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SPECIAL COMMUNICATION

Self-Reported Cardiac Risks and Interest in Risk Modification Among Volunteer Firefighters: A Survey-Based Study

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Context: Coronary heart disease causes approximately 45% of firefighter deaths annually. Although firefighters have clinically significant cardiac risks, a paucity of research and data exists.

Objective: To evaluate firefighters' cardiac risk factors as well as their motivation to resolve these risk factors.

Methods: During a 3-month period, volunteer firefighters representing the 79 fire departments serving Nassau and Suffolk counties in Long Island, NY, were asked to complete a nonvalidated, 19-item questionnaire regarding their health habits, medical history, and demographics.

Results: A total of 730 surveys were returned among a potential study population of 20,590 volunteer firefighters. More than three-quarters of respondents met the criteria for being overweight or obese, and nearly 40% reported having high blood pressure, high cholesterol, or both. Most respondents expressed at least some interest in attending a fire department–sponsored health lecture and participating in a fitness program.

Conclusion: Firefighters expressed desire to learn more about risk factor modifications and have fire departments take a more active role in helping firefighters improve their health. The effectiveness of resources and intervention programs should be assessed.

There are more than 1 million firefighters in the United States today, 72% of whom are volunteers.¹ Firefighting—by career and volunteer firefighters alike—is physically demanding and necessitates good

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physical and cardiovascular fitness.²⁻⁴ Although all firefighters tend to be selected based on applicants' physical fitness, cardiovascular health does not necessarily play a dominant role in defining fitness, especially over time. Approximately 100 firefighter deaths occur every year—excluding those that occurred on September 11, 2001—and about 45% of these deaths are caused by coronary heart disease.²

At a moment's notice, firefighters are called to respond to various alarms that require considerable demands on their bodies, some of which require working at near maximal heart rates for an extended time.⁵ These physiologic changes, the increased physical load from their protective equipment, and psychological stressors can cause severe strain on a firefighter who is not physically fit to perform his or her duties.⁶ One study⁷ indicated that specific duties (eg, fire suppression, alarm response) were associated with statistically significant risks of coronary heart disease.

Even among firefighters who are apparently fit, the extreme physical demands of firefighting are still evident, especially in hot and smoky conditions.⁸ Firefighters' cardiovascular fitness is important not only to their own health and safety, but also the lives of other firefighters and victims in need of assistance or rescue.

In considering cardiovascular fitness, modifiable and nonmodifiable cardiac risk factors exist. Nonmodifiable risk factors include age, family history, and sex.⁹ Modifiable risk factors include cigarette smoking, high blood pressure, high cholesterol levels, obesity, physical inactivity, and diabetes mellitus. Individuals with these risk factors are predisposed to increased morbidity and mortality.⁹ Firefighters can control their modifiable risk factors through diet, exercise, physician follow-up, and proper education about heart disease and its associated risk factors.

The National Fire Protection Agency (NFPA) sets standards regulating appropriate health and wellness programs and medical requirements for paid and volunteer fire departments. For example, NFPA 1582 Section 2-4.1.3 dictates that fire departments require firefighters to have medical evaluations within a specific time frame: every 3 years for persons aged 29 years or younger, every 2 years for persons aged 30 to 39 years, and every year for persons aged 40 years or older.^{10,11} These medical evaluations are designed to screen for and evaluate conditions that potentially could compromise an individual's ability to function as a firefighter.¹²

Individual fire departments can impose more stringent requirements for their firefighters and require more frequent physical examinations than those outlined by the NFPA. In addition, firefighters have the option of visiting their personal physicians for a physical examination under their own insurance. For example, a firefighter may be required by the NFPA and their department to have a physical examination once every 3 years, but he or she may choose to have an annual examination with his or her personal physician.

The NFPA Section 3-7.1¹⁰ outlines various cardiovascular medical conditions that could compromise a person's ability to function effectively as a firefighter (*Figure*). Category A conditions are deemed clinically significant risks to the safety and health of the individual firefighter or others. Category B conditions, based on severity, could disqualify a person from firefighting duties. For category B conditions, the evaluating physician—whether a firefighter's private physician or a fire department physician—determines the severity of the condition and whether or not it would hinder a firefighter's

performance.

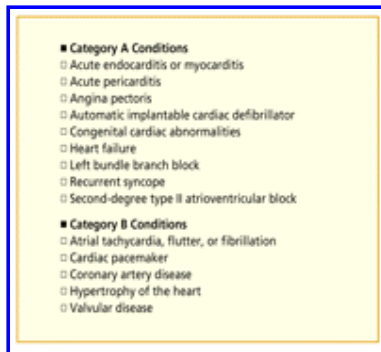


Figure. Cardiovascular conditions that may disqualify an individual from being a firefighter. A full description of these conditions may be found in Occupational Health and Safety Standards Handbook. 10

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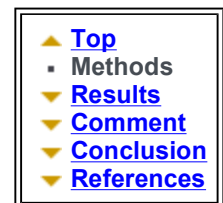
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Although it has been suggested that firefighters have clinically significant cardiovascular risks, a dearth of available research and data on the topic exists. The present study was designed to evaluate firefighters' health, knowledge of cardiac risk factors, and motivation to resolve these risk factors and improve their healthcare maintenance.

