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Death in the line of duty...

NIOSH
Fire Fighter Fatality Investigation and Prevention Program

A summary of a NIOSH fire fighter fatality investigation *August, 2013*

Volunteer Fire Chief Suffers Cardiac Arrest at Brush Fire – North Carolina

Executive Summary

On March 3, 2013, a 44-year-old Fire Chief experienced coughing, shortness of breath, and difficulty breathing while functioning as incident commander at a brush fire. The Chief drove himself to an on-scene ambulance and requested assistance. On-scene emergency medical service (EMS) personnel performed an initial assessment, initiated care, and began transport. En route to the emergency department (ED), the Chief suffered cardiac and respiratory arrest. Despite cardiopulmonary resuscitation (CPR) in the ambulance for about 60 minutes, the Chief died.

The death certificate and autopsy report, both completed by the County Medical Examiner's office, listed the cause of death as "atherosclerotic and hypertensive cardiovascular disease." The autopsy revealed a massively enlarged heart with severe coronary atherosclerosis. Given the presentation of his illness and his underlying heart disease discovered at autopsy, the Chief's respiratory distress was probably due to acute exacerbation of undiagnosed heart failure, precipitated by any of the following: a hypertensive crisis, ischemia, a heart attack, or a primary arrhythmia.

NIOSH offers the following recommendations to reduce the risk of heart attacks and sudden cardiac arrest among fire fighters at this and other fire departments across the country.

Ensure that all fire fighters receive an annual medical evaluation consistent with NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments.

Ensure fire fighters are cleared for duty by a physician knowledgeable about the physical demands of firefighting, the personal protective equipment used by fire fighters, and the various components of NFPA 1582.

Phase in a mandatory comprehensive wellness and fitness program for fire fighters.

Introduction & Methods

On March 3, 2013, a 44 year-old Fire Chief experienced breathing problems while functioning as incident commander at a brush fire and then suffered a fatal cardiopulmonary arrest en route to the ED. NIOSH was notified of this fatality on March 4, 2013, by the U.S. Fire Administration. NIOSH contacted the affected fire department (FD) on March 5, 2013, and again on May 16, 2013, to obtain additional information and to schedule the investigation. On June 3, 2013, a contractor for the NIOSH Fire Fighter Fatality Investigation Team (the NIOSH investigator) conducted an on-site investigation of the incident.

During the investigation, the NIOSH investigator interviewed the following people:

- Current Chief of the FD

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Introduction & Methods (cont.)

- Crew members who were working with the deceased Chief at the brush fire
- EMS personnel who provided treatment
- Wife of the deceased Chief
- Medical Examiner

The NIOSH investigator reviewed the following documents in preparing this report:

- County dispatch records
- FD incident report
- FD training records
- Ambulance pre-hospital care report
- Death certificate
- Medical Examiner's report
- Primary care physician (PCP) medical records
- Witness statements taken the day of the event

Investigative Results

Incident. On March 3, 2013, at 1518 hours the FD was dispatched to a brush fire in a national wildlife refuge. The engine arrived at 1527 hours and the Chief arrived in his personally owned vehicle and assumed command of the scene at approximately the same time. The fire was burning in a large open field (primarily sagebrush and grass) and was threatening a building on the refuge property. The Chief was also concerned about the fire entering a tree line and jumping a road, thus threatening private property. The brush truck arrived on scene at 1544 hours.

Several personnel who reported to Command for their assignments noticed that the Chief was coughing and sweating. When questioned about his health, the Chief told members that he was getting over a cold.

At 1554 hours the Chief drove his vehicle a short distance (< 1 mile) from his command post to a Medic unit stationed at the entrance to the refuge. The Chief was gasping for air and vomiting as he walked from his vehicle to the ambulance. The paramedic assisted the Chief into the back of the ambulance and initial assessment revealed that the Chief was sweating profusely and had rapid respirations (> 30 breaths per minute; normal is 6-12 breaths per minute), an elevated heart rate (140 beats per minute; normal resting is 60 -100 beats per minute), and a markedly elevated blood pressure (226/199 millimeters of mercury [mmHg]; normal is <120/80 mmHg). The Chief was immediately placed on oxygen using a non-rebreather mask. The paramedic radioed for assistance from another emergency medical technician (EMT) and a driver. As the two arrived, the ambulance departed the scene at 1605 hours to meet a medical helicopter to transport the Chief to the nearest hospital (46 miles away).

