



## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

### **Executive Summary**

On May 17, 2014, a 63-year-old male career wildland fire crew supervisor (“Supervisor”) performed the U.S. Forest Service arduous duty work capacity test (WCT) (commonly known as the pack test) to obtain his “red card,” certifying him to fight wildland fires on state property. The pack test requires an individual to complete a 3-mile walk within 45 minutes while wearing a 45-pound weighted vest. After four laps around the track (about 1 mile), the Supervisor grabbed his left leg and collapsed. Crew members found him unresponsive, not breathing, and with a weak pulse. A few seconds later his pulse stopped. Cardiopulmonary resuscitation (CPR) was begun, and an ambulance was requested. A weak pulse and breathing returned briefly as an automated external defibrillator (AED) was retrieved from the vehicle of a responding police officer. The AED was nonfunctional, so a second AED was brought to the scene by the local fire department approximately 2 minutes later. One shock was delivered without any change in the Supervisor’s clinical status. The ambulance arrived at 0826 hours, and ambulance service paramedics provided advanced life support (ALS), which included defibrillation, intubation, and intraosseous line placement. Two additional shocks were administered during transport to the hospital’s emergency department (ED), again with no change in the Supervisor’s clinical status. CPR and ALS continued for an additional 11 minutes in the ED. Despite CPR and ALS performed on the scene, en route to the ED, and inside the ED, the Supervisor was pronounced dead. The death certificate, completed by the county medical examiner, listed

“acute myocardial infarction” due to “hypertension, type II diabetes mellitus, and morbid obesity” as the cause of death. No autopsy was performed. Given the Supervisor’s underlying undiagnosed atherosclerotic coronary heart disease (CHD), the NIOSH investigators concluded the physical exertion associated with the pack test triggered a probable acute myocardial infarction (heart attack) and his sudden cardiac death.

NIOSH investigators offer the following recommendations to reduce the risk of heart attacks and sudden cardiac arrest among fire fighters at this and other wildland fire fighting agencies.

***Require completion of a health screen questionnaire (HSQ) prior to participating in the WCT.***

***Require exercise stress tests for fire fighters at increased risk for CHD.***

***Restrict fire fighters with medical conditions that have an increased risk of sudden incapacitation (e.g., cardiac arrest) as detailed in NFPA 1582.***

***Check WCT participants’ vital signs before and after testing.***

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

***Perform a candidate and member physical ability evaluation.***

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**Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH “Fire Fighter Fatality Investigation and Prevention Program” which examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency’s reports do not name the victim, the fire department or those interviewed. The NIOSH report’s summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency’s recommendations and is not intended to be definitive for purposes of determining any claim or benefit. For further information, visit the program website at [www.cdc.gov/niosh/fire](http://www.cdc.gov/niosh/fire) or call toll free 1-800-CDC-INFO (1-800-232-4636).

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Executive Summary (cont.)**

*Provide fire fighters with medical clearance to wear a self-contained breathing apparatus (SCBA) as part of the fire department’s medical evaluation program.*

*Conduct annual respirator fit testing.*

*Perform an autopsy on all on-duty fire fighter fatalities.*

### **Introduction & Methods**

On May 17, 2014, a 63-year-old male fire crew supervisor (“Supervisor”) suffered a probable heart attack and sudden cardiac death during his pack test. Despite CPR and ALS performed by crew members, ambulance service personnel, and in the ED, the Supervisor died. The United States Fire Administration notified NIOSH of this fatality on May 19, 2014. NIOSH contacted the affected agency on May 19, 2014, to obtain further information and on July 3, 2014, to initiate the investigation. On July 14, 2014, a safety and occupational health specialist from the NIOSH Fire Fighter Fatality Investigation Program traveled to Wyoming to conduct an on-site investigation of the incident.

During the investigation NIOSH personnel interviewed the following people:

- State forestry conservation program manager
- Camp site manager
- The Supervisor’s crew members
- The Supervisor’s wife

During the site visit NIOSH personnel reviewed the following records:

- Primary care physician records
- Ambulance report
- Hospital’s ED report
- Death certificate
- U.S. Forest Service WCT requirements

On May 17, 2014, the Supervisor arrived at the local school track at 0750 hours to participate in the state agency-scheduled pack test. The pack test requires participants to wear a 45-pound weighted vest and walk, not run, around a track for 3 miles within 45 minutes [Sharkey and Gaskill 2009]. This test is required to obtain a “red card,” which allows the card holder to fight wildland fires on state property. Two state forestry supervisors coordinated the test for three crew supervisors including the Supervisor and two members of the local volunteer fire department.