► **Methods**

Long Island, NY, comprises two counties: Nassau and Suffolk. The volunteer fire service of Nassau and Suffolk consists of approximately 20,590 volunteer firefighters from 79 departments. During routine physical examinations at Long Island firehouses between September 2006 and December 2006, the primary investigator (P.S.) distributed and collected surveys from firefighters as they waited to be examined. The Institutional Review Board at Kansas University School of Medicine-Wichita approved the use of human subjects.



Although the 19-item volunteer firefighter survey was not validated, it was developed based on methods and findings produced from a literature review.¹³⁻¹⁶ It included six demographic questions: sex, age, weight (in pounds), height (in feet and inches), years in the fire service, and type of firefighter (interior, exterior, emergency medical services, or fire police).

Other items focused on medical history, current medications, physician follow-up, personal health insurance, cigarette use, alcohol consumption, and exercise. The firefighters were asked to express their level of interest (ie, "definitely interested," "somewhat interested," or "definitely not interested") and current behaviors regarding fitness programs, proper diet, and reduction of heart attack risk. They were also asked to identify from four choices the major cause of death among firefighters nationwide: automobile accidents, burns, heart attacks, or smoke inhalation.

► Results

We received 730 surveys within the 3-month period. Although there were approximately 20,590 volunteer firefighters in Long Island at that time, the total number of firefighters who had the opportunity to complete the survey but chose not to is unknown as a result of the "snowball" and convenience sampling technique used in the present study.

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In the present study, 87.8% of respondents were men, 69.7% were interior firefighters, and 56.7% were aged 40 years or older ([Table 1](#)). Respondents reported length of service with a fire department ranging from a few months to 57 years (mean [SD], 15 [13] years; median, 13 years; mode, 1 year). Respondents' self-reported weights and heights were used to calculate body mass indexes (BMIs). Although 136 respondents (18.6%) had a BMI that put them in the "healthy" range, 301 (41.2%) had a BMI that classified them as overweight, and 259 (35.5%) had a BMI that identified them as obese.

View this table: [Table 1 Volunteer Firefighters in Long Island, NY: Characteristics of Survey Respondents \(N=730\)](#)
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In responding to the question, "Have you ever been diagnosed with or are you currently being treated for any of the following medical conditions," 145 respondents (19.9%) indicated having high blood pressure and 135 (18.5%) reported having high cholesterol levels ([Table 2](#)). Of these respondents, 62 reported having both high blood pressure and high cholesterol levels. In addition, 390 respondents (53.4%) had received an echocardiogram or cardiac stress test at least once.

View this table: [Table 2 Volunteer Firefighters in Long Island, NY: Self-Reported Medical History \(N=730\)](#)
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Although most respondents (69.2%) did not indicate that they were currently taking any medications, 225 (30.8%) did, of whom 218 listed specific medications ([Table 3](#)). One respondent reported taking eight different medications. As self-reported among respondents, 115 took miscellaneous medications (eg, for depression, gout, allergies), 114 took medication for high blood pressure, and 80 took medication for high cholesterol levels.

View this table: [Table 3 Volunteer Firefighters in Long Island, NY: Self-Reported Medication Use \(n=218\)*](#)
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Of the 327 (44.8%) respondents who reported participating in an exercise program, the mean (SD) number of hours each week of self-reported exercise was 5.92 (4.119). Of the 129 respondents (17.7%) who reported that they currently smoke, the mean (SD) number of packs smoked per day was 1.06 (0.364). Of the 452 respondents (61.9%) who reported consuming alcoholic beverages, the mean (SD) number of drinks per week was 4.69 (4.659).

Most respondents (637 [87.3%]) had their own health insurance, and nearly as many (602 [82.5%]) reported receiving "an annual physical from a physician." Moreover, most firefighters (375 [51.4%]) reported "follow[ing] up with a physician" once a year, 143 (19.6%) reported doing so every 6 months, and 98 (13.4%) reported following up every 3 months or sooner.

As previously described, NFPA-required physical examinations are distinct from those conducted by firefighters' private physicians. In the survey, respondents were asked to report how often they "follow-up with a physician." If the NFPA guidelines for the frequency of medical evaluations (eg, every 1, 2, or 3 years, according to age group) were applicable to firefighters "follow[ing] up with a physician," 44 respondents (6%) in the 17-to-29-year age group, 73 (10%) of the 30-to-39-year age group, and 88 (12%) of the group aged 40 years or older would not have been in compliance with the NFPA guidelines.

To address knowledge of heart disease among firefighters, the questionnaire directed respondents to select the major cause of line-of-duty deaths among firefighters across the United States. Three-fourths (554 [75.9%]) of respondents selected heart attacks; 78 (10.7%), smoke inhalation; 70 (9.6%), auto accidents; and 18 (2.5%), burns.

