



Fire Fighter Dies While Hospitalized After Pit Bull Terrier Attack— District of Columbia

SUMMARY

On July 7, 1999, a 64-year-old male career Fire Fighter/Driver/Operator and engine crew were dispatched to an anonymous 911 call reporting a fire in a densely populated residential area. Immediately upon arriving at the scene, the Fire Fighter/Driver/Operator (the victim) and crew members began to scan the area in search of fire. Crew members reported that within 2 minutes on the scene, an unrestrained pit bull terrier charged the victim from behind. A crew member witnessed the dog running toward the victim and yelled to alert him. The victim heard this warning, but was only able to partially turn around before the dog lunged at his chest, causing him to fall onto his back as he fought the animal's attack. The victim injured his knee and could not stand up. Other crew members were then able to contain the dog. The victim was transported via ambulance to a nearby hospital emergency department and admitted for knee surgery. On July 9, the morning of his scheduled surgery, the victim became acutely short of breath and unresponsive. Advanced life support (ALS) was initiated, but the victim did not survive. Autopsy findings included "hypertensive cardiovascular disease" as the cause of death and "blunt impact trauma [to the knee] with avulsion of [the] right quadriceps tendon" as the contributory condition." The anonymous 911 call was determined to be a false alarm.

Other agencies have proposed a three-pronged strategy for reducing the risk of cardiovascular deaths among fire fighters. This strategy consists of (1) minimizing physical stress on fire fighters, (2) screening to identify and subsequently rehabilitate high-risk individuals, and (3) encouraging increased individual physical capacity. Recommendations relevant to this fire department include

- *Exercise stress tests should be incorporated into the Fire Department's periodic medical evaluation program. The Department and Union should negotiate the content and frequency to be consistent with NFPA 1582.*
- *Reduce risk factors for cardiovascular disease and improve cardiovascular capacity by phasing in a mandatory wellness/fitness program negotiated between the Fire Department and the Union.*

INTRODUCTION & METHODS

On July 7, 1999, a 64-year-old male career fire fighter was attacked by a pit bull terrier while responding to an anonymous 911 call. Knee injuries resulting from this attack required the victim to be transported from the scene via ambulance to a nearby hospital emergency department. The victim was admitted and scheduled for knee surgery. In the early morning hours of July 9, 1999, the day of his scheduled surgery, the victim died. The National Institute for Occupational Safety and Health

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at:

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(NIOSH) was notified of this fatality on July 9, 1999, by the United States Fire Administration. On October 14, 1999, NIOSH contacted the affected fire department to initiate the investigation. On November 15, 1999, a Nurse Epidemiologist and a Senior Medical Epidemiologist from the NIOSH Fire Fighter Fatality Investigation and Prevention Team conducted an on-site investigation.

During the investigation NIOSH personnel met with and interviewed the

- Fire Chief and Assistant Fire Chief
- Victim's spouse and daughter
- Department's Chaplain
- Battalion Chief and Captain of the victim's station
- Fire Fighters from the victim's station who witnessed the canine attack
- Department Safety Officer
- Local Union President and Second Vice President
- Department Medical Services Officer
- Medical Director for the Department medical services
- Training Specialist at the Fire Department Training Academy

During the site-visit NIOSH personnel also reviewed

- Safety Officer's Incident Report
- Fire Department personnel records
- Fire Department dispatch records
- Fire Department policies, training, and operating procedures
- Death certificate
- Autopsy results
- Incident site
- National Climatic Data Center weather report for incident date