Participants were briefed, drank some water, donned their weighted vests, and stretched. After confirming that all participants were ready, the test began at approximately 0805 hours. The Supervisor had nearly completed lap 4 (1 mile) without difficulty when he grabbed his left leg and stepped off the track. Participants thought he was having a leg cramp, but then he suddenly collapsed (about 0815 hours). Crew members rushed over and removed his weighted vest and assessed him. He was unresponsive, but had a weak pulse. An ambulance was requested as CPR was begun (0817 hours). The Supervisor initially regained a pulse and respirations, but a few seconds later was not breathing and had no pulse. A police officer responded at about 0820 hours with an AED, but the AED did not function properly. The local fire department responded at about 0822 hours and applied their AED; one shock was delivered as the ambulance arrived (0826 hours).

The ambulance arrived on the scene to find CPR in progress. ALS was initiated, which included

## Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming

### Investigative Results (cont.)

cardiac monitoring and two defibrillations, placing an intraosseous line with cardiac resuscitation medications administered, and intubation with tube placement verified by breath sounds and capnography [Neumar et al. 2010]. The ambulance departed the scene at 0841 hours en route to the ED, arriving at 0843 hours.

Inside the ED, ALS measures continued without a change in the Supervisor's clinical status. Cardiac resuscitation efforts continued for 11 minutes, when the attending physician pronounced the Supervisor dead, and resuscitation efforts were discontinued (0854 hours).

**Medical Findings.** The death certificate, completed by the county medical examiner, listed “acute myocardial infarction” due to “hypertension, type II diabetes mellitus, and morbid obesity” as the cause of death. No autopsy was performed.

The Supervisor had a number of chronic medical conditions. These included:

- Hyperlipidemia diagnosed in 2010. His last laboratory blood tests revealed a normal level of total cholesterol level of 183 milligrams per deciliter (mg/dL) (normal is 100–199 mg/dL); an elevated low density lipoprotein level of 117 mg/dL (normal is 0–99 mg/dL); a reduced high density lipoprotein level of 38 mg/dL (normal is > 39 mg/dL); and a normal triglyceride level of 142 mg/dL (normal is 0–149 mg/dL). He was being treated with diet and exercise.
- Diabetes mellitus type II diagnosed in 2011. His last laboratory blood test revealed an elevated glucose level of 111 mg/dL (normal is

65–99) and an elevated hemoglobin A1C level of 6.1% (normal is 4.8%–5.6%). His diabetes was complicated by peripheral neuropathy and possibly nephropathy since 2011. He was being treated with diet.

- High blood pressure. His blood pressure was within normal limits when he took Losartan, an antihypertensive medication.
- Obesity since at least 2007.
- Nephropathy (presumably a complication of diabetes) diagnosed in 2011. His last laboratory blood test revealed an elevated creatinine level of 1.30 mg/dL (normal is 0.76–1.27 mg/dL), a low glomerular filtration rate of 41 milliliters per minute per 1.73 meters squared (mL/min/1.73m<sup>2</sup>) (normal > 59 mL/min/1.73m<sup>2</sup>), and no evidence of proteinuria.
- Metabolic syndrome.

In January 2014, the Supervisor weighed 303 pounds (body mass index of 36.9 kilograms per square meter, which is considered obese [CDC 2014], had a blood pressure of 130/80 millimeters of mercury (mmHg) (normal is 120/80 mmHg), and a pulse rate of 72 beats per minute (normal 60–80). In April 2014, the Supervisor weighed 275 pounds, 28 pounds lower than 3 months earlier.

According to the Supervisor's wife and agency personnel, the Supervisor exercised and had recently lost about 30 pounds. Additionally, he routinely performed physically demanding activities at his regular job as a crew boss. The Supervisor was asymptomatic while working and performing fire fighting duties.

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Description of the Agency**

At the time of the NIOSH investigation, the state agency consisted of five districts, one helibase, and a forestry conservation program. All employees are state employees; prison inmates provide supplementary staff for the conservation program.

**Membership and Training.** The agency requires applicants to be 18 years of age, have a valid state driver's license, pass a background check, and have a red card to fight wildland fires on state property.

The Supervisor was trained as a crew boss, felling boss, fire fighter I and II, firing boss, incident commander type 5, and helicopter crew member. He had 8 years of wildland fire fighting experience.

