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Background

This report, the seventh in a series, reviews activities related to the Missoula Technology and Development Center (MTDC) project on wildland firefighter health and safety. The project focuses on three main areas:

Work, Rest, and Fatigue

Development of an objective approach for the determination of work/rest standards, and recommended assignment lengths for crews and overhead.

Energy and Nutrition

Improvement of the energy intake, nutrition, and immune function of wildland firefighters.

Fitness and Work Capacity

Implementation of work capacity and medical standards and improvement of the health, safety, and productivity of firefighters.

Medical Standards

This issue focuses on the interagency medical standards program developed for wildland firefighters. Contributors include Kevin Jensen, the medical standards program manager, and Jay Paulsen, M.D., the program's medical advisor, who is with the Federal Occupational Health Program of the U.S. Public Health Service. The featured topic introduces the reasons for the program, the medical standards, the schedule

for medical examinations and tests, and the waiver/accommodation process.

The research section provides additional information about specific tests and the results of examinations conducted on Australian firefighters. The risk management section outlines cost-effective strategies managers can use to maintain a healthy workforce. Finally, the field notes section suggests steps individuals can take to reduce risk and cope with the stresses and demands of their jobs.



Evaluating a firefighter's blood pressure.

Featured Topic



Interagency Wildland Firefighter Medical Standards

Why Was the Program Developed?

In 1998 the Federal Fire and Aviation Leadership Council (FFALC) asked an interagency team to review the medical examination processes in effect for arduous duty wildland firefighters among its member agencies, and to make recommendations (see *National Interagency Incident Management System Wildland and Prescribed Fire Qualification System Guide*, PMS 310-1, January 2000) regarding positions that are considered arduous. The FFALC, which oversees wildland firefighting activities for the Federal Government, assembled a team drawn from the Departments of the Interior and Agriculture, the Office of Personnel Management, and the U.S. Public Health Service. Team members had backgrounds from fields including firefighting, fire program management, safety, human resources, and medicine. For the past 5 years, the team has undergone basic firefighter training, observed firefighting activities on wildland and prescribed fires, gathered information on the procedures being used for physical exams, reviewed relevant studies and the

available death and injury statistics, and interviewed fire managers and firefighters. They concluded that the medical exams, and the way they were being used, were inadequate to assure that employees' health was sufficient to avoid unnecessary risks, both for themselves and for others, in carrying out firefighting work. The team also was concerned that existing programs may lead to inconsistent or inadequate protection of employee rights under the Rehabilitation Act of 1973, and confidentiality under the Privacy Act of 1974, and that the existing programs could expose agencies to unnecessary liability.

For example, without standard procedures, firefighters with a specific medical problem in one district may experience different personnel actions than those in another district, whether from lack of knowledge, different local policies, or even personal grudges. A firefighter's confidential medical information may be revealed at the time of a pack test to a coworker who shouldn't have access to it, harming or embarrassing the firefighter. Without baseline and followup medical information, firefighters may not know they have a hearing loss, or how serious the loss is. They won't know how to tell if the loss has gotten worse from working around chain saws and heavy equipment. A crew boss may not know if a crewmember can't see colors normally and needs special escape-route flagging, or whether to assign fellow crewmembers to look out for the vision-impaired firefighter. A manager may not have an established basis and fair procedure to restrict individuals whose asthma, heart disease,

diabetes, or bad knees may pose a direct threat to their safety or that of their fellow firefighters. The Government, as an employer, is obligated to treat employees fairly and equitably, and to avoid knowingly placing employees in situations in which they are likely to be harmed while carrying out the requirements of the job.

The FFALC charged the interagency review team with developing and implementing a medical standards program that would apply throughout the Federal firefighting community. The goal was to have a program that:

- Provides medical examinations focused on the requirements of wildland firefighting
- Assures the review of medical histories and examination findings in a uniform and consistent manner, and by medical officers knowledgeable in wildland firefighting
- Defines the process to follow in considering waivers or accommodations for firefighters unable to meet the medical standards

The program also needed to meet the requirements of the Rehabilitation Act and the Privacy Act, and be acceptable to the Office of Personnel Management.