INVESTIGATIVE RESULTS

Incident. On July 7, 1999, the victim and his crew began their 24-hour shift at 0700 hours. The victim was a Fire Fighter/Driver/Operator of the engine company, and he began his shift by inspecting engine apparatus and his personal protective gear. Over the next 5 hours, the crew responded to nine medical emergencies, a typical number for this company. At 1242 hours, central dispatch received a report of a fire located in a densely populated residential area without a specific address or additional information provided. The anonymous call was thought to have originated from a pay phone in this area. At 1243 hours, dispatch assigned the local engine company (E-6), the victim's engine company (E-2), a nearby engine company (E-16), a ladder truck (T-3), and a Battalion Chief (B-6) to respond. At 1244 hours, E-2 was en route when dispatch informed them that E-6 was in service at another incident and that E-2 should assume the "first-due" (or first to arrive) position. At 1245 hours, E-2 arrived at the scene and one fire fighter began securing hose supply lines while the victim and the two other fire fighters began looking for signs of a fire. The victim, as Driver/Operator, was not in bunker gear and ran approximately 150 feet toward an alley looking for signs of fire. At this time, a pit bull terrier began chasing the victim from behind. A crew member witnessed the dog running toward the victim and yelled to alert him. The victim heard this warning but was only able to partially turn around before the dog lunged at his chest, causing him to fall onto his back as he fought the animal's attack. The two other fire fighters, dressed in full bunker gear, were able to place themselves between the victim and the dog, thereby protecting the victim from further attack. At 1247 hours, central dispatch was radioed for a medic unit for a fire fighter attacked by a dog. The fire fighters assisted the victim as he tried to get up, but his knee was severely injured during the attack and subsequent fall. At this time the other responding Fire Departments had arrived on scene (E-16, T-3,



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B-6). No fire was found, and at 1250 hours, the units were directed to return to their respective stations.

An ambulance transported the victim to a local hospital where he was admitted for rupture of the right knee (quadriceps) tendon. Surgery was scheduled for July 9, 1999. On that day, at approximately 0415 hours, the victim experienced sudden shortness of breath and his hospital roommate called for help. The victim became unresponsive, and despite resuscitation measures performed in the hospital, the victim was pronounced dead at 0515 hours.

Medical Findings. An autopsy by the Deputy Medical Examiner listed “hypertensive cardiovascular disease” as the cause of death, with “blunt impact trauma [to the knee] with avulsion of [the] right quadriceps tendon” as the contributing condition. Pertinent cardiovascular autopsy diagnoses included cardiac enlargement and coronary atherosclerosis. Blood and urine testing determined that no alcohol or illicit drugs were detected.

The victim’s last required Fire Department annual physical occurred in November 1998. He was cleared for fire fighter duties, and reports from family members indicated that the victim did not report any abnormal findings resulting from this examination. (Fire Department medical records, hospital medical records, and those of the victim’s private physician were not available for NIOSH investigative review at the time of this report.)

Family members and fire fighter colleagues reported that the victim never reported symptoms suggestive of heart disease at home, during leisure activities, or while performing fire fighter duties. Family members reported that the victim did not exercise regularly but was not overweight. He had no family history of coronary artery disease (CAD), nor did he have

a history of cigarette smoking. Family members reported that the victim controlled his dietary intake, most notably limiting foods containing salt and sugar, and consumed fresh fruits and vegetables daily. The family noted that the victim took prescribed oral medications for his high blood pressure and diabetes. Additionally, the victim’s family and crew members reported that the victim did not complain of symptoms suggestive of heart disease the day of the dog attack or the night before surgery.

DESCRIPTION OF THE FIRE DEPARTMENT

At the time of the NIOSH investigation, the Fire Department consisted of 1,182 uniformed personnel and served a population of 1,000,000 residents in a geographic area of 62 square miles. The department has 32 fire stations, where fire fighters work 24 hours on duty from 0700 to 0700 hours, and are off duty for 72 hours. Each shift of an engine or ladder company is staffed with four personnel (an officer and three fire fighters). In fiscal year 1999, the fire department responded to 115,948 incidents: 72,337 medical, 3,108 structural fire/rescue, and 40,503 nonstructural fire/rescue. The department is also responsible for emergency medical services, which responded to 100,448 incidents in fiscal year 1999 with a staff of approximately 373 trained personnel.

