

Improving Cardiovascular Risk Profiles in Firefighters

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Abstract Firefighters fall behind in the general public in meeting optimal levels of the seven American Heart Association metrics of cardiovascular health. Selected interventions for decreasing firefighter cardiovascular disease and risks are reviewed. Many cardiovascular risk factors are related to lifestyle and firefighters are at increased risk for cardiovascular events. Healthy People 2020 and the American Heart Association have goals to improve cardiovascular health nationally. The American Heart Association [1] defined ideal cardiovascular health as the absence of clinically manifested cardiovascular disease and the presence of optimal levels of seven metrics. These seven metrics include diet quality, physical activity, smoking, body mass index (BMI), blood cholesterol, blood pressure, and glucose. However, evidence demonstrates that firefighters whether career or volunteer fall woefully behind the general public in meeting these optimal levels for several reasons.

Keywords Firefighters, Health Promotion, Obesity, Nutrition

1. Background

There are approximately 1.1 million firefighters in the United States. Many in the public do not realize that of these 70% are volunteer and have other jobs [2,3]. The leading causes of death among firefighters are cardiovascular events, cancer, and motor vehicle accidents [2,4], while sudden cardiac events account for 50% of volunteer and 39% of on duty deaths [2]. Most of the deaths occur during fire suppression [5]. Many of these sudden cardiac events are preventable.

For every on duty fatal cardiovascular death, there are 17 nonfatal cardiovascular events [6, 7]. These line-of-duty events place the firefighter, co-workers, and the public at increased risk for death or disability related to fire associated injuries [7]. Laws exist to provide funding for the fire service and to provide benefits for firefighters' disabilities or deaths. According to Ratchford et al. [6], the predictable cost for one firefighter for one year of

cardiovascular disease (CVD) related disability ranges between \$250,000 and \$400,000 per year in addition to a benefit of \$80,000 death benefit. As a result, both the fire service and the public benefit from proactive actions to decrease morbidity and mortality.

2. Cardiovascular Risk Factors

Stress is one of the known cardiovascular risk factors associated with firefighting. Prioritization of exercise and diet are secondary to meeting the requirements of fulfilling job duties. Meeting their "day job" responsibilities as well as those of the fire service challenges volunteer fire fighters further [8]. Not only does stress contribute directly to CVD, but indirectly through its impact on the firefighters ability to choose and prepare healthy food.

Firehouse food habits vary widely but take out and fast food and group cooking are common practices. Many describe food options as limited, expensive, or unhealthy [8]. Some are uneducated about what constitutes a heart healthy diet and others do not recognize themselves as overweight or obese [2]. Ratchford et al. [6] found that in firefighters aged 40-58; 86% were overweight or obese, with 46% having an increased waist circumference.

Body mass index (BMI) fewer than 25 has been identified as optimal. However, the question of accuracy in firefighters and athletes has been questioned because muscle weighs more than fat. Ode et al [3] found that a BMI ≥ 30 accurately predicted firefighters as being over fat but a few large and lean firefighters were misclassified. A high proportion of obese firefighters underestimate their BMI category. Those who were obese but viewed themselves as normal/healthy or muscular tended to be more active but still had higher cardiovascular disease risk profiles than those who perceived themselves as heavier. Objectively determining BMI, informing the individual about actual weight status, and associated disease risks are very important to increasing awareness [9]. In addition, firefighters with BMI ≥ 25 should be assessed as percentage of fat, recommended being 14-25% [3].

Smoking has long been recognized as a leading cause of cancer and cardiovascular disease. In recent years many

restrictions have been placed on smoking in and around fire stations and on firefighters. This has given rise to the use of smokeless tobacco [10]. Many believe smokeless tobacco has fewer disease causing effects but most use it because of the restrictions on smoking [11].

Yang et al [12] found that even deaths in those younger than 45 years were frequently linked to lifestyle and supported previous recommendations for mandatory medical screenings. Making the screenings and physical standards mandatory potentially impairs the ability of many fire departments to function especially those who are entirely volunteers. Lifestyle changes are difficult to make but the culture of the fire service can and has been, used to facilitate those changes.