After the team members drafted the standards, and the forms and guidelines for their use, they recommended a pilot test to refine the materials and the procedures to implement them. They also recommended a series of field validations and research into the effects some of the specific standards might have. Finally, the waiver and accommodation process,

a major part of the medical standards program, was set up to assure firefighters a fair and consistent system was in place when the process identified medical conditions that could pose a risk to safe and efficient job performance. The next step involved a series of reviews and approvals by the Government agencies involved.

The standards, forms, and procedures were approved by the FFALC in January 2000. The pilot program implementation began during 2001 with firefighters in the Southwest. The pilot program will be expanded over the next few years, to include the Northwest during the 2003 fire season. Alaska, California, Hawaii, and Nevada will follow in 2004, with the Mountain States in 2005 and the Central and Southeastern States in 2006. Lessons learned during the phased implementation will be incorporated into the overall program.

What Are the Standards?

All medical standards are subject to clinical interpretation by the medical review officer, incorporating knowledge of the job of firefighting and the environmental conditions in which firefighters work. Also, because the standards must relate directly to the actual requirements of the job of a wildland firefighter, they are written in a format such as "The firefighter must have [specified body systems or functions] that will provide for the safe and efficient conduct of the requirements of the job." In many cases, examples or ways in which compliance with the standard might be demonstrated are provided. Individual assessments must be made on

a case-by-case basis (see the wildland firefighter Web site, <http://medical.smis.doi.gov/nifcmedicalstds.htm>, for a more complete presentation of the examples used in the standards). The medical standards are distinct from "performance requirements" for the wildland firefighter, such as the pack test. This test is discussed in detail in the report by Brian J. Sharkey, Ph.D., *Fitness and Work Capacity*, Second Edition, National Wildfire Coordinating Group, April 1997.

The medical standards for individual wildland firefighters are summarized below. For each body function or topic area, the medical review officer looks for evidence from the physical examination, laboratory tests, or medical history of any impairment that might present a safety risk, or that could worsen as a result of a firefighter's work.

Psychiatric Standard—The applicant/incumbent must have judgment, mental functioning, and social interaction/behavior that will provide for the safe and efficient conduct of the requirements of the job.

Prosthetics, Transplants, and Implants Standard—The presence or history of organ transplantation or use of prosthetics or implants are not of themselves disqualifying. However, the applicant/incumbent must be able to safely and efficiently carry out the job of wildland firefighting.

Immune System/Allergic Disorders Standard—The applicant/incumbent must be free of communicable diseases, have a healthy immune system, and be free of significant

allergic conditions that would impede the ability to safely and efficiently carry out the requirements of the job.

Medication Standard—The need for and use of prescribed or over-the-counter medications are not necessarily disqualifying. Each of the following points should be considered:

- Medication(s) (type and dosage requirements)
- Potential drug side effects
- Drug-environmental interactions
- Adverse drug reactions
- Drug toxicity or medical complications from long-term use
- Drug-drug interactions
- Drug-food interactions
- History of patient compliance

Vision Standard—The applicant/incumbent must be able to see well enough to safely and efficiently carry out the requirements of the job. This requires binocular vision, far visual acuity, depth perception, peripheral vision, and color vision, which may be demonstrated by:

- Far visual acuity of at least 20/100 in each eye, without corrective lenses
- Far visual acuity of at least 20/40 in each eye, with correction (if necessary) with contact lenses or glasses
- Color vision sufficient to distinguish at least red, green, and amber (yellow)
- Peripheral vision of at least 85 degrees laterally in each eye
- Normal depth perception
- No ophthalmologic condition that would increase ophthalmic

sensitivity to bright light, fumes, or airborne particulates, or susceptibility to sudden incapacitation.

Head, Nose, Mouth, Throat, and Neck Standard—The applicant/incumbent must have structures and functions of the head, nose, mouth, throat, and neck that are sufficient for the individual to safely and efficiently carry out the requirements of the job.

