals with severe symptoms. Even in mildly symptomatic individuals, sudden death accounts for the majority of deaths.
• Coronary heart disease (CHD) is the major cause of systolic dysfunction.
• Hypertension is the cause or associated factor in the development of HF among individuals with a nonischemic etiology.
• Idiopathic dilated cardiomyopathy is the most frequent diagnosis of individuals who present with systolic dysfunction and no evidence of significant underlying coronary artery disease.

Percutaneous Coronary Intervention
The Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Vehicle Drivers recommendations for percutaneous coronary intervention (PCI) encompass angioplasty and other catheter-based techniques aimed at relieving coronary obstructions.

In the setting of an uncomplicated, elective procedure to treat stable angina, the post-procedure waiting period is 1 week. The waiting period allows for a small threat caused by acute complications at the vascular access site. Drivers undergoing PCI in the setting of an acute myocardial infarction or unstable angina should be restricted from driving duties for the longer waiting period recommended for these conditions.

Congenital Heart Disease
Heart failure and sudden death are the major causes of death among individuals with congenital heart disease. Due to the complexity of these problems, the Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Drivers recommend that the driver has regular, ongoing follow-up by a cardiologist knowledgeable in adult congenital heart disease.

The driver with congenital heart disease must meet the qualification standards. As a medical examiner, your decision to certify should be based on:
• Anatomic diagnosis.
• Severity of the congenital defect.
• Results of treatment.
• Present fitness status.
• Risk of sudden death or incapacitation.

Heart Transplantation
Although the number of heart transplant recipients is relatively small, some recipients may wish to be commercial motor vehicle drivers. The major medical concerns for certification of a commercial driver heart recipient are transplant rejection and post-transplant atherosclerosis.

Myocardial Disease
Myocardial diseases are often progressive and require long-term follow-up. Even so, improved diagnostic testing and treatment can increase the number of drivers with myocardial disease who seek commercial motor vehicle driver certification.

Hypertrophic Cardiomyopathy
Hypertrophic cardiomyopathy is a complex disease characterized by marked morphologic, genetic, and prognostic heterogeneity. Some individuals experience a benign and stable clinical course, while in others the disease is characterized by progressive symptoms. For some individuals, sudden death is the first definitive manifestation of the disease.

Restrictive Cardiomyopathy
The Mayo Clinic performed a study on idiopathic restrictive cardiomyopathy between 1979 and 1996. The Clinical Profile and Outcome of Idiopathic Restrictive Cardiomyopathy report indicated a 5-year survival rate of only 64%, compared with an expected survival rate of 85%.

**Syncope**

Syncope is a symptom, not a medical condition, that can present an immediate threat to public safety when causing the driver of a commercial motor vehicle to lose control of the vehicle.

As an example, syncope as a consequence of an arrhythmia while driving, places the driver and others around the driver at the time in serious jeopardy. Medications are available that are effective in managing ventricular arrhythmias and, although they are designed to prevent occurrences, they are not "fail-safe" and if an arrhythmia recurs, syncope may follow.

Recurrent, unexplained syncope and syncope from cardiac causes may herald a markedly increased future risk for sudden death.

The medical examiner should ensure that:

- Diagnosis distinguishes between pre-syncope (i.e., dizziness, lightheadedness) and true syncope (i.e., loss of consciousness).
- The medications used by the driver do not predispose the driver to precipitous declines in blood pressure, syncope, fatigue, or electrolyte shifts and imbalances.
- Cardiac-based syncope is differentiated from other causes of syncope.
  - Conduction system diseases that cause syncope must be treated before the driver is considered for certification.
- Other forms of syncope, such as neurological-based conditions (e.g., migraine headache, seizures) are adequately evaluated.
- You may refer to the Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Vehicle Drivers for diagnosis-specific recommendations for:
  - Hypersensitive carotid sinus with syncope.
  - Neurocardiogenic syncope.

**Valvular Heart Diseases and Treatments**

Murmurs are a common sign of valvular heart conditions; however the presence of a murmur may be associated with other cardiovascular conditions. As a medical examiner, you must distinguish between functional murmurs and pathological murmurs that are medically disqualifying.