**Screening Medical Questionnaire and Medical Evaluations.** The state agency does not require candidates/members to complete an HSQ prior to any of the annual WCTs, which include the walk test, field test, or the pack test. Preplacement and annual medical evaluations also are not required. When members are injured on duty, a medical clearance for return to duty by the state workers' compensation physician is required. If a member is ill and misses more than 3 days, a medical clearance is required by a primary care physician, who forwards an opinion for return to duty to the state agency.

**Health and Wellness Programs.** The state agency has a draft fitness policy that encourages employees to participate in the state wellness program and the National Interagency Fire Center fitness program called "FireFit" [NIFC 2010]. Although the Supervisor regularly participated in physical fitness activities, he did not participate in the state wellness program or FireFit. Annual pack tests are required for all employees who fight wildland fires.

### **Discussion**

**Atherosclerotic Coronary Heart Disease and Sudden Cardiac Death.** In the United States, atherosclerotic CHD is the most common risk factor for cardiac arrest and sudden cardiac death [Meyerburg and Castellanos 2008]. Risk factors for its development include age older than 45, male gender, family history of coronary artery disease, smoking, high blood pressure, high blood cholesterol, obesity/physical inactivity, and diabetes [NHLBI 2012; AHA 2014]. The Supervisor had three modifiable CHD risk factors (diabetes, high blood cholesterol, obesity) and had metabolic syndrome.

The narrowing of the coronary arteries by atherosclerotic plaques occurs over many years, typically decades [Libby 2013]. However, the growth of these plaques probably occurs in a nonlinear, often abrupt fashion. Heart attacks (myocardial infarctions) typically occur with the sudden development of complete blockage (occlusion) in one or more coronary arteries that have not developed a collateral blood supply. This sudden blockage is primarily due to blood clots (thrombosis) forming on top of atherosclerotic plaques [Libby 2013].

Establishing a recent (acute) heart attack requires any of the following: characteristic electrocardiogram (EKG) changes, elevated cardiac enzymes, or coronary artery thrombus. The Supervisor did not have a heart rhythm on which to acquire an EKG, cardiac enzymes were not tested, and no autopsy was performed. Therefore, although the death certificate listed an acute heart attack as the cause of death, this cannot be definitively diagnosed.

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Discussion (cont.)**

**Primary Arrhythmia.** Another possible etiology for the Supervisor’s sudden cardiac death is a primary cardiac arrhythmia (e.g., ventricular tachycardia/fibrillation). Risk factors for ventricular tachycardia/fibrillation include cardiac disease, heart attack, sleep apnea, dietary supplements, smoking, alcohol, drug abuse, medications, diabetes, and hyperthyroidism [AHA 2012; Mayo Clinic 2013]. Because an acute heart attack cannot be definitively diagnosed, it is possible the Supervisor had a primary cardiac arrhythmia.

In addition to medical conditions, sudden cardiac death has been linked to heavy physical exertion [Tofler et al. 1992; Mittleman et al. 1993; Willich et al. 1993; Albert et al. 2000]. Among fire fighters, sudden cardiac events 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]. The Supervisor had completed one third of the pack test. This activity expended about 7–8 METs, which is considered moderate to heavy physical activity [Gledhill and Jamnik 1992; Ainsworth et al. 2011]. NIOSH investigators conclude the Supervisor’s sudden cardiac death was probably due to a “silent” (no angina) heart attack or, less likely, a primary arrhythmia triggered by the physical exertion associated with the pack test.

**Occupational Medical Standards for Wildland Fire Fighters.** National Fire Equipment System (NFES) Standard 1596, Fitness and Work Capacity, provides information on fitness, work capacity, nutrition, hydration, the environment, work hardening, and injury prevention. It requires medical clearance for return to work, but not for preplacement, periodic, or pre-WCT evaluation [Sharkey and Gaskill 2009]. NFES 1596 refers to

the American College of Sports Medicine (ACSM) recommendation for a medical examination for persons who are over the age of 40, who have heart disease risk factors (smoking, high blood pressure, elevated cholesterol), or who have been sedentary and plan a major increase in activity. For many others, a simple health screening questionnaire ensures readiness to engage in training, work, or a job-related WCT [Sharkey and Gaskill 2009]. The Supervisor had at least one of these ACSM triggers for a medical evaluation, but an HSQ was not completed.

NFES 1109, Work Capacity Test Administrator’s Guide, addresses requirements and recommendations for performing the WCT pack test. It does not require a pre-WCT medical examination for all applicants [Whitlock and Sharkey 2003]. When a medical examination is required, neither blood testing for lipid and glucose levels nor exercise stress tests (EST) are required.

