

**DEVELOPING A COMPREHENSIVE WELLNESS PROGRAM FOR
FIREFIGHTERS**

Strategic Management of Change

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Abstract

In 1999 the Boston Fire Department suffered the loss of 12 active members, nine due to heart disease, two due to cancer, and one from disease of the pancreas. New leadership within labor and the administration of the Boston Fire Department (BFD) felt it was time to analyze issues of firefighter health and safety. The problem was that the BFD did not have a wellness program for its members, and the establishment of such a program may in fact improve the health of its membership and lower the occurrences of death and illness.

Descriptive research methodology was used to answer the following questions:

1. How does improving physical fitness, proper nutritional behavior, and stress management reduce heart disease and improve general health?
2. What immediate changes can be made within the Boston Fire Department to reduce heart disease and improve the general health of its members?
3. What standards presently exist within the fire service concerning the topic of wellness?
4. Will the membership of the Boston Fire Department be receptive to a wellness program?

The procedures used to complete this research included a literature review of fire service periodicals, texts on health and fitness, and a pilot program that employed 62 volunteers to take part in a well/fitness program.

The results of this research imply that major changes in training and education are needed to address this problem. Future legal standards may also change the way the BFD addresses this problem.

Recommendations were made that will hopefully guide the BFD through the beginning stages of addressing this issue. They include the creation of an ergonomics committee, offering a monetary allowance for employees that join a health club, offering free physical exams for members over 40 years of age, and performing a study on wellness programs now in existence in other large city fire agencies.

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Introduction

According to the *Boston Fire Department 1998 Annual Report*, (1999) the Boston Fire Department employs 1,612 active members, most of which are assigned to field operations. During the year 1999 the BFD experienced the deaths of 12 active members, nine due to heart disease, two due to cancer, and one from disease of the pancreas. The BFD presently has 50 members being treated for heart disease and cancer, 50 members being treated for musculoskeletal injuries, 10 members with breathing difficulties, and 10 members with wounds or burns (personal communications with Dr. Michael Hamrock BFD Medical Director, February 1, 2000).

Nationally, over 50% of line-of-duty deaths are caused by heart failure; it is well known that certain changes in behavior can reduce the number of these deaths. These changes include physical fitness, nutrition, and stress management (Pearson, Hayford, and Royer, 1995). The implementation of a wellness program has been recommended by various organizations concerned with firefighter health issues (IAFF, 1997).

Unlike other professions, firefighting requires a person to work at near maximal heart rates for long periods of time. New protective gear, which encapsulates a firefighter causing restrictions in movement, has only added to this problem. The heated environment that firefighters encounter on the fireground further exacerbates this problem (Pearson, Hayford, & Royer, 1995).

The medical profession now focuses on disease prevention rather than disease management. The fire service profession is now incorporating this same philosophy regarding the protection of its own members. The problem was that no formal plan existed within the BFD that addressed the issues of heart disease as it relates to firefighters. These needs are education, medical evaluations, physical fitness programs, nutritional programs, and stress management programs. This was seen as a problem because of the deaths of nine active duty members to heart disease in 1999.

The purpose of this applied research project was to address the following questions:

- How does improving physical fitness, nutrition, and stress management reduce heart disease, and other ailments experienced by firefighters?
- What immediate changes can be made by the BFD to reduce heart disease amongst its members?
- What standards presently exist concerning this topic? and
- Will the membership of the BFD be receptive to a wellness program?

This project used descriptive research methodology and employed the following procedures. A literature review was conducted of past writings and research by educators, medical professionals, and persons presently involved in the implementation of firefighter wellness programs. Literary

sources were obtained from the National Fire Academy's (NFA) Learning Resource Center (LRC), the University of Massachusetts' Healy Library; the National Fire Prevention Association (NFPA) in Quincy, Massachusetts; personal interviews, and written questionnaires.

Background & Significance

Background

In June of 1999, Fire Captain Jack McKenna assumed the position of President for Boston Firefighters Local 718, of the International Association of Firefighters. One of President McKenna's immediate concerns was the high amount of deaths due to heart disease that occurred within his local membership within the year 1999. President McKenna established a committee to assess the problem and asked the department administration for possible future assistance in this endeavor. Departmental assistance was promised by Commissioner Martin E. Pierce Jr. and the wellness committee's first meeting was held in September of 1999.

At this meeting it was decided that a pilot program enlisting 25 volunteers was needed to test wellness education programs. These 25 members would be offered a medical screening, a physical fitness program, nutritional education, and stress management information. The Department agreed to provide funding for this pilot program.

A Memorandum of Understanding (MOU) was attained with the Dedham Health and Athletic Club of Dedham, Massachusetts

to provide physical fitness and nutritional education. A MOU was also undertaken with the Boston Veterans Administration Hospital and St. Elizabeth's Hospital of Boston to provide medical exams and stress management information.

Sixty-four applicants expressed a desire to enter the pilot program. The committee decided that it would be a missed opportunity to deny acceptance to any of the applicants. All 64 applicants were accepted and the program officially began on December 1, 1999.

Significance

This applied research project was important to the National Fire Academy's (NFA) "Strategic Management of Change" course because it changes a basic philosophy of firefighter safety. The old philosophy directed fire departments to manage wellness issues after members were sick or injured. The new philosophy encourages fire departments to prevent sickness and injury amongst its membership.

This applied research project is an analysis of an existing problem facing the BFD and an assessment of what health and safety issues need to be changed in order to improve the health and safety of the BFD membership.