Classification of Murmur Severity

The intensity of murmurs is classified on a scale of I to VI, from the least pronounced murmur to the loudest. Classification is rated as follows:

- Grade I – Must strain to hear a murmur.
- Grade II – Can hear a faint murmur without straining.
- Grade III – Can easily hear a moderately loud murmur.
- Grade IV – Can easily hear a moderately loud murmur that has a thrill.
- Grade V – Can hear the murmur when only part of the stethoscope is in contact with the skin.
- Grade VI – Can hear the murmur with the stethoscope close to the skin; it does not have to be in contact with the skin to detect the murmur.

Murmurs that are:

- Systolic and grade I or II are usually benign if the driver has no signs or symptoms of heart disease.
- Mid-systolic are usually benign if the driver has no signs or symptoms of heart disease.
• Additional evaluation is recommended when murmurs are:
  • Systolic, grade I or II, and the driver has signs or symptoms of heart disease.
  • Systolic and grade III or higher.
  • Holosystolic or late systolic.
  • Diastolic or continuous.

Aortic Regurgitation
Aortic regurgitation is usually a chronic condition characterized by a prolonged asymptomatic phase and gradual left ventricular (LV) dilatation. Other conditions such as infective endocarditis and aortic dissection can result in acute severe aortic regurgitation. The recommendations are for chronic aortic regurgitation.

Recommendation parameters for aortic regurgitation include the severity of the diagnosis, LV size, and the presence of signs or symptoms.

Mild or moderate aortic regurgitation occurs in the presence of normal LV systolic function and little or no LV enlargement.

Aortic Stenosis
The most common cause of aortic stenosis in adults is a degenerative process associated with many of the risk factors underlying atherosclerosis. Aortic stenosis may cause a heart murmur.

Recommendation parameters for aortic stenosis include the severity of the diagnosis and the presence of signs or symptoms.

Aortic Valve Repair
Aortic valve repair is a technique for repairing the existing aortic valve and usually does not require anticoagulant therapy. Early post-operative evaluation is required to assess adequacy of repair and extent of residual aortic regurgitation.

Mitral Regurgitation
Recommendation parameters for mitral regurgitation include the severity of the diagnosis and the presence of signs or symptoms. The development of symptoms, especially dyspnea, fatigue, orthopnea, and/or paroxysmal nocturnal dyspnea, is a marker of a poor prognosis, including an inability to perform driver tasks and increased risk for sudden cardiac death.

Mitral Stenosis
Recommendations for mitral stenosis are based on valve area size and the presence of signs or symptoms. Inquire about episodes of angina or syncope, fatigue, and the ability to perform tasks that require exertion.

Mitral Stenosis Treatment
Management of mitral stenosis is based primarily on the development of symptoms and pulmonary hypertension rather than the severity of the stenosis itself. Treatment options for mitral stenosis include enlarging the mitral valve or cutting the band of mitral fibers.

Procedures include:
  • Percutaneous balloon mitral valvotomy.
  • Surgical commissurotomy.

Symptomatic improvement occurs almost immediately, but after 9 years, recurrent symptoms are present in approximately 60% of individuals.
Mitral Valve Prolapse
The natural history of mitral valve prolapse is extremely variable and depends on the extent of myxomatous degeneration, the degree of mitral regurgitation, and association with other conditions.

Mitral valve prolapse is usually a benign condition. In some cases, mitral regurgitation may be progressive, resulting in left ventricular (LV) and left atrial enlargement, atrial fibrillation, and congestive heart failure.

Mitral Valve Repair for Mitral Regurgitation
The majority of inadequate valvular repair procedures can be detected in the early perioperative period. Careful evaluation at this time includes a two-dimensional echocardiography with Doppler and, if necessary, transesophageal echocardiography.

Prosthetic Valves
Prosthetic valves can be mechanical or biological. There are a wide range of reported complications depending upon the variable methods of reporting, the make and model of the prosthesis, the site of implantation, comorbidities, and underlying left ventricular (LV) function, among other causes.

The clinical course is heavily influenced by factors other than valve-related complications, for example, LV dysfunction, congestive heart failure, progression of disease in other valves, coronary disease, or pulmonary hypertension.

Pulmonary Valve Stenosis
Pulmonary valve stenosis is usually a well-tolerated cardiac lesion normally exhibiting a gradual progression. Gradual or sudden incapacitation may, however, occur in certain circumstances.