While en route the Chief went into respiratory and cardiac arrest. CPR was initiated. After suctioning the Chief's airway to remove the vomitus, the paramedic inserted an oropharyngeal tube and ventilated the Chief with oxygen using a bag and mask. The EMT attached the automated external defibrillator leads onto the Chief's chest, but no shock was advised. The paramedic attempted orotracheal intubation but was unsuccessful.

The ambulance drove approximately 14 miles to the landing zone where the neighboring advanced cardiac life support unit and medical helicopter met them. All three EMS units continued to provide treatment including intravenous cardiac medications, defibrillations, and intubation. Despite these resuscitation measures, there was no improvement in the Chief's condition. At 1722 hours, approximately 1 hour and 17 minutes after

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Investigative Results (cont.)

the initiation of medical treatment, resuscitation efforts were discontinued and the Chief was pronounced dead.

Medical Findings. The death certificate and autopsy, both completed by the Assistant Chief Medical Examiner, listed the cause of death as "atherosclerotic and hypertensive cardiovascular disease." Pertinent autopsy findings included a massive heart (cardiomegaly) weighing 835 grams (expected 452 grams) with biventricular hypertrophy. His coronary arteries showed "diffuse moderate with multifocal severe" atherosclerotic stenosis of the main coronary arteries. No coronary thrombosis was noted. See Appendix A for more detailed autopsy information.

The Chief had long-standing hypertension (diagnosed in 1999) and Type 2 diabetes mellitus (diagnosed in 2002), both of which were poorly controlled. The Chief switched to a new PCP in August 2011, after having not seen his physician since December 2009. In August 2011, his blood pressure was 200/100 mmHg. The Chief saw his PCP five times between August 2011 and January 2012 to monitor his blood pressure and to adjust his blood pressure medications. The Chief did not return to his PCP after his January 2012 visit, at which time his blood pressure was still poorly controlled (176/90 mmHg). His most recent laboratory tests, which were completed in August 2011, included high blood glucose (224 milligrams per deciliter [mg/dL]; normal < 110 mg/dL) and high hemoglobin A1C (9.4%; normal less than 7.0%), both indicative of poorly controlled diabetes mellitus. Laboratory tests completed in August 2011 also indicated total cholesterol of 173 mg/dL (desirable < 200 mg/dL), high density lipoprotein (HDL cholesterol) of 57 mg/dL (normal 40-59 mg/dL), and low density lipoprotein (LDL cholesterol) of 106 mg/dL (optimal < 100 mg/dL; near optimal 100-129 mg/dL; borderline high 130-159 ml/dL) [National Cholesterol Education Program 2002].

The Chief had a family history of cardiovascular disease, hypertension, and Type 2 diabetes. He had quit smoking approximately 3 years before his death. At autopsy, the Chief was 70 inches tall and weighed about 249 pounds, giving him a body mass index of 35.7 kilograms per meter squared [CDC 2011]. He was a smoker, but had quit smoking in 2010. He had a family history of coronary heart disease (CHD).

Description of the Fire Department

The volunteer FD consists of 30 uniformed personnel serving a population of approximately 1,800 residents in a geographic area of 45 square miles.

Membership. Potential members must have a driver's license and be 18 years of age; junior members may join at 14 years of age but have limited responsibilities. Potential members are required to attend three business meetings, which are held monthly, before the members vote.

Medical Evaluations/Medical Clearance. The FD does not require pre-placement or periodic medical evaluations. The FD does not require a medical clearance for return to work following an injury or illness.

Fitness/Wellness Programs. The FD has exercise equipment at the fire station but does not provide a fitness or wellness program.

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Discussion

Coronary Heart Disease. The most common risk factor for cardiac arrest and sudden cardiac death is CHD, defined as the build-up of atherosclerotic plaque in the coronary arteries [AHA 2012]. Risk factors for CHD include three non-modifiable factors (age older than 45, male gender, and family history of CHD) and six modifiable factors (smoking, hypertension, high blood cholesterol, obesity, physical inactivity, and diabetes mellitus) [National Cholesterol Education Program 2002; AHA 2012;]. The Chief had five of these risk factors (male, family history of CHD, diabetes mellitus, hypertension, and obesity).