The survey prompted respondents to address the roles of fire departments in firefighters' health. More than half of the respondents (423 [57.9%]) "strongly agreed" and 255 (34.9%) "somewhat agreed" that fire departments should take a more active role in informing their members about the increased medical risks associated with their jobs. In fact, 325 respondents (44.5%) were "definitely interested" and 333 (45.6%) were "somewhat interested" in attending "a lecture regarding proper diet and exercise and reducing heart attack risk" if their departments would provide it. Moreover, 415 (56.8%) and 292 (40.0%) reported being "definitely interested" and "somewhat interested," respectively, in participating in a fitness program if their departments provided it.

► Comment

The findings of the current study suggest that firefighters know they are at high risk for cardiovascular disease. Although only 10 firefighters reported having had a heart attack, more than three-fourths of respondents had a BMI classification—a useful screening measure for the health and fitness of firefighters⁴—of overweight or obese. In fact, nearly 40% of the respondents reported having high blood pressure, high

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cholesterol, or both, and nearly one-third of the firefighters reported taking medications, most of which were to manage cardiovascular disease risks.

Our study yielded conclusions similar to those of other studies.^{17,18} In the present study, at least 90% of respondents favored fire departments' taking a more active role in informing its members about the increased medical risks associated with their jobs, would attend a department-organized lecture regarding proper diet and exercise and reduction of their risks of heart attack, and were interested in participating in a department-sponsored fitness program.

Many respondents had cardiovascular disease risk factors, and a few even had previous cardiovascular incidents. Moreover, when returning their surveys, many firefighters reported to the survey collector (P.S.) that they had difficulty decreasing their risk factors because of a lack of education about cardiovascular disease or difficulty in receiving appropriate healthcare.

Although firefighters are required to have a regular physical examination, fire departments may not pay for the examination. Even if the fire department covers the cost of the physical examination, the individual firefighter is responsible for paying for any further tests or follow-up care, making it particularly difficult for firefighters without health insurance.

The present study substantiates the need for further health education as most (657 [90%]) of the respondents reported having at least some interest in learning more about how to decrease their cardiac risk factors. Firefighters' reported desire to learn presents an exciting opportunity for healthcare providers and public health advocates to partner with fire departments to improve access to resources, identify cardiac risk factors, and assist in modifying these risk factors.

In addition, fire departments must take a more proactive approach to ensure that their firefighters are healthy.¹⁴ They could provide lectures, seminars, and counseling to begin or enhance firefighters' education about cardiovascular disease. A physical fitness program at a local health club or a firehouse gymnasium could allow firefighters to improve their physical fitness. The NFPA does recommend that fire departments have a fitness program, which may vary from having a gym on the firehouse premises or reimbursing for personal trainers or weight loss programs. Although some fire departments included in the current study had some form of fitness program in place, specific information was not collected because of the amount of variance among programs.

Resources are available, including those provided by Predictive Advanced Cardiovascular Evaluation (<http://www.pacecardio.com>), the American Heart Association (<http://www.americanheart.org>), and WebMD (<http://www.webmd.com>), to address cardiovascular disease among a number of populations and can be applied to the fire service. Moreover, although 635 (87%) of the firefighters in this study reported having health insurance, fire departments could contact local government officials about health insurance supplementation for those without insurance. Fire department officers could also contact local physicians to establish a referral base for firefighters who do not have a primary care physician.

Certain limitations to the present study exist. For example, all data collected in the current study were self-reported. No objective data, such as blood pressure readings or levels of high-density lipoprotein, low-density lipoprotein, total cholesterol, triglycerides, or glucose, were collected. However, because of

the number of respondents in the current study, which was considerably higher than those in similar studies, [16,17,19](#) collecting objective data might be more difficult. Also, although objective data would be useful, self-reported data have value, especially regarding interest in department-sponsored education or exercise initiatives.

In addition to including objective data, the survey instrument would benefit from further clarification, such as a clear definition of how much alcohol constitutes one drink. Respondents may or may not have had an accurate understanding of alcohol content, so further explanation would increase the accuracy of the answer to this question. However, even with these limitations, the survey provides important data on the lifestyles and risk factors of firefighters.

Another potential limitation of the present study is that the findings cannot be generalized beyond the Long Island geographic region. Even so, our study has identified a relatively large population interested in receiving educational resources, and this in itself is valuable.

► Conclusion

The findings of this study suggest that coronary heart disease and its associated risk factors are prevalent in the fire service. Moreover, volunteer firefighters are generally aware of the potential risk of cardiovascular disease in their occupation and are interested in learning more about risk factor modification.

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Future research should evaluate firefighters' knowledge, behaviors, and intentions regarding risk factors after a lecture or intervention. It is important for the health and safety of firefighters and the communities they serve for fire district commissioners or fire chiefs to provide resources and interventions for their employees and volunteers. Effectiveness of resources and intervention programs among this population should also be evaluated for future use and potential guidelines.

► Footnotes

Dr Scanlon was a volunteer firefighter in Long Island, NY, for 9 years (1999 through 2008) and was an assistant fire chief for 2 years.

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