Cardiovascular Tests
Detection of an undiagnosed heart or vascular finding during a physical examination may indicate the need for further testing and examination to adequately assess medical fitness for duty.

Diagnostic-specific testing may be required to detect the presence and/or severity of cardiovascular diseases. The additional testing may be ordered by the medical examiner, primary care physician, cardiologist, or cardiovascular surgeon.

When requesting additional evaluation from a specialist, the specialist must understand the role and function of a driver; therefore, it is helpful if you include a description of the role of the driver and a copy of the applicable medical standard(s) and guidelines with the request.

Record additional tests in the Medical Examination Report form, Section 6. LABORATORY AND OTHER TEST FINDINGS, and/or attach additional test reports.

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ETT - stress test results attached

Echocardiography
Left ventricular ejection fraction (LVEF) may be assessed by echocardiography. Imaging studies have superior sensitivity and specificity compared to the standard exercise tolerance test (ETT) and are indicated in the presence of an abnormal resting electrocardiogram or non-diagnostic standard ETT.

Driver should have:
- An LVEF greater than or equal to 40%.
- No pulmonary hypertension.
  NOTE: Pulmonary hypertension is pulmonary artery pressure greater than 50% of systemic systolic blood as determined by echocardiography or cardiac catheterization.

Remember - If echocardiography test results are inconclusive, some form of radionuclide imaging may be used to obtain the ejection fraction measurement.

Exercise Tolerance Test
The exercise tolerance test is the most common test used to evaluate workload capacity and detect cardiac abnormalities.

Driver should be able to:
- Exercise to a workload capacity greater than 6 Metabolic Equivalents (METs) (through Bruce protocol stage II or equivalent).
- Attain a heart rate greater than or equal to 85% of predicted maximum (unless on beta blockers).
- Have a rise in systolic blood pressure greater than or equal to 20 mm Hg without angina.
- Have no significant ST segment depression.
  NOTE: METs — Extensive literature exists on the energy requirements for many physical tasks.
  - Sedentary activity requires fewer than 2 METs. These activities include sitting, slow walking, and lifting light objects of no more than 10 pounds.
  - Light work requires 2 to 4 METs and includes carrying lightweight objects of no more than 20 pounds.
  - Medium work requires 4 to 6 METs and includes carrying moderate weight objects of up to 50 pounds.
  - Heavy and very heavy work requires greater than 6 METs and includes carrying heavy objects and climbing stairs rapidly.

Remember - Medical fitness for duty includes the ability to perform strenuous work. Overall requirements for commercial drivers along with the specific requirements in the job description should be deciding factors in the certification process.

High Blood Pressure/Hypertension - 49 CFR 391.41(b)(6)
"A person is physically qualified to drive a commercial motor vehicle if that person —
  Has no current clinical diagnosis of high blood pressure likely to interfere with his/her ability to operate a commercial motor vehicle safely."

49 CFR 391.43(f) Blood Pressure (BP)
"If a driver has hypertension and/or is being medicated for hypertension, he or she should be recertified more frequently. An individual diagnosed with Stage 1 hypertension (BP is 140/90–159/99) may be certified for one year. At recertification, an individual with a BP equal to or less than 140/90 may be certified for one year; however, if his or her BP is greater than 140/90 but less than 160/100, a one-time certificate for 3 months can be issued. An individual diagnosed with Stage 2 (BP is 160/100-179/109)
should be treated and a one-time certificate for 3-month certification can be issued. Once the driver has reduced his or her BP to equal to or less than 140/90, he or she may be recertified annually thereafter. An individual diagnosed with Stage 3 hypertension (BP equal to or greater than 180/110) should not be certified until his or her BP is reduced to 140/90 or less, and may be recertified every 6 months."

Relevance to Driving

According to the Third National Health and Nutrition Examination Survey, 29% of all U.S. adults 18 years and older have BP greater than or equal to 140/90 or are taking medication for hypertension. The prevalence of hypertension is nearly equal for men and women. Among adults with hypertension, 78% are aware of their condition, 68% are treated with antihypertensive medication, and 64% achieve BP less than 140/90 with treatment.

Hypertension alone is unlikely to cause sudden collapse; however, hypertension is a potent risk factor for the development of more serious cardiovascular disease (CVD), peripheral vascular disease, and chronic renal insufficiency. BP greater than or equal to 140/90 is deemed high for most individuals without other significant cardiovascular risk factors.