In FEMA's (1996) student manual *Strategic Management of Change*, an analysis involves the following steps:

- Identifying organizational conditions and comparing them to the existing mission, standards, values, and norms,
- Identifying potential destabilizing forces,
- Assessing the impact of current conditions, and
- Determining organizational change requirements.

Literature Review

Research started with gathering health and safety information regarding the national firefighting population. In his book, *Safety and Survival on the Fireground*, Vincent Dunn (1992) produced the following information regarding firefighter deaths and injuries:

- Each year in the United States over 100 firefighters die in the line of duty, and another 100,000 are injured.
- On average there is one firefighter death every three days, and 8,000 firefighter injuries every 30 days (Dunn, 1992).

Dunn (1992) goes on to state that the causes of firefighter deaths ranking from most frequent to least frequent are:

- Stress (physical and emotional),
- Responding to, and returning from alarms,
- Falls, or falling objects,
- Heat and toxins released from combustion, and
- Structure collapse (p.1).

In the Federal Emergency Management's Association's [FEMA (1996)] *Fire and Emergency Medical Service Ergonomics*, it states that injuries to firefighters would most often consist of strains and sprains (40%), followed by wounds (20%), and (20%) from burns and smoke.

Dunn (1992) offers that the high numbers of deaths and injuries can be attributed to the fact that firefighting is a dangerous occupation, but it differs from other dangerous occupations. Before other dangerous occupations such as miners, ironworkers, and heavy equipment operators begin their tasks, there are extensive preparations. Lighting is provided, as well as structural supports, and a proper breathing atmosphere is ensured before workers are allowed to enter their work area. Firefighters work in an atmosphere of fire, smoke, and hazardous materials that by its very nature negates the benefits of lighting, attacks the stability of structural supports, and poisons the breathing atmosphere as well as increase temperatures to hundreds of degrees above normal.

Ergonomics

Ergonomics is the science of safety principles in the workplace. It is best utilized when workers at all levels of an organization are empowered to identify health problems in their profession, and participate in rectifying these problems.

Ergonomics began during World War II when improvements in the effectiveness and efficiency of equipment used in battle needed extensive study for optimal results. Until recently ergonomics was used solely within military operations, now American industry also employs ergonomics to

redesign jobs, and to create safer environments for their workers (FEMA, 1996).

The fire service can benefit from an ergonomics program by making it a component of a complete well/fitness program. Ergonomic principles can help identify "... poorly designed equipment and unsafe job practices so that improvements can be made, and injury and loss time lessened" (FEMA, 1996, p.1-4).

FEMA (1996) recommends analyzing the following ergonomic activities:

- Lifting and carrying fire hose, ladders, and people,
- Performing firefighting tasks in physically awkward positions, (Fire and accident scenes are very haphazard and this leads to employing unconventional body placement to complete certain tasks. This is especially true during extrication and rescue operations.)
- Engineering fire service vehicles for proper step height and equipment placement, and
- Evaluating firefighter protective clothing and equipment that also reduces mobility and increases heat stress.

The employment of ergonomics into the fire service is a proactive approach to the wellness of fire service members. An ergonomic committee within fire departments can provide for early recognition and prevention of health problems. The ergonomic committee should supervise injury and death

statistics within the department, as well as provide education, evaluate equipment, interface with all ranks, conduct job analysis, and help provide technical solutions to problems. Record keeping of activities is important to substantiate job redesign and program and equipment expenditures. FEMA also suggests that members serving on the ergonomics committee should rotate to demonstrate inclusiveness, but should always involve the department's physician, and a top administrative officer. The committee should be well publicized and provide regular reports of its activities (FEMA, 1996).

Heart Disease

"We teach our firefighters about the dangers encountered during firefighting operations, but we teach them nothing about the number one cause of firefighter deaths, which is heart disease" (personal communications with Deputy Chief John Hasson, Emergency Management Director City of Boston, February 25, 2000).

The American Heart Association [AHA (1996)] teaches that the heart is actually one part of the circulatory system, which also includes the lungs, and blood vessels of the body. The blood vessels deliver fresh oxygenated blood throughout the body and return the waste products in the form of a gas back to the lungs for reoxygenation. The heart itself is divided into two sections. Each section, sometimes referred to as the right heart and the left heart, contains two chambers consisting of atria and a ventricle.

The right side of the heart takes in the oxygen-depleted blood and delivers it to the lungs. Once this blood is reoxygenated in the lungs it is returned to the left side of the heart for distribution throughout the body. In order to do this efficiently the heart relies on valves between the atria and the ventricles on each side of the heart. These valves prevent a back-flow of blood which would render the pumping ability of the heart to be inefficient. Once the blood leaves the left side of the heart its first job is to feed itself. The heart feeds itself through the coronary arteries. The coronary arteries surround the heart and reach into the heart to supply it with oxygenated blood.

Most heart disease is due to atherosclerosis, the build-up of plaque, or cholesterol and fat, within the coronary arteries. When this happens there may be pain during exertion as the arteries begin to clog and restrict the oxygen supply to the heart. Complete blockage will cause a heart attack, and this will damage the section of the heart being fed by the blocked artery (Pearson et al, 1995).

Physical Fitness

A physical fitness regime is needed for a healthy heart. There are three main categories of physical fitness. They are aerobic, anaerobic, and flexibility. Research on these categories was done to describe the necessity of maintaining proper fitness in each category.