The narrowing of the coronary arteries by atherosclerotic plaques occurs over many years, typically decades [Libby 2008]. However, the growth of these plaques probably occurs in a nonlinear, often abrupt fashion [Shah 1997]. Most heart attacks occur when a vulnerable plaque ruptures, causing a blood clot to form and occlude a coronary artery. Establishing a recent (acute) heart attack requires one or more of the following: characteristic electrocardiogram (EKG) changes, elevated cardiac enzymes, or coronary artery thrombus. In this case, the Chief did not have a heart rhythm to conduct an EKG tracing, he died before cardiac enzymes would become elevated, and no thrombus was identified at autopsy. However, heart attacks can occur without evidence of a coronary thrombus [Davies 1992; Farb et al. 1995]. Thus, although a heart attack is unlikely, it cannot be ruled out.

Heart Failure. Heart failure is the inability of the heart to pump enough blood to meet the body's needs [Mann 2008]. Fatigue, shortness of breath, and dyspnea on exertion are the most common initial presentations of heart failure. Because the body can compensate for impaired cardiac function, a person with heart failure can be asymptomatic. Conditions that commonly cause or exacerbate heart failure symptoms include chronic hypertension, hypertensive crisis (rapid acute elevation of blood pressure), myocardial infarction, discontinuation of heart failure medication, cardiac arrhythmias, pulmonary embolus, heat stress, and physical overexertion. The Chief probably had chronic heart failure as evidenced by his massively enlarged heart (severe cardiomegaly) and left ventricular hypertrophy (LVH). His acute onset of respiratory distress (pulmonary edema) was probably an acute exacerbation of his heart failure due to hypertensive crisis (his initial blood pressure was 226/199 mmHg). However, ischemia, a heart attack, or a primary cardiac arrhythmia cannot be ruled out.

Cardiomegaly/Left Ventricular Hypertrophy. The autopsy revealed that the Chief had cardiomegaly and biventricular hypertrophy, with the left ventricle being severely hypertrophied (2.3 cm). Both conditions independently increase the risk for sudden cardiac death [Levy et al. 1990]. Hypertrophy of the left ventricle is relatively common among individuals with long-term hypertension, a heart valve problem, or chronic cardiac ischemia (reduced blood supply to the heart muscle) [Siegel 1997]. The Chief had a history of hypertension and probably had ischemia due to his underlying coronary artery disease (CAD). Therefore, both conditions probably caused his marked cardiomegaly and LVH. On the basis of the lack of characteristic histologic findings on autopsy, the medical examiner determined that hypertrophic cardiomyopathy was not a cause of his cardiomegaly [Ho and Seidman 2006].

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Discussion (cont.)

Sudden Cardiac Death. The Chief's sudden cardiac death was probably an acute exacerbation of undiagnosed heart failure precipitated by any of the following: hypertensive crisis, ischemia, a heart attack, or a primary cardiac arrhythmia. Epidemiologic studies have found that heavy physical exertion sometimes immediately precedes and triggers sudden cardiac death [Albert et al. 2000]. Sudden cardiac events in fire fighters have been associated with alarm response, fire suppression, and heavy exertion during training (including physical fitness training) [Kales et al. 2003; Kales et al. 2007; NIOSH 2007]. Some authors have also suggested that activation of the sympathetic nervous system (adrenaline surge) associated with alarm response and emergency operations may contribute to the triggering of cardiac events in fire fighters [Soteriades et al. 2011]. It is unclear if being incident commander at this brush fire could have generated the physical or emotional stress needed to trigger the Chief's sudden death.

Occupational Medical Standards for Structural Fire Fighters. To reduce the risk of sudden cardiac arrest or other incapacitating medical conditions among fire fighters, the National Fire Protection Association (NFPA) developed NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments [NFPA 2007; NFPA 2013]. This voluntary industry standard provides (1) the components of a preplacement and annual medical evaluation and (2) medical fitness for duty criteria. The Chief either had, or had risk factors for, the following medical conditions warranting medical fitness for duty concerns: hypertension, diabetes mellitus, metabolic syndrome, and CHD.