Hearing Standard—The applicant/incumbent must be able to hear well enough to safely and efficiently carry out the requirements of the job. This requires binaural hearing (to localize sounds) and auditory acuity, which may be demonstrated by an audiogram showing hearing thresholds of no greater than 40 decibels at 500, 1,000, 2,000, and 3,000 hertz in each ear, and no evidence of ear conditions likely to present a safety risk or to worsen as a result of carrying out the essential functions of the job. The use of hearing aids to meet this standard is not permitted, because firefighters need to localize sounds accurately.

Dermatology Standard—The applicant/incumbent's skin must be sufficient for the individual to safely and efficiently carry out the requirements of the job.

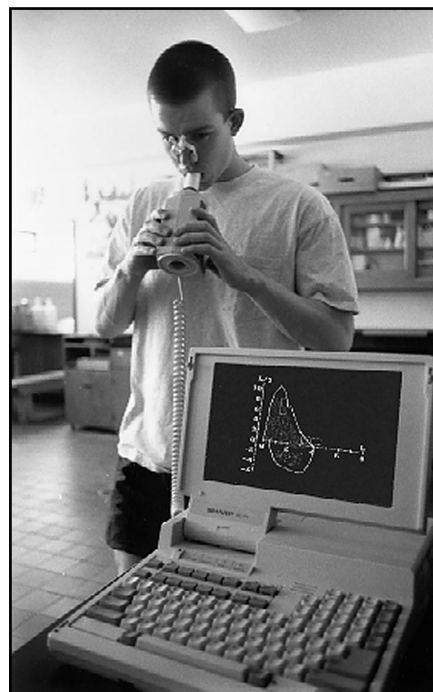
Vascular System Standard—The applicant/incumbent's vascular system must be sufficient for the individual to safely and efficiently carry out the requirements of the job. This may be demonstrated by an exam showing no evidence of phlebitis, thrombosis, or venous stasis, and no evidence of arterial insufficiency.

Cardiac Standard—The applicant/incumbent's cardiovascular system must be sufficient for the individual to safely and efficiently carry out the requirements of the job. This may be demonstrated by a normal physical exam of the cardiovascular system (blood pressure less than or equal to 140 millimeters mercury systolic and 90 millimeters mercury diastolic, and a normal baseline electrocardiogram).

Chest and Respiratory System Standard—The applicant/incumbent's respiratory system must be sufficient for the individual to safely and efficiently carry out the requirements of the job. This may be demonstrated by a normal physical exam of the respiratory system and a normal pulmonary function test (on the baseline exam). Note: the requirement to use an inhaler (such as for asthma) requires agency review.

Endocrine and Metabolic System Standard—Any excess or deficiency in hormonal production can produce metabolic disturbances affecting weight, stress adaptation, energy production, and a variety of symptoms or pathology, such as elevated blood pressure, weakness, fatigue, and collapse. The applicant/incumbent's endocrine and metabolic functions must be sufficient for the individual to carry out the requirements of the job safely and efficiently.

Hematopoietic System (Blood-Forming) Standard—The applicant/incumbent's hematopoietic (blood and blood-producing) system must be sufficient for the individual to



carry out the requirements of the job safely and efficiently.

Musculoskeletal System Standard—The applicant/incumbent's musculoskeletal system must be sufficient for the individual to carry out the functional requirements of the job safely and efficiently. This may be demonstrated by a physical exam of the upper and lower extremities, neck, and back that is within the range of normal variation for strength, flexibility, range of motion, and joint stability. Individuals who require the use of a prosthetic device will have to provide documentation from their surgeon or physician that they (and, if applicable, their prosthetic device) are considered to be fully cleared for the essential functions of the job.

Central and Peripheral Nervous System Standard, and Vestibular System Standard—The applicant/incumbent's nervous system must be sufficient for the individual to

carry out the requirements of the job safely and efficiently. This may be demonstrated by a physical exam of the cranial and peripheral nerves and the vestibular and cerebellar system that is within the range of normal variation, and by a normal basic mental status evaluation (giving correct responses to questions about, person, place, time, and current events).