By collaborating with nurses and other healthcare providers, fire chiefs can lead by example and implement training in their departments. Inherent in the culture of the fire department is friendly competition and support for achieving personal and group goals.

3. Lay the Ground Work

The first step is to determine what is needed by the local fire department. Ask the following questions: Who are the healthcare providers? What resources in the community are dedicated to wellness? What does the department need to address adequately the cardiovascular risk among volunteers and full time firefighters? Consider mutual aid agreements: Can these departments share resources related to health and wellness? One underutilized but widely available resource is the Cooperative Extension Service. This university-linked service is not just for farmers and gardeners. Family Consumer Science agents can provide education about nutrition, physical fitness, and much more.

Do not overlook fire department culture. Sustainability, maintenance consistency and cohesion are necessary to achieve goals. Interpersonal, intrapersonal, and organizational factors demonstrate effects on fitness and other health behaviors. Intrapersonal factors that have the strongest influence on success of any major lifestyle change are personal motivation and awareness. Awareness when associated with high personal motivation is the key. However, studies have shown that some firefighters are unaware of cardiovascular disease risk factors, underestimate their weight, and do not regularly participate in medical screenings [9, 13].

Interpersonal factors are strong proponents of social cohesion and crew dependability. Captains who are strong proponents of programs have significant influence over crews. Management support and fitness can influence outcomes positively or negatively. When managers are fit, voice support, and supply resources for program maintenance then they positively influence crews. Organizational factors such as adequate space support for regular wellness activities, and or policies related to fitness enhance physical fitness programs. MacKinnon et al. [14]

conducted a follow-up study of the long term effects of a peer lead healthy lifestyle program. The differences between the intervention and control dissipated over time but at the end of 1 year, worksites as a whole were healthier. This lends support to the provision of dedicated workout time uninterrupted by routine duties to the on-duty firefighter or for departments to hold regular fitness/work-outs as a group.

4. Taking Action

Several studies have been conducted in the United States regarding cardiovascular fitness in firefighters. Dobson et al [15] found five themes that firefighters believed related to cardiovascular fitness. These themes were; fire station eating culture, night calls and sleep interruption, supervisor leadership and physical fitness, sedentary work, and age/generational influences were the major influences on individuals and unit fitness. Fire station eating culture was the most complex with six sub-themes; meal planning, portion size, tradition/peer pressure, call interruption/eating habits, high calorie snacking, and influence of fire station eating culture on making changes. These findings underscore that behavior change is a function of many factors not just cognitive awareness [16].

Goheer et al. [17] piloted a program that consisted of six 90-minute sessions of nutrition and cooking demonstrations. Family members were encouraged to attend. Firefighters evaluated the program as helpful but there is no mention of changes in BMI or evaluation of maintenance of the changes made. However, the participants reported the changes they made in their diet extended to their home. This suggests educational programs in the workplace may have a ripple effect on the family.

McDonough et al [16] collaborated with a fire department and spent eight weeks evaluating and developing an 8-week intervention tailored to meet the identified needs of the fire fighters. The intervention consisted of health education seminars, nutrition information sharing, exercise demonstration and hands-on health snack preparation. In addition, approximately one-half of the participants received individualized coaching by an ACSM-certified specialists and a licensed athletic trainer. Although weight did not decrease the waist circumference decreased by 8.3% in the coached group. Differences in other pre/post differences were not significant but were positive trends were noted, with slightly higher scores in the coached group. McDonough et al [16] concluded that the annual fitness testing does not produce adequate cardiovascular fitness to prevent cardiovascular events. Departments without access to centralized exercise facilities need programs and methodologies to implement year round to improve and maintain cardiovascular fitness. Joining with healthcare organizations, universities, or community colleges would be mutually beneficial.