Aerobic exercise deals with increasing one's endurance, and can be measured by a person's aerobic capacity. Aerobic capacity is the body's ability to expel carbon dioxide for air within the lungs, oxygenate the blood, and then pump oxygenated blood from the heart through the vascular system to the cells within the muscles. This process continues until the cells within the muscles of the body absorb the oxygen, combine it with blood sugar and fat creating fuel (energy) to power the body. Muscle usage creates waste within the muscles in the form of carbon dioxide and lactic acid; this waste is removed by the absorption of oxygen by the muscle tissue.

A low aerobic capacity is caused by the inability of the cells within the muscles to process oxygen. The creation of energy is proportional to the level of physical activity. Increasing aerobic training strengthens the lungs and heart, and transfers oxygen faster increasing the ability of the muscle cells to produce aerobic energy and improve endurance (Davis, 1993)

During firefighting activities heart rates increase rapidly and can remain at 100% maximum beats per minute until a vital task is completed (Gilman & Davis, 1993). A high aerobic capacity allows one to sustain a high level of physical performance for longer periods of time without becoming tired, and allows one to recover quicker by removing waste from the muscle tissue. To attain a high aerobic capacity firefighters must exercise the

cardiovascular system of the body. Exercising the large muscle groups of the body for twenty minutes or more at least three times per week will improve aerobic capacity within four weeks. Common aerobic exercises include walking, running, swimming, and biking (O'Connor, 1996b).

The next component of physical fitness is the issue of anaerobic fitness. Anaerobic energy is stored energy that is used by the body for short bursts of high energy. Anaerobic energy can be compared to fuel within a battery; this energy is quickly exhausted and must be replaced or recharged. Weight training increases anaerobic capacity. Lactic acid is also a waste product of anaerobic energy, and is removed in the same fashion as the waste produced from aerobic energy (Davis, 1993). This fact shows the relationship between aerobic conditioning and anaerobic conditioning.

Anaerobic conditioning can be improved by engaging in exercises involving weights or utilizing techniques that force the body to overcome resistance such as pull-ups and push-ups. Forearms/hands, arms, chest, shoulders, lower back, and legs are important muscle groups for firefighting and should be exercised three times per week. Anaerobic training for females will require more work because of differences in stature, muscle mass, and hormonal balance and this fact should be addressed early, during the planning stage of a fitness program (O'Connor, 1995).

A third component of physical fitness is the issue of flexibility. "Flexibility is the range of movement around a joint or a series of joints within the body" (O'Connor, 1996a, P.23). It concerns the pliability of muscles, tendons, and ligaments, and the ability of these tissues to conduct a full range of motion. Flexibility is especially important for performing tasks related to firefighting. These tasks include lifting heavy objects (including people), reaching, climbing, and stressing joints beyond a normal range of motion (O'Connor, 1996a).

"Everyone's flexibility is reduced as they age. Males are about 20% less flexible than women at every age" (O'Connor, 1996a, p. 23).

Total body flexibility can only be measured by testing each joint individually, but some general tests can be performed to rate overall flexibility. These tests involve a simple toe-touch from the standing and sitting position. A twenty minute stretching session is recommended per week, stretches should be static not erratic. Stretching exercises should extend connective tissue and the position held for 20 to 40 second intervals.

It is not uncommon for fitness programs to be implemented without any provisions for improving flexibility. Flexibility directly influences the incidence of musculoskeletal injuries in the firefighting profession, and must be a priority in a fitness program (O'Connor, 1996a).

Nutrition

Addressing the issue of physical fitness can only be done with a proper nutritional program. Firefighters perform strenuous duties in an environment that also involves an increase in heat imposed upon the body; this added heat is caused by fire and the encapsulation one experiences while wearing bunker gear. This added heat causes the heart to work harder which causes deterioration in performance level due to fatigue. Fuel in the form of nutrients is needed to re-energize the body (Smith, 1995).

Nugent (1993) states that there are four steps that must be taken when devising a nutritional plan. These steps include education, appetite modification, exercise, and proper mind set.

Education is the first step and the one that will be discussed in this research project. Educating your employees on the science of nutrition is the key to changing behavior. Foods or nutrients can be broken down into six categories: carbohydrates, fats, proteins, vitamins, mineral, and water. The foods we consume contain calories. The calories represent potential energy that our bodies use to produce heat and work.

Carbohydrates and proteins contain four calories per gram, while fats contain nine calories per gram. Vitamins, minerals, and water contain zero calories but are necessary components of proper nutrition and thus proper body function.

Carbohydrates are of two types, simple and complex. Simple carbohydrates include disaccharides (table sugar) and monosaccharides (glucose and fructose). Inside the body the disaccharides yield the monosaccharides (Nugent, 1993). Simple carbohydrates such as sweets or desserts are usually high in calories but have little nutritional value. Although these carbohydrates contain no more calories than complex carbohydrates, a problem exists with the overconsumption of these products (Smith, 1995).

Nugent (1993) explains that complex carbohydrates are a more efficient fuel source. Complex carbohydrates are released into the blood stream at a slower rate and do not drastically raise the body's blood sugar level. Complex carbohydrates produce glycogen, which is needed by the muscles during exertion. The ability of the body to store glycogen is directly related to the sedentary level of an individual. An active person will store more glycogen than an inactive person and will be able to perform strenuous duties longer and more efficiently. Complex carbohydrates are found in fruits, vegetables, beans, and grains. These foods also contain high levels of fiber, which acts as a cleansing agent during the digestive process and can reduce the risk of colon cancer, as well as cardiovascular disease, and adult diabetes.