In individuals ranging from 40 to 89 years of age, for every 20 mm Hg systolic or 10 mm Hg diastolic increase in BP, there is a doubling of mortality from both ischemic heart disease and stroke. The relationship between BP and risk of a CVD event is continuous, consistent, and independent of other risk factors. Both elevated systolic and diastolic BP are risk factors for coronary heart disease (CHD).

Once in the profession, commercial motor vehicle (CMV) drivers have a greater propensity to develop hypertension than their peers in other professions. The Cardiovascular Advisory Panel Guidelines for the Medical Examination of Commercial Motor Vehicle Drivers includes data from Ragland, et al., demonstrating that the percentage of drivers with hypertension increased from 29% in drivers with fewer than 10 years of driving experience, to 32% in drivers with 10-20 years of experience, and to 39% in drivers with more than 20 years of driving experience. As the years of experience rise, part of the increase in hypertension may relate to accompanying aging, increase in body mass, or decline in physical activity.

High BP can be a modifiable CVD risk factor. Lifestyle modification and pharmacotherapy are the mainstays of antihypertensive treatment regimens. Effective hypertension management reduces cardiovascular morbidity and mortality. The Chicago Heart Association Detection Project in Industry found that antihypertensive therapy reduces the incidence of stroke, myocardial infarction, and heart failure.

Contemporary medical therapies are effective in lowering BP, reducing complications, and are generally regarded as safe.

Health History and Physical Examination

The general purpose of the history and physical examination is to detect the presence of physical, mental, or organic conditions of such character and extent as to affect the ability of the driver to operate a CMV safely. This examination is for public safety determination and is considered by the Federal Motor Carrier Safety Administration (FMCSA) to be a “fitness for duty” examination.

The medical examiner’s fundamental obligation is to establish whether a driver has high BP that is likely to interfere with the ability to operate a CMV safely, thus endangering public safety.
The examination is based on information provided by the driver (history), objective data (measuring BP and physical examination), and additional testing requested by the medical examiner. The assessment should reflect physical, psychological, and environmental factors.

Medical certification depends on a comprehensive medical assessment of overall health and informed medical judgment about the impact of single or multiple conditions on the whole person.

During the physical examination, the ME should ask the same questions they would for any individual who is being assessed for high BP and/or with a current clinical diagnosis of hypertension.

A current diagnosis of hypertension exists when one or more antihypertensive agents are used to control high BP. When antihypertensive medication is used to treat an underlying condition other than high BP, certification is based on the underlying condition and tolerance to the medication.

The FMCSA Medical Examination Report form includes questions about the health history of the driver and requires measuring BP. Additional questions should be asked to supplement the information requested on the Medical Examination Report form. The ME may ask about symptoms of hypertension and use of antihypertensive medications. It is generally not the role of the medical examiner to determine treatment for the disease.

The ME should evaluate for other clinical cardiovascular diseases, including CHD, heart failure, and left ventricular hypertrophy, as well as stroke or transient ischemic attack, peripheral artery disease, retinopathy, nephropathy, and other target organ damage.

The ME must review and discuss with the driver any "yes" answers

Does the driver:
- Have high BP?
- Take medication?

Questions the ME may ask include

Does the driver have:
- Contact information for the treating provider and a medical release form?
- Symptoms related to or caused by high BP?
- Limitations resulting from the disease or treatment?
- Lifestyle risk factors, particularly modifiable behaviors and conditions (e.g., smoking, obesity, and/or lack of exercise)?
- Uncontrolled hypertension while using three or more antihypertensive medications at close to maximum dosages? If the response is “yes,” an evaluation for secondary hypertension may be appropriate.

For every certification and recertification examination the ME must:
- Measure BP.
- Confirm BP greater than 139/89 with a second measurement taken later during the examination.
- Check pulse rate, strength, and rhythm.

**NOTE:** Under the supervision of the medical examiner, trained assistive personnel may measure and record the BP; however, it is prudent for the medical examiner to confirm disqualifying BP personally.

**Measure Blood Pressure**
Because of the prevalence of hypertension in the commercial driving population, this routine test is an essential tool as part of the physical examination to determine the medical fitness for duty of the driver. Blood pressure (BP) should be measured in a standardized fashion using equipment that meets certification criteria.