Hypertension. NFPA 1582 provides guidance for fire department physicians to follow when treating hypertensive fire fighters [NFPA 2013]. The standard states that Stage 2 hypertension (systolic $\geq$ 160 mmHg or diastolic $\geq$ 100 mmHg) compromises the member's ability to safely perform several essential job tasks. Explanatory information in the Appendix indicates that members with Stage 2 hypertension should be restricted until their blood pressure is brought under control. Despite visiting his PCP several times in 2011, the Chief's blood pressure remained poorly controlled. Based on NFPA 1582, the Chief should have been restricted from firefighting duties including incident command because of the risk of sudden incapacitation [NFPA 2013].

Diabetes Mellitus. NFPA 1582 provides guidance for fire department physicians to follow when treating diabetic fire fighters [NFPA 2013]. The standard states that fire fighters with diabetes mellitus that is controlled by diet, exercise, or oral hypoglycemic agents should be restricted from duty unless the member meets all of the following criteria:

- has had hemoglobin A1C measured at least four times a year over the last 12 months prior to evaluation if the diagnosis of diabetes has been present over 1 year. Hemoglobin A1C readings $\geq$ 8% shall trigger a medical evaluation to determine if another condition is responsible for the elevated hemoglobin A1C. In addition,a set schedule for blood glucouse monitoring and a thorough review of that data shall occur
- if on oral hypoglycemic agents, has had no episodes of severe hypoglycemia (defined as requiring assistance of another person in the preceding year)

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- has achieved a stable blood glucose as evidenced by hemoglobin A1C level < 8% during the prior 3-month period
- has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms
- has normal renal function on the basis of a calculated creatinine clearance > 60 milliliters per minute and absence of proteinuria
- has no autonomic or peripheral neuropathy
- has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by EKG and cardiac imaging.

The Chief did not meet any of these criteria. Based on NFPA 1582, he should have been restricted from fire fighting duties including incident command because of increased risk of sudden incapacitation.

Metabolic Syndrome. NFPA 1582 provides guidance for fire department physicians to follow when treating members with metabolic syndrome [NFPA 2013]. Metabolic syndrome increases the risk of cardiovascular ischemic disease, diabetes, and accelerated hypertension. Metabolic syndrome is defined as three or more of the following components [Grundy et al 2004; NFPA 2013]:

- abdominal obesity, defined as a waist circumference >102 cm (>40 in) in men
- triglycerides > 150 mg/dL
- HDL cholesterol < 40 mg/dL for men
- blood pressure > 135/85 mmHg
- fasting blood glucose > 110 mg/dL

The NFPA Standard states that members with the metabolic syndrome should receive an exercise stress test with imaging. An abnormal stress test or an inability to achieve 12 METs on the stress test indicates an inability to safely perform several essential job tasks. The Chief had metabolic syndrome based on his high blood pressure, high blood glucose, and obesity. According to the medical records provided to NIOSH, a stress test was not performed..

Risk Factors for CHD. The Chief had multiple risk factors for CHD and was found on autopsy to have severe CHD. Exercise stress tests can identify occult CHD. Recommendations for conducting exercise stress tests on asymptomatic individuals without known heart disease are varied. The following paragraphs summarize the positions of widely recognized organizations on this topic.

NFPA 1582, a voluntary industry standard, recommends an exercise stress test with or without imaging be performed "when clinically indicated by history or symptoms" and refers the reader to its Appendix A [NFPA 2013]. Items in Appendix A are not standard requirements, but are provided for "informational purposes only." Appendix A recommends using submaximal (85% of predicted maximal heart rate) stress tests as a screening tool to evaluate a fire fighter's aerobic capacity. Cardiology evaluation with a symptom-limiting stress test and imaging studies should be used for fire fighters with the following conditions:

- abnormal screening submaximal tests
- cardiac symptoms
- known coronary artery disease (CAD)
- one or more risk factors* for CAD (in men older than 45 and women older than 55)
- fire fighters with a Framingham Risk Score > 10% [NHLBI 2008]

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*Risk factors are defined as hypercholesterolemia (total cholesterol > 240 milligrams per deciliter), hypertension (diastolic blood pressure > 90 mm of mercury), smoking, diabetes mellitus, or family history of premature CAD (heart attack or sudden cardiac death in a first-degree relative less than 60 years old).