Nugent (1993) further states that fats are a necessary fuel for efficient body functioning. Proper fat intake produces essential fatty acids and also delivers vitamins A,

D, E, and K through the walls of digestive tract. Fats also provide needed energy and increase the flavor of food. The negative effects of fats involve the fact that they contain nine calories per gram.

Fats are identified by its ability to bond with hydrogen. Saturated fats do not bond with hydrogen, and include animal fats, butter, and whole milk. The fact that these fats do not bond with hydrogen molecules allows these products to solidify with in the body causing heart damage, cholesterol problems, and some cancers. Unsaturated fats can bond with hydrogen and include monounsaturated fats and polyunsaturated fats. Polyunsaturated fats such as peanut oil, olive oil, and sunflower oil bond with hydrogen even more readily than monounsaturated fats. Replacing saturated fats with unsaturated fats has been shown to reduce cholesterol levels in some individuals, decreasing the occurrence of cardiovascular disease.

Proteins are our most versatile nutrient. Proteins contains carbon, hydrogen, oxygen, and nitrogen. The body takes these four elements and combines them in different formations to produce amino acids. Protein is obtained from animal and vegetable sources, animal sources being more efficient. Vegetable sources do not contain all of the amino acids needed by the body, so they must be eaten in the proper combination to provide the body with a sufficient supply of amino acids. Protein is needed for formation of body tissue, antibodies, hormones, maintaining water

balance, acid balance, blood clotting, and the distribution of oxygen and nutrients to the cells. Any excess of nitrogen is eliminated through the urine while the rest of any unused protein is stored as fat (Nugent, 1993).

Vitamins are organic substances used by the body to prevent disease and to regulate body processes such as digestion, muscle contraction, body growth, and energy release. Some vitamins need the presence of fats for proper distribution while others like B, and C vitamins need water for proper performance. The body requires only about an eighth of a teaspoon of vitamins per day to satisfy its needs (Nugent,1993).

Minerals are inorganic products and are used by the body for the regulation of nerve impulse conduction, acid balance within the blood, water supply, and heart rhythm (Nugent, 1993).

Nugent emphasized that water is the most vital nutrient, but usually the most neglected. Most of the other nutrients need water in some form to accomplish its mission. Water composes 55 to 65% of the human female body and 65 to 75% of the human male body. Water carries nutrients and oxygen throughout the cells while removing waste in the process. If the body retains salt the water within the cells is drawn out leaving the cells unable to perform its intended tasks. Firefighters therefore cannot wait for normal signals indicating thirst. It is important to provide constant hydration at all times. A proper hydration

schedule throughout the day also allows the water to lubricate joints and strengthen the body's soft tissues. On the fireground water provides the body with a natural air conditioning system, by providing sweat which prevents the buildup of internal heat. Eight eight-ounce glasses a day is necessary for minimal performance and should be increased during operations (1993).

Stress

According to the FEMA manual, *Stress Management: Model Program for Maintaining Firefighter Well-Being*, FEMA (1991) states that,

Stress is recognized as one of the most serious occupational hazards affecting firefighter's health, well-being and career. On the other hand, we know that stress is not something to be avoided absolutely, as it is essential for vitality and optimal functioning (P.1).

Stress is a serious occupational hazard for firefighters. Stress can have negative affects on health, performance, decision-making, morale, and family. The inability to deal with stress may lead to drug and alcohol abuse, as well as increase smoking habits (FEMA, 1991).

Dealing with stress can be learned, and exercises in stress reduction both cognitive and physical can be learned. "With a proper stress management program in place an organization can help their members turn stress into a catalyst for productivity and personal growth" (FEMA, 1991, p.3).

FEMA (1991) states that all people are exposed to stress; stress is often defined as the "wear and tear" caused by living in today's fast paced society. The effects of this phenomenon are seen by the popularity of new prescription drugs and also over the counter drugs that are sold by the millions every day in today's world.

Firefighters deal with many of the stresses that influence others everyday, but they also have some very unique stressors. They include responding to life-threatening situations, fires, hazardous materials, building collapses, and incidents involving death. Other stressors include departmental organization problems, training issues, leadership, and scheduling policies (FEMA, 1991).

Stress can also negatively effect a person's heart and cardiovascular system, causing heart disease a common killer in the fire service. Stress costs the American public about twenty million dollars annually. Stress decreases a person's motivation, increases absenteeism, decreases productivity and performance, and damages a person's emotional coping skills (FEMA, 1991).

Stress is however a necessary component of life. Stress is the mechanism that allows our bodies to adapt to rapid change, identify danger, and make quick decisions.

Stressors are the stimulus that triggers the stress response. Physical stressors for firefighters include temperature change, sudden noise, deadly gasses, carcinogenic agents, explosions, radiation, building collapses and vehicle accidents. "These sudden stressors are called [rapid onset stressors] and more often than not begin with the fire alarm at the firehouse" (FEMA, 1991, p.8).

Cognitive stressors include crowding, social stressors, personal stressors, and life changes. Cognitive stressors

deal with issues involving personal interactions, marriage, retirement, work, and death.

Interpreting an event as stressful is known as cognitive appraisal. Feeling an emotion created by our cognitive appraisal is called emotional arousal and this can also be accompanied by physical arousal. Emotional arousal can bring on feelings of sadness or joy depending on the stressor, but physical arousal reacts the same way regardless of good stress or bad stress, this is why issues such as vacations, holidays, and certain celebrations can be related to stress-related diseases.