BP levels aid in evaluating the risk of an acute hypertensive event while driving and assist you as you make certification decisions that allow a driver who does not present an immediate safety risk to continue working while obtaining primary care provider evaluation and implementing a primary care provider treatment plan.

Remember, you are the medical examiner and not the treating provider. The purpose of the examination is medical fitness for duty, not diagnosis and treatment of the underlying disease.

NOTE: Under the supervision of the medical examiner, trained assistive personnel may measure and record BP; however, it is prudent for the medical examiner to confirm disqualifying BP personally.

Confirm BP higher than or equal to 140/90 with a second measurement taken later during the examination. BP, especially systolic pressure, will fluctuate in a short time from normal to elevated and back to normal as a response to many factors, including:

- Circadian cycle.
- Emotional and physical states.
- Transient hypertension (e.g., "white coat syndrome").
- Use of left versus right arm during BP measurement.
- Problems with technique, such as:
  - Placing the BP cuff over clothing instead of on the skin.
  - Using an inappropriately-sized BP cuff.
  - Positioning the arm incorrectly.

Check the pulse and note rate, strength, and rhythm.

Record BP and pulse in Section 5 of the Medical Examination Report form.

<table>
<thead>
<tr>
<th>Blood Pressure Pulse Rate</th>
<th>5. Blood Pressure Pulse Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure Systolic</td>
<td>136</td>
</tr>
<tr>
<td>Diastolic</td>
<td>84</td>
</tr>
<tr>
<td>Pulse Rate Regular</td>
<td>76</td>
</tr>
</tbody>
</table>

NOTE: The table on the right side of Section 5 summarizes certification decisions based on the stages of hypertension. The first column shows the BP ranges and the second column reflects the corresponding stage of hypertension. When the systolic and diastolic readings are in different stages of hypertension, classify BP as the higher stage (e.g., BP of 164/96 or 154/104 is classified as stage 2 hypertension).

The ME must document discussion with the driver about

- Any affirmative history, including if available:
  - Onset date and diagnosis.
  - Medication(s), dose, and frequency.
  - Any current limitation(s).
- Potential negative effects of medication used while driving, including over-the-counter medications.
• Any abnormal finding(s), noting:
  o Effect on driver ability to operate a CMV safely.
  o Necessary steps to correct the condition as soon as possible, particularly if the untreated condition could result in more serious illness that might affect driving.
• Any additional tests and evaluation.

Medical fitness for duty includes the ability to perform strenuous labor. Overall requirements for commercial drivers as well as the specific requirements in the job description of the driver should be deciding factors in the certification process.

**Essential Hypertension**

The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure established three stages of hypertension that define the severity of hypertension and guide therapy.

49 CFR 391.43(f) Blood Pressure (BP) was amended to include the use of BP readings equivalent to the stages of hypertension to determine driver certification status. The complete text of the amendment may be accessed at Federal Register/Vol. 68, No. 189/Tuesday, September 30, 2003/Rules and Regulations, 56199.

When you determine certification for the driver with high BP in the ranges of stage 1 or stage 2 hypertension (BP greater than 140/90 but less than 180/100), consider these additional factors:

• Type of examination (certification or recertification).
• Current certification interval (1-2 years or 3 months).
• Treatment (lifestyle changes, use of medication).
• Severity of hypertension prior to treatment (particularly if history of stage 3 hypertension).

The purpose of the one-time, 3-month certificate is to allow the driver with high BP that is an absolute indication for antihypertensive drug therapy to continue to drive while taking steps to lower the elevated BP. It is not intended as a means to indefinitely extend driving privileges for a driver with a condition that is associated with long-term risks.

For the driver with high BP or hypertension to maintain continuous certification, the driver must demonstrate at examination BP at or less than 140/90.

**NOTE:** "One-time" means you cannot issue consecutive 3-month certificates for BP greater than 140/90. It does not mean once in a lifetime.

**Secondary Hypertension**

The prevalence of secondary hypertension in the general population is estimated at between 5% and 20%. You should obtain information that assesses the underlying cause, the effectiveness of treatment, and any side effects that may interfere with driving.

Examples of primary conditions that may lead to secondary hypertension include pheochromocytoma, primary aldosteronism, renovascular disease, and unilateral renal parenchymal disease. Some of these conditions may be amenable to surgical intervention.