Gastrointestinal System

Standard—The applicant/incumbent's gastrointestinal tract must be sufficient for the individual to carry out the requirements of the job safely and efficiently.

Genitourinary System

Standard—The applicant/incumbent's genitourinary system must be sufficient for the individual to safely and efficiently carry out the requirements of the job.

What Does the Exam Include?

The exam, while focused on the requirements of wildland firefighting, is a basic physical evaluation that includes:

- Medical history
- General appearance and vital signs (height, weight, blood pressure, and heart rate)
- General physical examination
- Audiogram (including 500, 1,000, 2,000, 3,000, 4,000, 6,000, 8,000 hertz in both ears)
- Visual acuity, near and far vision, corrected and uncorrected
- Peripheral vision, depth perception, and color discrimination (red/green/yellow)

- Pulmonary function test—spirometry
- Chest x-ray, (baseline exam only)
- Electrocardiogram—resting (baseline exam only)
- Tuberculosis (Mantoux) skin test (baseline exam only)
- Tetanus vaccination (to maintain as current)
- CBC (hemoglobin, hematocrit, platelets, white blood cell, dipstick UA (baseline/exit exam only), and blood chemistries: (LDH, SGOT/AST, SGPT/ALT, GGT, bilirubin [baseline/exit exam only]); (total cholesterol, LDL-C, HDL-C, triglycerides, blood glucose [each exam])
- Cholinesterase (red blood cell/plasma; baseline exam only)

Why Are Tests Listed That Aren't Linked With a Standard?

Your firefighter medical exam is being done because of the employment relationship that exists between Federal firefighters and the Federal Government, and the responsibility that your agency has to you and to the public. As an employment-based exam, information that may be important to you and to the agency is recorded to provide a baseline set of data for comparison if you develop a health problem later that may be work related.

For example, a chest x-ray and an electrocardiogram are done at your baseline exam to record the initial status of your lungs and heart. These are not repeated in subsequent medical standards exams, although your own doctor may

choose to repeat the tests later as part of a workup if you develop a pulmonary or cardiac condition, such as pneumonia or heart disease. Also, baseline cholinesterase levels are recorded because of the potential for firefighters to be exposed to pesticides in the course of their work, and for baseline data that can be compared with postexposure data to see whether exposure has been significant.

How Is the Program Implemented?

The medical program involves a designated Interagency Medical Standards Program manager to oversee the entire process, a medical review officer to review medical information and provide medical clearances and consultative recommendations, standard physical examination forms and procedures, and standard waiver and accommodation procedures. It also depends on fire management officers, personnel officers, and firefighters themselves.

For permanent firefighters, exams usually can be scheduled before the fire season starts. Their medical clearances, waivers, or accommodations can be resolved before fire assignments begin for the year. For temporary firefighters, their plans to fight fire may not be known until the fire season, or even a specific fire, is underway. Exams and followup work may have to be done under time constraints. In either case, the fire management officer works with the interagency medical standards program manager to schedule firefighters for their exams or screenings, and to supply them the forms they need to complete.

The specific forms used and the exam a firefighter receives will depend on the firefighter's age and employment status:

Baseline (or Initial) Exam:

Used by firefighters in permanent positions, and by temporary firefighters once they reach the age of 45, this full medical exam is based on the interagency medical examination and clearance form. It is more comprehensive than the periodic exam because baseline employment- and age-related information needs to be recorded for the firefighter.

Periodic Exam: This exam is for permanent firefighters and temporary firefighters older than 45. It is also based on the interagency medical examination and clearance form, but is less comprehensive than the baseline exam. For permanent firefighters, this exam is conducted every 5 years until age 45 and every 3 years thereafter. Temporary firefighters older than 45 receive the periodic exam every 3 years.

Annual Medical History: A brief medical history questionnaire and medical screening are required for firefighters in years when a more complete medical examination is not scheduled. This questionnaire is used by temporary firefighters until they are 45.