Other studies have evaluated one or more aspects of cardiovascular fitness by increasing physical activity, improving nutritional status, or identifying modifiable cardiovascular risk factors. One of the most modifiable is hypertension. Hypertension or high blood pressure is strongly associated with poor cardiovascular outcomes. Optimal blood pressure is 120mm Hg over 80mm Hg. Firefighters with hypertension is 12 times more likely to die from cardiovascular disease [18]. Blood pressure can be decreased by limiting sodium intake to less than 2400 milligrams/day and limiting alcohol to two drinks per day are known to decrease blood pressure. Those who are overweight or obese are two to six times more likely to have hypertension. Increasing physical activity can reduce blood pressure up to 8 mm Hg. In addition, regular exercise contributes to weight loss. The minerals, calcium, magnesium, and potassium also improved blood pressure. In addition, these minerals are found in fruits, vegetables, nuts, beans, and grains that contain fiber which also promotes weight loss [18].

Physical fitness relies on exercise and just like underestimating their weight, firefighters tend to overestimate their fitness levels and not recognize their cardiovascular risk factors. Therefore, medical clearance before beginning an intensive physical exercise program is necessary [19]. Minimally, evaluation should include an electrocardiogram, blood glucose, lipid profile, weight, BMI, waist circumference, and blood pressure. Recorded before beginning and recorded periodically while the firefighter is participating in an exercise program. Improvements seen will serve to motivate the individual. All individual results should remain confidential but aggregate data reports can be used to motivate the group.

Occupational Safety and Health Administration (OSHA; CFR1910.156. section b, part 2) mandates firefighters be physically capable of performing the duties assigned. National and international Fire Fighter Associations have developed task forces or guidelines to address firefighter fitness (International Association of Firefighters [IAFF] & National Fire Protection Agency [NFPA], 2016). For example, the NFPA developed a standard for health related fitness programs (HRFP) for all fire department members. The standard requires assignment of a qualified health fitness coordinator, periodic fitness assessment (at minimum annually), exercise training program, education and counseling regarding health promotion for ALL members and a process for collecting and maintain health related fitness program data. Within the each component are guidelines for designing and implementing HRFP.

In order to minimize risks firefighters, fire departments, and the community must take an active role in healthy through proper nutrition, weight control stress management, substance abuse prevention, and personal safety. Mandates and legislation alone will not achieve the desired outcomes.