Emotional arousal can cause different feelings within different people depending on the situation. Physical arousal is identical for everyone and will present itself as increased heart rate, increased blood pressure, and increased respirations among others. This physical arousal is caused by interactions between our nervous system and our endocrine (hormonal) system producing a neuroendocrine response. During this response our thoughts are transduced into mechanical and chemical activity within our muscles and glands. This response produces physical effects that present itself as a pounding heart, sweaty hands, rapid breathing, upset stomach, nausea, muscle pain, and headaches.

At this time the hormone thyroxin may be released from the thyroid. The presence of thyroxin may not be noticed for ten days or more but will present itself by the symptoms

which include; worry, anxiety, paranoia, insomnia, decreased heart strength, and increased possibility of cardiac failure.

Untreated stress can ultimately cause psychosomatic diseases. These are real diseases that include actual tissue damage. They include migraine headaches, hypertension, muscle tension, and peptic ulcers. The body will also be more vulnerable to infectious diseases, diabetes, and cancer (FEMA, 1991).

When the neuroendocrine system activates it also releases catecholamines or stress hormones, of which adrenaline is a component. Adrenaline can cause heart tissue damage as well as damage to the lining of the arteries, which may lead to a heart attack (FEMA, 1991).

During the period between 1981 and 1990, 560 firefighters died as a result of heart attacks. Of this number 233 deaths were attributed to fireground stress and overexertion (Fahy, 1993).

Well/fitness programs can address the issues of stress by providing stress management education. Stress management uses therapeutic, educational, and common sense techniques to reduce the impact that stress has on our minds and bodies. These techniques include decompression, biofeedback training, and relaxation. Relaxation training can consist of transcendental meditation, yoga, progressive muscle relaxation, and self-pacing. Aerobic exercise is a good reliever of negative stress. Exercise decreases the release

of adrenaline during stressful periods and this causes less strain on the cardiovascular system (FEMA, 1991).

Age

The average age of the members employed by the Boston Fire Department (BFD) is 47 (Dr. Michael Hamrock, personal communications, February 10, 2000). Most firefighters die of heart attacks between the ages of 46 and 51 (Dunn, 1992). With this in mind, what physical changes occur in the human body after age 40? People over age 40 can expect some physical decline especially if they lead a sedentary lifestyle. Humans lose almost 6.6 pounds of lean-body mass each decade after reaching adulthood. This rate of decline increases after age 45. Our ability to use oxygen declines, glucose tolerance decreases, body fat increases, and blood pressures usually rise. All of these processes can be slowed, stopped, and reversed by regular physical activity (WebMD, 2000a). Part of the problem lies not only in age, but also in gender. While women usually establish lifetime relationships with health care professionals, men do not. Men tend to seek medical attention for disease management or medical emergencies rather than prevention (WebMD, 1999b).

Legal Issues

Any new program, even one to reduce heart disease will come under legal scrutiny. If fire departments are to establish a well/fitness program requiring the demonstration of certain physical strength tests, they will surely come under the scrutiny of existing law. The American

Disabilities Act of 1990 mandates that all testing maintain a relationship between job criteria and the employee's ability to perform the tasks. Departments much show that physical fitness tests and medical evaluations are job-related and thus job-valid. Only traits specific to the position can be measured (Snyder, 1991).

Title VII of the Civil Rights Act of 1964 describes human rights issues in terms of "protected groups". Any test can be challenged if it has a negative effect on a protected group. Groups protected by Title VII include race, color, religion, sex, and national origin. Title VII restrictions must be kept in mind when designing timed physical events and teachable tasks. (Giomi, Walter, Neves, Halpin, Landry, & Ducey, 1999).

The National Fire Protection Association (NFPA) developed standards regarding health and physical fitness of firefighters. NFPA standard 1500: *Fire Department Occupational Safety and Health Program* specifies physical, medical and organizational requirements to protect the health and well-being of firefighters (NFPA, 1992). NFPA standard 1582: *Medical Requirements for Firefighters*, specifies minimum medical evaluation requirements for new-hires and current firefighters (NFPA, 1997).

Problems with NFPA standards 1500 and 1582 stem from the fact that they were devised without input from organized labor. In 1997 members of the International Association of Firefighters (IAFF) and The International Association of

Fire Chiefs (IAFC) joined together to create *The Fire Service Joint Labor Management Wellness-Fitness Initiative*. Using ten major metropolitan departments within the United States and Canada they created a "...wellness/fitness system with a holistic positive, rehabilitative, and educational focus. They are committed to moving beyond negative timebased performance testing to achieve progressive wellness" (IAFF, 1997, p.iii). This program recognizes the fact that well/fitness issues can only be accomplished by a labor/management partnership. The cornerstone of the program is the fact that it is non-punitive. The initiative states that a successful wellness program must be individualized and not measured against norms or standards. However, the initiative does state that intervention is required when life threatening conditions do exist (IAFF, 1997). Employers will only have access to medical records regarding "fitness for duty, necessary work restrictions, and appropriate accommodations (IAFF, 1997, p.2). Confidentiality is maintained by maintaining all medical files separate from personnel records (IAFF, 1997).