The American College of Cardiology/American Heart Association (ACC/AHA) has also published exercise testing guidelines [Gibbons et al. 2002]. The ACC/AHA guideline states the evidence is "less well established" (Class IIb) for the following groups:

- persons with multiple risk factors (defined similarly to those listed by the NFPA)
- asymptomatic men older than 45 years and women older than 55 years:
  - who are sedentary and plan to start vigorous exercise
  - who are involved in occupations in which impairment might jeopardize public safety (e.g., fire fighters)
  - who are at high risk for CAD due to other diseases (e.g., peripheral vascular disease and chronic renal failure)

The U.S. Department of Transportation provides guidance for those seeking medical certification for a commercial driver's license. An expert medical panel recommended exercise tolerance tests (stress tests) for asymptomatic "high risk" drivers [Blumenthal et al. 2007]. The panel defines high risk drivers as those with any of the following:

- diabetes mellitus
- peripheral vascular disease
- age 45 and above with multiple risk factors for coronary heart disease
- Framingham risk score predicting a 20% coronary heart disease event risk over the next 10 years

The U.S. Preventive Services Task Force (USPSTF) does not recommend stress tests for asymptomatic individuals at low risk for CHD events. For individuals at increased risk for CHD events, the USPSTF found "insufficient evidence to recommend for or against routine screening with EKG, exercise tolerance test, or electron beam computerized tomography scanning …" Rather, they recommend the diagnosis and treatment of modifiable risk factors (hypertension, high cholesterol, smoking, and diabetes) [USPSTF 2004]. The USPSTF does note that "For people in certain occupations, such as pilots, and heavy equipment operators (for whom sudden incapacitation or sudden death may endanger the safety of others), consideration other than the health benefit to the individual patient may influence the decision to screen for coronary heart disease."

In summary, despite the Chief's relatively young age (< 45 years), available guidelines indicate that an exercise stress test was appropriate given the number and severity of his CHD risk factors. Specifically, NFPA 1582 recommends that a stress test be performed for individuals with diabetes mellitus or metabolic syndrome because of the greater risk of cardiovascular disease in individuals with these conditions. Had a stress test been performed, perhaps his underlying CHD could have been identified and subsequently treated.

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Recommendations

NIOSH investigators offer the following recommendations to reduce the risk of on-the-job heart attacks and sudden cardiac arrest among fire fighters.

Recommendation #1: Ensure that all fire fighters receive an annual medical evaluation consistent with NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments.

Guidance regarding the content and frequency of these medical evaluations can be found in NFPA 1582 and in the International Association of Fire Fighters (IAFF)/International Association of Fire Chiefs (IAFC) Fire Service Joint Labor Management Wellness/Fitness Initiative [NFPA 2013; IAFF, IAFC 2008]. These evaluations are performed to determine fire fighters' medical ability to perform duties without presenting a significant risk to the safety and health of themselves or others. To ensure improved health and safety of candidates and members, and to ensure continuity of medical evaluations, it is recommended the FD comply with this recommendation, particularly the section addressing CHD issues. However, the FD is not legally required to follow the NFPA standard or the IAFF/IAFC initiative. Applying this recommendation involves economic repercussions and may be particularly difficult for smaller fire departments to implement.

To overcome the financial obstacle of medical evaluations, the FD could urge current members to get annual medical clearances from their private physicians. Another option is having the annual medical evaluations (vital signs, height, weight, visual acuity, and EKG) completed by paramedics and emergency medical technicians from the local ambulance service. This information could then be provided to a community physician (perhaps volunteering his or her time), who could review the data and provide medical clearance (or further evaluation, if needed). The more extensive portions of the medical evaluations could be performed by a private physician at the fire fighter's expense (personal or through insurance), provided by a physician volunteer, or paid for by the FD, city, or state. Sharing the financial responsibility for these evaluations between fire fighters, the FD, the city, the state, and physician volunteers may reduce the negative financial impact on recruiting and retaining needed fire fighters.

Recommendation #2: Ensure fire fighters are cleared for duty by a physician knowledgeable about the physical demands of firefighting, the personal protective equipment used by fire fighters, and the various components of NFPA 1582.