NFPA 1051, Standard for Wildland Fire Fighter Professional Qualifications, sets forth the requirements to become a wildland fire fighter including physical fitness and medical considerations. For medical clearance, NFPA 1051 refers to NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments [NFPA 2012; NFPA 2013a]. NFPA 1582 was developed, in part, to reduce the risk of sudden cardiac arrest or other incapacitating medical conditions among fire fighters. This voluntary industry standard provides the components of a preplacement and annual medical evaluation and medical fitness for duty criteria. The Supervisor had a medical condition that, according to NFPA 1582, should have resulted in his restricted work activity (diabetes mellitus) and two conditions that should have triggered an exercise stress test (metabolic syndrome and coronary heart disease risk factors).

## Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming

### Discussion (cont.)

Diabetes Mellitus. NFPA 1582 provides guidance for fire department physicians to follow when treating diabetic fire fighters [NFPA 2013a]. 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:

- (1) If on oral hypoglycemic agents, has had no episodes of severe hypoglycemia (defined as requiring assistance of another in the preceding year)
- (2) Has achieved a stable blood glucose as evidenced by HA1C level less than 8 during the prior 3-month period
- (3) Has a dilated retinal exam by a qualified ophthalmologist or optometrist that shows no higher grade of diabetic retinopathy than microaneurysms
- (4) Has normal renal function on the basis of a calculated creatinine clearance greater than 60 milliliters per minute and absence of proteinuria
- (5) Has no autonomic or peripheral neuropathy
- (6) Has normal cardiac function without evidence of myocardial ischemia on cardiac stress testing (to at least 12 METs) by EKG and cardiac imaging [NFPA 2013a]

The Supervisor had diabetes mellitus complications of nephropathy and peripheral neuropathy and according to NFPA 1582, should have been restricted from full duty.

**Exercise Stress Tests.** On the basis of the Supervisor’s age and history of high blood pressure, cholesterol, and diabetes mellitus, the NFPA, the American College of Cardiology/American Heart

Association (ACC/AHA), and the American College of Sports Medicine (ACSM) would have recommended a symptom limiting exercise stress test to screen for CHD. The following paragraphs summarize the positions of widely recognized organizations on this topic.

NFPA. NFPA 1582’s Appendix A recommends using submaximal (85% of predicted heart rate) EST as a screening tool to evaluate a fire fighter’s aerobic capacity. Maximal (i.e., symptom-limiting) EST with imaging 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)

Risk factors are defined as hypercholesterolemia (total cholesterol greater than 240 milligrams per deciliter), hypertension (diastolic blood pressure greater than 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). Given the Supervisor’s age, hypercholesterolemia, diabetes, and metabolic syndrome, a symptom-limiting EST should have been performed.

ACC/AHA. The ACC/AHA has also published exercise testing guidelines [Gibbons et al. 2002]. The ACC/AHA guideline states that the evidence to conduct stress tests in asymptomatic individuals is “less well established” (Class IIa) for those with diabetes mellitus Type II who plan to start vigorous exercise and (Class IIb) for the following groups:

- persons with multiple risk factors (defined similarly to those listed by the NFPA)

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Discussions (cont.)**

- 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 coronary artery disease due to other diseases (e.g., peripheral vascular disease and chronic renal failure)

ACSM. The ACSM considers individuals with diabetes mellitus to be at high risk for CHD and recommends a medical examination and exercise testing [ACSM 2006].

Like NFPA, the above ACC/AHA and ACSM criteria suggest an EST would have been appropriate for the Supervisor. Had an EST been performed, perhaps the Supervisor's CHD could have been identified, leading to further evaluation and treatment.

The National Wildfire Coordinating Group developed and follows the NFES 1596 and NFES 1109 guidelines. Neither guideline requires an EST for asymptomatic individuals, although given the Supervisor's age, diabetes mellitus, and high cholesterol, an EST would have been recommended by NFPA, AHA/ACC, and ACSM. Additionally, a mandatory comprehensive wellness/fitness program, including weight reduction, dietary education, and exercise would have benefited the Supervisor.

### **Recommendations**

NIOSH investigators offer the following recommendations to reduce the risk of heart attacks and sudden cardiac arrest among fire fighters at this and other wildland agencies.