Personal Interviews

Personal communication was undertaken with members of the New York Fire Department (NYFD). Lieutenant Kevin Malley, Fitness Program Director (NYFD), David Prezant, MD, Deputy Chief Medical Officer (NYFD), and Dr. Kerry Kelly, MD, Chief Medical Officer (NYFD), agreed to meet with the BFD Well/Fitness Committee consisting of Cochairmen Richard

Paris Executive Board Local 718 (BFD), and Dr. Michael Hamrock, Medical Director (BFD), District Chief Gerard T. Fontana, Committee Member (BFD), and Firefighter Sean Kelly, Committee Member (BFD). This meeting took place on February 10, 2000 at NYFD Headquarters.

Lieutenant Kevin Malley and his staff explained in detail the components of the IAFF/IAFC initiative regarding physical fitness and nutrition. Some issues discussed by Lieutenant Malley included the necessity of designating time while on duty to physical fitness, the possibility of merit awards, and employing achievable standards. Malley did admit that resistance was high during the beginning stages of the program, but he is now sensing some improvement (personal communication, Feb. 10, 2000).

Dr. Kelly stated that the key to a wellness program succeeding is keeping it "non-punitive", and applying standards that are not too difficult. Inappropriate standards will cause mistrust and defiance. There is also a need for firefighters to be informed on issues of weight gain and nutrition as she has stated that it is not uncommon to see a firefighter gain 15 pounds within the first five years of employment. Dr. Kelly felt confident that the wellness program has, and will continue to save the lives of NYFD firefighters (personal communication, Feb. 10, 2000).

Dr. David Prezant was emphatic on two key issues: that employees should have total faith in the confidentiality of the program, and that the program be supported from top

personnel of the administration and labor. Another issue raised by Dr. Prezant was to celebrate the successes of the program, as too much energy is focused on the negative aspects regarding established standards. Lives will be saved and that's a positive result of a wellness program. Dr. Prezant also felt that all components of the program should be done in-house and not contracted out for bid. He felt that consistency in record keeping and the ability to measure improvements from year to year is best accomplished by a program developed from within (personal communication, Feb. 10, 2000).

Education

The wellness-fitness initiative created by the IAFF and the IAFC agreed that it should focus on education (IAFF, 1997). To accomplish this goal information is needed on how adults learn.

Andragogy is the art and science of teaching adults. Andragogy contains four elements: self-concept, experience, "readiness to learn", and "time perspective and orientation to learning".

Self-concept acknowledges the fact that adults want to be thought of as mature, and resent any violation of their independence. When forming an educational program for adults experience accumulated through life cannot be dismissed. Programs should be developed with input from adult learners. Adults know what they need to accomplish personal goals. First adults must possess a "readiness to

learn" which is an individual's diagnostic process that helps a person to identify their personal needs. Second, adults must have a "time perspective and orientation to learning" which means that a learning program must be taught as addressing the needs of the present. This is different from childhood learning where most of our learning was focused on the future (Ingalls, 1999). Ingalls (1999) further explains andragogy by saying that adults learn best when "...they have a need to know as a result of experience, and a present problem situation or learning need"(p.9). The concepts of andragogy must be taken into account when designing a curriculum for adult wellness.

Procedures

This research project employed descriptive research to study the science of health and fitness, identify legal issues regarding implementing a wellness program, identify educational issues, and also developed a pilot program to help diagnose issues regarding the implementation of a wellness program. This research utilized a comprehensive review of literay sources, past research findings, and personal communications with experts in the field of wellness.

Literature Review

The literature review began at the National Fire Academy's Learning Resource Center in February of 2000. Additional research was conducted at the University of Massachusetts Healy Library in Boston, Massachusetts, through information from the American Heart Association, and the National Fire Protection Association in Quincy, Massachusetts.

This research involved researching articles in fire service periodicals that were written to improve the health of firefighters. Other literary sources included texts from FEMA, the NFPA, and the IAFF regarding firefighter health and safety issues.

Personal Correspondence

Oral correspondence was conducted with the New York Fire Department (NYFD) regarding a wellness program implemented in their department as part of the IAFC-IAFF wellness initiative. This interaction was made to gain advice on the possibility of implementing a wellness program within the Boston Fire Department.

Participants included the wellness and medical staff of the NYFD, as well as the Boston Firefighter's Local 718 wellness committee.

Written correspondence took place in the form of a questionnaire to 62 Boston firefighters that completed a pilot program. The pilot program involved a three-month physical fitness and medical evaluation program that will hopefully identify barriers to the possible implementation of a wellness program for the Boston Fire Department.

Assumptions

It was assumed that all facts and figures received from the research of others were gathered according to proper standards and procedures. It was also assumed that all members involved in the pilot program would provide honest and open feedback.

Limitations

The limitations that influenced this project mainly concerned the fact that all information between the participants of the pilot program and the medical staff involved with this program was kept confidential between these two parties. This was deemed necessary to ensure the non-punitive nature of this program. Facts and figures gathered were compiled as a group and not noted per individual.

Results

1. How does physical fitness, nutritional behaviors, and stress management reduce heart disease and improve general health?

During firefighting activities heart rates increase rapidly and can remain at 100% maximum beats per minute until a vital task is completed (Gilman & Davis, 1993).

A high aerobic capacity is needed to perform the strenuous duties of firefighting; this capacity can only be attained by aerobic training. Aerobic training strengthens the lungs and the heart and increases the ability of muscle cells to use oxygen for anaerobic strength and clean out the waste or lactic acid within the muscles to improve endurance. A regular physical fitness program is needed to maintain proper aerobic and anaerobic fitness (Davis, 1993).