According to NFPA 1582 and the IAFF/IAFC Fire Service Joint Labor Management Wellness/Fitness Initiative, the FD should have an officially designated physician who is responsible for guiding, directing, and advising the members with regard to their health, fitness, and suitability for duty [NFPA 2013; IAFF/IAFC 2008]. The physician should review job descriptions and essential job tasks required for all FD positions to understand the physiological and psychological demands of firefighting and the environmental conditions under which fire fighters perform, as well as the personal protective equipment they must wear during various types of emergency operations. In addition, this physician should oversee all fitness for duty recommendations provided by PCPs and have the final authority for all medical fitness for duty decisions. It is important that firefighters, and command personnel, be medically cleared to reduce the risk of sudden incapacitation during emergency operations. To ensure the FD physician or other PCP is familiar with NFPA 1582, the NIOSH investigators recommend the FD provide

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Recommendations (cont.)

a copy or a link to the NFPA website where a copy could be purchased or viewed on-line at no charge.

Recommendation #3: Phase in a mandatory comprehensive wellness and fitness program for fire fighters.

Guidance for fire department wellness/fitness programs to reduce risk factors for cardiovascular disease and improve cardiovascular capacity is found in NFPA 1583, Standard on Health-Related Fitness Programs for Fire Fighters, the IAFF/IAFC Fire Service Joint Labor Management Wellness/Fitness Initiative, the National Volunteer Fire Council Health and Wellness Guide, and in Firefighter Fitness: A Health and Wellness Guide [USFA 2004; IAFF, IAFC 2008; NFPA 2008; Schneider 2010]. Worksite health promotion programs have been shown to be cost effective by increasing productivity, reducing absenteeism, and reducing the number of work-related injuries and lost work days [Stein et al. 2000; Aldana 2001]. Fire service health promotion programs have been shown to reduce CHD risk factors and improve fitness levels, with mandatory programs showing the most benefit [Dempsey et al. 2002; Womack et al. 2005; Blevins et al. 2006]. A study conducted by the Oregon Health and Science University reported a savings of more than $1 million for each of four large fire departments implementing the IAFF/IAFC wellness/fitness program compared to four large fire departments not implementing a program. These savings were primarily due to a reduction of occupational injury/illness claims with additional savings expected from reduced future nonoccupational healthcare costs [Kuehl et al. 2013]. The FD does not have a wellness/fitness program. Given the FD's structure, the National Volunteer Fire Council program would be very helpful [USFA 2004]. NIOSH recommends a formal, mandatory wellness/fitness program to ensure all members receive the benefits of a health promotion program.

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Investigator Information

This incident was investigated by the NIOSH Fire Fighter Fatality Investigation and Prevention Program, Cardiovascular Disease Component located in Cincinnati, Ohio. Denise L. Smith, Ph.D, led the investigation and coauthored the report. Dr. Smith is professor of Health and Exercise Sciences, and Director of the First Responder Health and Safety Laboratory at Skidmore College. She is a member of the NFPA Technical Committee on Occupational Safety and Health. Dr. Smith was working as a contractor with the NIOSH Fire Fighter Fatality Investigation and Prevention Program, Cardiovascular Disease Component during this investigation. Thomas Hales, MD, MPH, provided medical consultation and coauthored the report. Dr. Hales is a member of the NFPA Technical Committee on Occupational Safety and Health, and Vice Chair of the Public Safety Medicine Section of the American College of Occupational and Environmental Medicine (ACOEM).

Appendix A

Autopsy Findings

- Heart size and structure
  - Heart weight = 835 grams (expected weight 452 grams) [Silver and Silver 2001]
  - Biventricular hypertrophy
    - Left ventricular wall concentrically hypertrophied = 2.3 cm
    - Right ventricular wall = 0.5 cm
  - Heart valves are within norml limits
- Coronary arteries
  - Coronary artery distribution is right dominant
  - Focally calcific moderate atherosclerotic stenosis of the anterior descending, diagonal, and right coronary arteries
  - No coronary thrombosis
- Microscopic examination
  - Patchy myocyte hypertrophy
  - Variable areas of stellate interstitial and perivascular fibrosis
  - Scattered contraction bands
  - Fatty infiltration of the AV node
- No drugs of abuse detected

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