#### ***Recommendation #1: Require completion of an HSQ before participating in the WCT.***

The WCT Administrator's Guide states that the candidate must complete an HSQ or medical history designated by the hiring agency before training for the WCT [Whitlock and Sharkey 2003]. Depending on the results of the HSQ and the age of the candidate, the agency may require a medical examination. Once individuals have received medical clearance, they may begin training for the WCT. The test administrator reviews the forms and determines whether to allow participants to take the test. If the test administrator is concerned that an applicant is not capable of completing the test, the administrator may require a medical clearance from the applicant's primary care physician.

The HSQ, located in Appendix B of the WCT Administrator's Guide [Whitlock and Sharkey 2003], does not cover all CAD risk factors identified by the AHA/ACC (Appendix A). Specifically, the HSQ includes no question regarding smoking status. In addition, some questions are ambiguous (e.g., Are you more than 20 pounds overweight?) without giving the fire fighter any guidance regarding ideal body weight, such as body mass index. NIOSH investigators suggest replacing these yes/no questions with questions that require the fire fighter to enter specific information (Appendix B). The WCT Administrator would then make the decision whether the fire fighter was fit to perform

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Recommendations (cont.)**

the WCT. Using these questions puts more responsibility on fire fighters to know the results of their medical tests. The state should modify the WCT Administrator's Guide HSQ to ensure that adequate and appropriate information regarding the health status of the fire fighter is identified.

In this instance, the state did not require that WCT candidates complete an HSQ prior to the walk test, the more arduous field test, or the most arduous pack test [Sharkey and Gaskill 2009]. If the Supervisor had completed the HSQ and checked the boxes for diabetes and high cholesterol (Appendix A), the WCT Administrator may not have allowed the Supervisor to take the pack test.

#### ***Recommendation #2: Require exercise stress tests for fire fighters at increased risk for CHD.***

NFPA 1582, the IAFF/IAFC Fire Service Joint Labor Management Wellness/Fitness Initiative, and the ACC/AHA recommend an exercise stress test for male fire fighters older than 45 with one or more CAD risk factors [IAFF, IAFC 2008; Gibbons et al. 2002; NFPA 2013a]. The Supervisor was over the age of 45 and had hypercholesterolemia and diabetes mellitus. The EST could be conducted by the fire fighter's personal physician or the state-contracted physician. If the fire fighter's personal physician conducts the test, the results must be communicated to the state-contracted physician, who should be responsible for decisions regarding medical clearance for fire fighting duties. The state should ensure ESTs are conducted on high risk individuals during the fire fighters' physical evaluations.

#### ***Recommendation #3: Restrict fire fighters with medical conditions that have an increased risk of sudden incapacitation (e.g., cardiac arrest) as detailed in NFPA 1582.***

The Supervisor's CHD was undiagnosed; however, according to NFPA 1582, the continuing presence of modifiable CHD risk factors (high cholesterol, diabetes mellitus, and hemoglobin A1c) should have restricted his participation in fire suppression tasks [NFPA 2013a]. This guidance from NFPA is similar to that of the American College of Cardiology/American Heart Association and the U.S. Department of Transportation for commercial truck drivers [Gibbons et al. 2002; Blumenthal et al. 2007; NFPA 2013a].

#### ***Recommendation #5: Check WCT participants' vital signs before and after testing.***

NFES 1109, Work Capacity Test Administrator's Guide, requires that an emergency medical technician or someone with equivalent qualifications observe candidates during and after the test and be available to provide emergency medical assistance, if needed [Whitlock and Sharkey 2003]. The emergency medical technician should take participant vital signs (pulse, blood pressure, and respirations) before and after the WCT to ensure that the participant does not have a precluding condition before the test, and that the participant's vital signs return to normal levels after the test.

#### ***Recommendation #6: Phase in a mandatory comprehensive wellness and fitness program for fire fighters.***

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## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Recommendations (cont.)**

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, and in Firefighter Fitness: A Health and Wellness Guide [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 [Pelletier 2009; Baicker et al. 2010]. Fire service health promotion programs have been shown to reduce CAD 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; Poston et al. 2013]. 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]. At the time of our investigation, the Agency had a draft wellness/fitness program, but exercise equipment was not available in the fire station. NIOSH recommends a formal, mandatory wellness/fitness program to ensure all members receive the benefits of a health promotion program.