Nutritional requirements for proper firefighter fitness involve a proper balance of carbohydrates, proteins, fats, vitamins, minerals, and water consumption (Nugent, 1993). Understanding the way the human body converts these substances for use as fuel, and avoiding an improper consumption which can be converted to excess fat is considered to be an important element in any educational program devised to prevent heart disease and to improve general health (Nugent, 1993, Smith, 1995).

FEMA (1991) describes stress as a serious occupational hazard affecting the health of firefighters. Dunn (1992) states that the leading cause of death among firefighters is due to stress, this includes emotional stress as well as physical stress. Exercises exist which can lessen the negative effects of stress on the human body. A stress management program can teach a person to deal with stress and reduce the release of negative hormones that damage the lining of the arteries (FEMA, 1991). A stress management program involves the use of physical fitness, nutrition, as well as relaxation training, biofeedback training, and decompression techniques (FEMA, 1991).

2. What immediate changes can be made within the Boston Fire Department to reduce heart disease and improve the general health of its members?

According to Vincent Dunn, firefighters are most apt to die from heart attacks between the ages of 46 and 51 (Dunn, 1992). Improving the physical fitness of firefighters has

been identified as a way to improve general health and wellness. To this end Dr. Michael Hamrock, Medical Director of the Boston Fire Department suggested that the Department purchase elliptical crosstrainers for each Boston firestation. This plan was approved by Fire Commissioner Martin E. Pierce Jr. and fifty-thousand dollars was released from the general budget to purchase this equipment. At this time this equipment has been purchased and delivered to each fire station. Commissioner Pierce also released General Order #29, which encouraged the membership to attain a physical exam that should include the testing of the following:

- Blood pressure,
- Skin,
- Eyes,
- Hearing,
- Heart and lungs,
- Abdominal and testicular regions,
- Prostrate, and the
- Vascular system.

This immediate response served to heighten the awareness of health issues amongst the membership.

3. What standards presently exist within the fire service concerning the topic of wellness?

This question must be addressed whenever well/fitness programs are implemented. Marsh (1997) provided in depth discussion on this topic in his project titled *New Medical/Physical Standards for Frederick County Firefighters*.

The current standards include NFPA 1500 which specifies physical, medical, and organizational requirements regarding the health and well being of firefighters (NFPA, 1992). NFPA 1582, is another standard which specifies minimum medical evaluation requirements for new-hires and current firefighters (NFPA, 1997). The most popular standard, or the standard accepted by ten major metropolitan fire departments in North America is *The Fire Service Joint Labor Management Wellness-Fitness Initiative*. This initiative was co-written by the International Association of Firefighters and The International Association of Fire Chiefs in 1997.

4. Will the membership of the Boston Fire Department be receptive to a wellness program?

The answer to this question was determined from the written responses of the participants of the pilot program. It was determined from their responses that the participants of this pilot program:

- Did feel that their participation in the program was a positive experience,
- Did feel healthier because of their participation,

- Were satisfied with all of the components of the pilot program,
- Do believe that the BFD should have a wellness program, but believe that this program should be voluntary rather than mandatory,
- Do believe that training and education on issues of heart disease, cancer, and preventing injuries should be part of a normal fire department training program, and
- Would like more emphasis placed on ancillary issues such as smoking cessation and the effects of bunker gear.

Discussion

The median age of the Boston Fire department is now 47, (Hamrock, personal communication, February 10, 2000). The age at which most firefighters die due to heart attacks range from age 46 through 51 (Dunn, 1992). This fact coupled with the 12 deaths of active members in 1999 has encouraged union leaders and management to address the problem of wellness within the Department. This research has identified several topics, which must be addressed regarding the reduction of heart disease and the betterment of overall general health.

A physical fitness program that includes improving the aerobic, anaerobic, and flexibility capacities of

firefighters is deemed as a must for maintaining proper a healthy heart and also to reduce musculoskeletal injuries (Gilman & Davis, 1993). Proper physical conditioning must first begin with an education program. The membership must know how the circulatory system of the body works before they can improve their aerobic capacity. The membership must know how the muscles in the body process oxygen to provide strength and endurance. The theories of Ingalls (1999) regarding adult education states that adult education must be participative at all levels, and that the process must involve the present needs of the adult student. To merely state that certain behaviors are beneficial will not guarantee compliance. The membership must know how their bodily systems function just as they are taught equipment usage and maintenance.

This concept may create major changes within the fire service. Dunn (1992) states that before World War Two the American firefighter was expected to suffer casualties for the salvation of property. The priority today is life safety including the life of the firefighter. This concept of firefighter wellness is the next step in firefighter health and safety.

The results of this research have uncovered many implications for the BFD. First, management and labor alike as suggested by FEMA (1996), should support the establishment of an ergonomics committee. This committee would allow the BFD to address health and safety issues

before people are sick or injured. Second, incorporating wellness education as part of department training will definitely increase the duties of the training division but has the potential for delivering beneficial results regarding personnel lost to sickness and injury. Third, and most importantly the BFD has the opportunity to devise a program that has the joint approval of labor and management and not one that is thrust upon them by legal mandate.