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REFERENCES

- [1] American Heart Association. (2016). ACC/AHA Guidelines. Online available from <http://circ.ahajournals.org/content/early/2013/11/11/01.cir.0000437741.48606.98>
- [2] Eastlake, A. K., Knipper, B. S., He, X., Alexander, B. M., & Davis, K. G. Lifestyle and safety practices of firefighters and their relation to cardiovascular risk factors. *Work [serial online]* (February 2015), 50(2):285-294.
- [3] Ode, J., Knous, J., Schlaff, R., Hemenway, J., Peterson, J. & Lowry, J. Accuracy of body mass index on volunteer firefighters. *Occupational Medicine (Oxford England)* 64.3: 193-197. MEDLINE.
- [4] Barger, L. K., Rajaratnam, S. M. W., Wang, W., O'Brien, C. S., Sullivan, J.P., Qadri, S., Lockley, S. W., & Czeisler, C.A. (2015). Common sleep disorders increase risk of motor vehicle crashes and adverse health outcomes in firefighters. *Journal of Clinical Sleep Medicine [serial on the Internet]*(2015, Mar.), 11(3), 233-240.
- [5] Pillutla, P., Li, D., Ahmadi, N., & Budoff, M. J. Comparison of coronary calcium in firefighters with abnormal stress test findings and in asymptomatic non firefighters with abnormal stress test findings. *American Journal of Cardiology [serial on the Internet]*, (2012, Feb. 15), 109(4): 511-514.
- [6] Ratchford, E. V., Carson, K. A., Jones, S. R., & Ashen, M.D. (2014). Usefulness of coronary and carotid imaging rather than traditional atherosclerotic risk factors to identify firefighters at increased risk for cardiovascular disease. *American Journal Cardiology [serial on the Internet]*, (2014, May). 113(9): 1499-1504.
- [7] Banes, C. J. Firefighters cardiovascular risk behaviors: Effective Interventions and cultural congruence. *Workplace Health SAF.* (2014). 62(1): 27-34.
- [8] Frattaroli, S., Pollack, K. M., Bailey, M., Schafer, H., Cheskin, L. J., & Holtgrave, D. R. Working inside the firehouse: Developing a participant-driven intervention to enhance health-promoting behaviors. *Health Promotion Practice [serial on the Internet]*, (2013, May) 14(3): 451-458. MEDLINE.
- [9] Baur, D. M., Christophi, C. A., Tsismenakis, A. J., Jahnke, S. A., & Kales, S. N. Weight-perception in male career firefighters and its association with cardiovascular risk factors. *BMC Public Health [serial on the Internet]*, (2012, Jan.), 12(1):480-487.
- [10] Jitnarin, N., Haddock, C. K., Poston, W., & Jahnke, S. (2013). Smokeless tobacco and dual use among firefighters in the Central United States. *Journal of Environmental and Public Health [serial on the Internet]*, (2013, Jan.), 29(7):2041-2044.
- [11] Poston, W. S.C., Haddock, C. K., Jitnarin, N., & Jahnke, S. A. A national qualitative study of tobacco use among career firefighters and department health personnel. *Nicotine & Tobacco Research [serial on the Internet]*, (a2012, June), 14(6): 734-741.
- [12] Yang, J., Teehan, D., Farioli, A., Baur, D. M., Smith, D., & Kales, S. N. Sudden cardiac death among firefighters ≤ 45

- years of age in the United States. *American Journal of Cardiology*, 112(12): 1962-1967.
- [13] Risavi, B. L. & Staszko, J. Prevalence of risk factors for coronary artery disease in Pennsylvania (USA) firefighters. *Prehospital Disaster Medicine* [serial on the Internet], (2016, Feb.), 31(1), 102-107. Supplemental Index.
- [14] MacKinnon, D. P., Elliot, D. L., Thoemmes, F., Kuehl, K. S., Moe, E. L., Goldberg, L., Burrell, G. L., & Ranby, K. W. Long-term effects of a worksite health promotion program for firefighters. *American Journal of Health Behavior* [serial on the Internet], (2010, Nov.). 34(6): 695-706.
- [15] Dobson, M., Choi, B., Schnall, PL., Wigger, E., Garcia-Rivas, J., Israel, L., & Baker, D. B. Exploring occupational and health behavior causes of firefighter obesity: A qualitative study. *American Journal of Industrial Medicine* [serial on the Internet], (2013, July), 56(7): 776-790.
- [16] McDonough, S. L., Phillips, J. S., & Twilbeck, T. J. Determining best practices to reduce occupational health risks in firefighters. *Journal of Strength and Conditioning Research*, (Lippincott, Williams, & Wilkins) [serial on the Internet] (2015, July) 29(7): 2041-2044.
- [17] Goheer, A., Bailey, M., Gittelsohn, J., & Pollack, K. M. Fighting fires and fat: An intervention to address obesity in the fire service. *Journal of Nutrition Education and Behavior* [serial on the Internet], (2014, May), 46(3):219-220.
- [18] Moore, K. Blood pressure in firefighters: A silent killer? *Fire Engineering* [serial on the Internet]. (2013, Dec.). 166(12):26-31.
- [19] Jahnke, S. (2016). Seven reasons for annual firefighter physical test. Available online from <https://www.firerecruit.com/articles/56802018-7-reasons-for-annual-firefighter-physical-tests>
- [20] International Association of Fire Fighters (IAFF). (2016). Wellness-fitness initiative. Available online from <http://www.client.prod.iaff.org>
- [21] National Fire Protection Association. (2016). NFPA 1583: Standard on Health Related Fitness Programs for Fire Department Members. Available online from <http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&code=1583>