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## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Investigator Information**

This incident was investigated by the NIOSH Fire Fighter Fatality Investigation and Prevention Program, Cardiovascular Disease Component in Cincinnati, Ohio. Mr. Tommy Baldwin (MS) led the investigation and co-authored the report. Mr. Baldwin is a Safety and Occupational Health Specialist, a National Association of Fire Investigators (NAFI) Certified Fire and Explosion Investigator, an International Fire Service Accreditation Congress (IFSAC) Certified Fire Officer I, and a former Fire Chief and Emergency Medical Technician. Dr. Thomas Hales (MD, MPH) provided medical consultation and co-authored 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).

# Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming

## Appendix A

USDA Forest Service/Department of the Interior FS-5100-31 (v 03/2013) OMB 0596-0164 (Expires 03/2016) WCT Level

### Health Screening Questionnaire (HSQ)

Assess your health needs by marking all true statements

\_\_ Arduous

\_\_ Moderate

\_\_ Light

The purpose is to identify individuals who may be at risk in taking the Work Capacity Test (WCT) and recommend an exercise program and/or medical examination prior to taking the WCT.

Employees are required to answer the following questions. The questions were designed, in consultation with occupational health physicians, to identify individuals who may be at risk when taking a WCT. The HSQ is not a medical examination. Any medical concerns you have that place you or your health at risk should be reviewed with your personal physician prior to participating in the WCT.

#### Check ‘Yes’ or ‘No’ in response to the following questions:

- Y     N    1)    During the past 12 months have you at any time (during physical activity or while resting) experienced pain, discomfort or pressure in your chest.
- Y     N    2)    During the past 12 months have you experienced difficulty breathing or shortness of breath, dizziness, fainting, or blackout?
- Y     N    3)    Do you have a blood pressure with systolic (top #) greater than 140 or diastolic (bottom #) greater than 90?
- Y     N    4)    Have you ever been diagnosed or treated for any heart disease, heart murmur, chest pain (angina), palpitations (irregular beat), or heart attack?
- Y     N    5)    Have you ever had heart surgery, angioplasty, or a pace maker, valve replacement, or heart transplant?
- Y     N    6)    Do you have a resting pulse greater than 100 beats per minute?
- Y     N    7)    Do you have any arthritis, back trouble, hip /knee/joint /pain, or any other bone or joint condition that could be aggravated or made worse by the Work Capacity Test?
- Y     N    8)    Do you have personal experience or doctor’s advice of any other medical or physical reason that would prohibit you from taking the Work Capacity Test?
- Y     N    9)    Has your personal physician recommended against taking the Work Capacity Test because of asthma, diabetes, epilepsy or elevated cholesterol or a hernia?

Regardless whether you are taking the Work Capacity test at the Arduous, Moderate or Light duty level, a “Yes” answer requires a determination from your personal physician stating that you are able to participate.

#### I understand that if I need to be evaluated by a physician, it will be based on the fitness requirements of the position(s) for which I am qualified.

Signature: \_\_\_\_\_ Printed Name \_\_\_\_\_ Date \_\_\_\_\_  
Unit: \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

#### Privacy Statement

The information obtained in the completion of this form is used to help determine whether an individual being considered for wildland firefighting can carry out those duties in a manner that will not place the candidate unduly at risk due to inadequate physical fitness and health. Its collection and use are covered under Privacy Act System of Records OPM/Govt-10 and are consistent with the provisions of 5 USC 552a (Privacy Act of 1974).

#### Paperwork Reduction Act Statement

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0164. The time required to complete this information collection is estimated to average 5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA’s TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (800) 975-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

## **Fire Crew Supervisor Suffers Sudden Cardiac Death During Pack Test – Wyoming**

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### **Appendix B**

#### **NIOSH-recommended Questions**

History:

- Male older than 45 years
- Female older than 55 years
- Father or brother has had a heart attack before age 55
- Mother or sister has had a heart attack before age 65
- Smoker
- Previously diagnosed with hypertension (high blood pressure)
  - Take prescription medication for high blood pressure
  - Most recent blood pressure measurement
  - Date of most recent blood pressure measurement
- Previously diagnosed with hypercholesterolemia/hyperlipidemia (high blood cholesterol)
  - Take prescription medication for high blood cholesterol
  - Most recent cholesterol levels [e.g., low density lipoprotein (LDL), total cholesterol/high density lipoprotein (HDL) ratio]
  - Date of most recent cholesterol measurement
- Previously diagnosed with diabetes mellitus
  - Take prescription medication for diabetes
  - Most recent blood sugar measurement
  - Date of most recent blood sugar measurement

Current height:

Current weight:

Physically inactive (i.e., you get less than 30 minutes of exercise at least 3 days per week)