Recommendations

1. The BFD should create an Ergonomics Committee, for the purpose of improving health and safety of the membership. This committee should involve union leadership as well as high level management. The health effects of bunker gear and haz mat encapsulation suits are one area that would benefit from this committee.
2. The BFD should begin educating the membership on issues of heart disease, cancer, nutrition, and stress. This education is needed because the firefighter's most important piece of equipment is his or her body. Maintaining firefighter health will require this knowledge. Advancements in technology have not replaced the labor intensiveness of the occupation of firefighting.
3. The BFD should offer it's membership monetary reimbursement for joining a health club. The

- membership is currently given an allowance to maintain their uniforms, and allowance should also be given for wellness.
4. Annual physical exams should immediately be offered for fire personnel over age forty. These exams should be non-punitive and confidential. The research states, that most American males over forty practice disease management rather than disease prevention. This attitude cannot be changed if members feel threatened by the outcome.
 5. Wellness/fitness programs of other major cities should be studied and a wellness program should be established within the BFD with information gained from this study.

References

- American Heart Association, (1996). *Guide to Heart Attack Treatment, Recovery, and Prevention*. New York, NY: Random House.
- Boston Fire Department Annual Report 1998*. Boston, MA.
- Davis, P., O., (1993, October). Not "strength vs. endurance," but both. *Fire Chief*, 26-27.
- Dunn, V., (1992). *Safety and Survival on the Fireground*. Saddle Brook, NJ: Fire Engineering Books and Video.
- Gilman, W.D., & Davis, P.O., (1993 May/April). Firefighting Demands Aerobic Fitness. *NFPA Journal*, 68-73.
- Giomi, S., Walter, A. A., Neves, M. P., Halpin, R.W., Landry, M., & Ducey, N., (1999, March). *Options for Establishing a Physical Fitness Program for the Honolulu Fire Department*. (Executive Development Research Paper). Emmitsburg, MD: National Fire Academy.
- Fahy, R. F., (1993 March/April). Firefighter Fatalities Resulting From Heart Attacks. *NFPA Journal*, 73.
- Federal Emergency Management Agency, (1991). *Stress Management: Model Program for Maintaining Firefighter Well-Being*. Sterling, VA: International Association of Fire Chiefs Foundation.
- Federal Emergency Management Agency, (1996, March). *Fire and Emergency Medical Services Ergonomics*. Emmitsburg, MD: U. S. Fire Administration.

Ingalls, J. (1999, Spring). Andragogy concepts for adult learning. *Readings for self-assesment*. Boston, MA: Wheatly Copy Store, University of Massachusetts.

International Association of Firefighters, (1997). *The Fire Service Joint Labor Management Wellness-Fitness Initiative*, Second ed. Author.

Marsh, A. D., (1997, September). (Executive Fire Officer Research Paper). Emmitsburg, MD: National Fire Academy.

National Fire Academy, (1996). *Strategic Management of Change-Student Manual*. FEMA/USFA/NFA-SMOC-SM. Emmitsburg, MD: United States Fire Academy.

National Fire Protection Association, (1992). *Fire department Occupational safety and Health Program, (NFPA 1500)*. Quincy, MA: Author.

National Fire Protection Association, (1997). *Medical Requirements for Firefighters, (NFPA 1582)*. Quincy, MA: Author.

Nugent, M.R., (1993, July). The Nutritional Overhaul: A Plan You Can Live With. *Firehouse*, 48-52.

O'Connor, J., (1995, April/May). Strength for Firefighting. *Firefighting News*, 26-27.

O'Connor, J., (1996a, June/July). The Joy of Flex. *Firefighter's News*, 22-28.

O'Connor, J., (1996b, August/Sept.). Why Aerobics? *Firefighter's News*, 20-21.

Pearson, J., Hayford, J., Royer, W., (1995). *Comprehensive Wellness for Firefighters*. New York, NY: Van Nostrand Reinhold.

Smith, C., (1995, August). Fueling the Firefighter: Part 1. *Health and Safety*, 6-10.

Snyder, D.A., (1991). Physical Fitness and Agility Tests. *The Americans With Disabilities Act*, 260-266. Portland, OR: The Labor Relations Information System.

Title VII of the Civil Rights Act of 1964, as amended, 424.sc.2000(e).

WebMD, (2000a). Fit Over 40.
<http://content.health.msn.com/>

WebMD, (2000b). Why Men Delay Going to the Doctor.
<http://content.health.msn.com/>

Appendix A

Dear Wellness Program Member;

Enclosed is a questionnaire that we on the Local 718 Wellness committee would like your participation. The information will be presented to President McKenna of Local 718 for his analysis and information on establishing a wellness program for the members of the Boston Fire department.

We on the committee appreciate your involvement in this pilot program and hope it has been beneficial to yourself and members of your family.

Sincerely;

Richard Paris
Committee Chairman

1. I would consider my participation in the Wellness Pilot Program to be: (circle one) positive negative.
2. I feel that the effect this program has had on my health and well-being can be described as: (circle one)
I feel healthier. I feel the same. I feel less healthy.
3. Do you think that you will maintain a wellness/fitness program on your own? Yes No
4. Were you satisfied with the following components of the program:
Medical Exam. Yes No
Physical Fitness Yes No
Nutrition Yes No
Stress management Yes No
5. Do you think the BFD should have a wellness program?
Yes No
6. If your answer to number 5 was yes. Should this program be mandatory or voluntary. (circle one)
7. Should firefighters be given training and education on issues of heart disease, cancer, and physical injuries as part a regular training curriculum? Yes No

8. I think the Pilot Program needs to put more emphasis on;

Please check item or items below.

Smoking cessation_____ Exercise_____ Stress Info_____

Nutrition_____ Medical Evaluation_____

Effects of Bunker Gear_____ Other_____

9. Please add any comments and any additional feelings you may have at this time.