Preemployment/Preplacement Evaluations. The Fire Department requires a preemployment/preplacement medical evaluation for all new hires, regardless of age. Components of this evaluation for all applicants include the following:

- A complete medical history
- Height, weight, and vital signs
- Physical examination
- Complete blood count (CBC)
- Blood lipid profile (total cholesterol, HDL cholesterol, triglycerides)



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- Urinalysis
- Urine drug test for illicit drug use
- Chest X-ray
- Resting electrocardiogram (EKG)
- Hepatitis B immunization
- Tuberculosis (TB) skin testing
- Vision testing
- Hearing testing

These evaluations are performed by a physician group at a local hospital under contract with the city. Once the evaluation is complete, a physician makes a decision regarding medical clearance for fire fighting duties. Prospective candidates are also required to complete a physical ability test. This is a timed-performance evaluation of typical fire fighting duties.

Periodic Evaluations. The content of the annual medical evaluations required by this Department is very similar to the preemployment physical. The only difference is that the EKG is not repeated again until age 35. After being performed once at age 35, it is not routinely repeated again until age 40, after which it is done annually. The Department does not conduct routine exercise stress (treadmill) tests (EST). If, however, the fire fighter is above the age of 40 with two or more risk factors for CAD, the contract physicians recommend the fire fighter obtain an EST from a private physician. Because of limited access to Department and private medical records, NIOSH investigators were unable to determine if this fire fighter had ever had an EST or been advised to do so.

Most stations have exercise (strength and aerobic) equipment, frequently donated to or purchased by the fire fighters. In addition, the Department maintains an extensive voluntary fitness/wellness program. This program is administered under the guidance of the contracted physicians and the contracted hospital. The program includes aerobic conditioning, health maintenance (smoking cessation classes, weight control programs, nutrition counseling, and education

on high blood pressure, diabetes, and cholesterol), and a critical incident stress debriefing program. Weight training equipment is available in another section within the contracted hospital.

Training. The Fire Department requires all newly hired fire fighters to complete the 22-week Fire Academy course. Once completed, the fire fighter is NFPA certified as a Fire Fighter I & II, certified as a Hazmat responder at levels I & II, and certified as an emergency medical technician (EMT) and in cardiopulmonary resuscitation (CPR). The victim had 36 years of fire fighting experience and was a certified Fire Fighter Technician and Driver/Operator.

DISCUSSION

In the United States, coronary artery disease (atherosclerosis) is the most common risk factor for cardiac arrest and sudden cardiac death.¹ Risk factors for its development include age over 45, male gender, family history of coronary artery disease, smoking, high blood pressure, high blood cholesterol, obesity/physical inactivity, and diabetes.² The victim had several of these risk factors: age greater than 45 years old, male gender, high blood pressure, diabetes mellitus, and lack of conditioning physical activity.

The narrowing of the coronary arteries by atherosclerotic plaques occurs over many years, typically decades.³ However, the growth of these plaques probably occurs in a nonlinear, often abrupt fashion.⁴ Heart attacks typically occur with the sudden development of complete blockage (occlusion) in one or more coronary arteries that have not developed a collateral blood supply.⁵ This sudden blockage is primarily due to blood clots (thrombosis) forming on the top of atherosclerotic plaques.

Blood clots, or thrombus formation, in coronary arteries are initiated by disruption of atherosclerotic plaques. Certain characteristics of the plaques (size,



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composition of the cap and core, presence of a local inflammatory process) predispose the plaque to disruption.⁴ Disruption then occurs from biomechanical and hemodynamic forces, such as increased blood pressure, increased heart rate (HR), increased catecholamines, and shear forces, which occur during heavy exercise.^{6,7} Fire fighting activities are strenuous and often require fire fighters to work at near maximal heart rates for long periods. The increase in heart rate has been shown to begin with responding to the initial alarm and persist through the course of response activities.⁶⁻⁸ Epidemiologic studies have found that heavy physical exertion sometimes immediately precedes and triggers the onset of acute heart attacks.⁹⁻¹²

Autopsy findings indicate that the victim had evidence of 75% atherosclerotic disease in one coronary artery and 25% in the others. A document from the Office of Decedent Affairs, attached to the autopsy report, indicates that the victim died of “CPA” (presumably a cardiopulmonary arrest). The document also confirms information from family members and colleagues that there was a resuscitation effort. The victim’s autopsy lists the knee injury related to the dog attack as a contributing condition to the victim’s death from hypertensive cardiovascular disease. Because the NIOSH investigators did not have access to the victim’s complete medical records, a definitive statement regarding his fatal event cannot be made. However, based on his clinical scenario and his autopsy findings (CAD and no evidence of a pulmonary embolus), an acute heart attack and subsequent cardiac arrest is the most likely sequence of events leading to this victim’s death.

The Department conducts extensive preemployment/preplacement medical evaluations which match those recommended by the National Fire Protection Association (NFPA). The annual medical evaluations, however, differ slightly.¹³ NFPA recommends a yearly physical evaluation to include

a medical history, height, weight, blood pressure, and visual acuity testing. Based on age, NFPA recommends a more thorough evaluation to include a more comprehensive vision testing procedure, audiometry, pulmonary function testing, a complete blood count, urinalysis, and biochemical (blood) test battery be conducted on a periodic basis according to the age of the fire fighter (under 30, every 3 years; 30 to 39, every 2 years; and 40 and over, every year). This Department could thus reduce the frequency of their complete blood counts, urinalysis, urine drug tests, and blood chemistries in fire fighters under 40 years of age.

Current NFPA 1582 guidelines for annual medical examinations note that “No firm guidelines for stress electrocardiography in asymptomatic individuals have been developed.”¹³ However, they note that a reasonable approach would be to include treadmill testing for fire fighters at age 40, or at 35 for those with a risk factor for CAD. NFPA considers risk factors to be family history of heart attack at age less than 55 years, hypertension, diabetes mellitus, cigarette smoking, and hypercholesterolemia (total cholesterol greater than 240 or HDL cholesterol less than 35).¹³ The EST procedure has errors both in over-diagnosis and in under-diagnosis, although newer techniques including the use of thallium administration or additional monitoring can improve the accuracy of the procedure.¹⁴ It is possible that if this fire fighter had had an EST performed, his underlying CAD may have been identified, and he could have been directed toward further evaluation and treatment.

RECOMMENDATIONS AND DISCUSSION

The following recommendations address health and safety generally. This list includes some preventive measures that have been recommended by other agencies to reduce the risk of in-the-line-of-duty sudden cardiac death among fire fighters. These



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recommendations have not been evaluated by NIOSH but represent research presented in the literature or consensus votes of Technical Committees of NFPA or labor/management groups within the fire service.

Recommendation #1: Exercise stress tests (EST) should be incorporated into the fire department's periodic medical evaluation program. The Fire Department and Union should negotiate the content and frequency to be consistent with NFPA 1582.

The Department currently has a mandatory preemployment/preplacement examination. Additionally, the department conducts annual medical evaluations for each fire fighter. We encourage the Department to include EST for fire fighters at high risk for CAD. Cost savings from discontinuing nonrecommended testing done on an annual basis could help pay for EST. All testing should be performed in a **confidential, nondiscriminatory** manner.

Recommendation #2: Reduce risk factors for cardiovascular disease and improve cardiovascular capacity by phasing in a mandatory wellness/fitness program negotiated between the Fire Department and the Union.

This Department, as described to NIOSH investigators, currently offers a comprehensive and thoughtfully devised wellness and fitness program. This is a voluntary program, and it is unclear how many fire fighters within this Department actually use it. To encourage full participation for all fire fighters, we encourage **negotiation** by the Department and the Union to phase in mandatory utilization.

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INVESTIGATOR INFORMATION

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