Exit Exam: The exam permanent employees receive when they leave an arduous duty wildland firefighter position.

Some circumstances may make a full medical examination impractical. When local medical services are not available or when firefighters must be hired quickly (especially during

fire emergencies), agencies may need to obtain medical clearances very quickly. In these situations, the annual medical history and clearance form may be used. In addition, a brief medical screening is performed by a health care professional. In all cases, a medical clearance must be completed before taking the pack test.

The Interagency Medical Standards Program manager will provide to your fire management officer a program orientation and guidance on the steps that are to be followed to complete the medical clearance process under the new medical standards. Contact your fire management officer, or the wildland firefighter Web site, <http://medical.smis.doi.gov/nifcmedicalstds.htm>, for more information.

What Happens When a Firefighter Isn't Medically Cleared?

Just because an employee has a medical condition identified through the medical standards program, doesn't mean the employee won't be allowed to work as a firefighter, even at the arduous level. It does mean that further information may be needed from the individual's personal physician to clarify the problem noted during the exam. The individual's past performance may need to be reviewed to see whether the medical finding may have caused work difficulties. Some form of accommodation may be needed to allow the firefighter to do the job safely. Under the Rehabilitation Act of 1973 (or the Americans With Disabilities Act, for nonFederal workers), an employee who can safely and efficiently perform his or

her duties, with or without a reasonable accommodation, can't be prevented from doing so based upon a disability or a medical finding. An interagency medical review board convenes to consider medical restriction cases. The established waiver and accommodation process is designed to ensure that the firefighter is treated fairly under the law. The goal is to keep firefighters fighting fire, not to prevent them from doing so, as long as they can do their jobs safely and efficiently without significant risk of harming themselves or others.

Who Has Access to Confidential Medical Records?

Under the Privacy Act, and the various regulations that implement the provisions of the act, individuals have a right both to know the records the Government maintains about them and how those records may be used. The results of a firefighter's medical history and exam are kept in safe, secure locations. Access to the records is limited to the individual firefighter and to a limited group of others who have a specific, justifiable, work-related "need to know," as covered in the regulations. For further information, refer to the *Interagency Medical Review Board Guide*, which may be found at <http://medical.smis.doi.gov/IMRB%20Guide.pdf>.

Kevin Jensen is the manager of the Interagency Medical Standards Program. Jay Paulsen, M.D., of the U.S. Public Health Service's Federal Occupational Health Program is the program's medical advisor.

Research



Wildland Firefighter Medical Standards

Related Studies

All medical standards, and all medical clearance decisions, must be based on the actual requirements for safe and efficient performance of the job. The standards for wildland firefighters are no exception. The team that developed the standards interviewed firefighters, observed firefighting operations in many fire situations and in different types of terrain, and reviewed available literature on medical aspects of firefighting and safety. A summary of the primary bases for the standards may be found at <http://medical.smis.doi.gov/wlffmedstdsbasis0902.pdf>. A few examples of pertinent studies relating to the standards follow.

Color Vision—A tech tip by Bob Beckley, *Flagging for Firefighting Escape Routes and Safety Zones* (0151-2339-MTDC), reviewed the colors and styles of flagging ribbon available. The report notes that color blindness affects about 10 percent of the population. Individuals with impaired color vision were able to see lime-green flagging best. Those with normal color vision could see hot-pink flagging best. The tech tip recommended using hot pink flagging, but said that lime-green flagging

could also be used on crews that have colorblind members. The medical exam includes an assessment of color vision. The standard requires normal color vision. A firefighter who can't meet this requirement needs to be identified so that proper escape flagging can be used by crews to which the firefighter is assigned.

Hearing Aids—Hearing is essential for normal verbal communication among crewmembers, including warnings, instructions, and social interaction. Firefighters need to detect natural sounds in the environment to identify movement and possible threat posed by rolling rocks or logs, and by fire itself. The ability to localize sounds accurately, particularly in low-light situations and with loud, competing background noise, was widely expressed by firefighters and managers as critical to firefighter safety.

According to the American Medical Association's *Guides to the Evaluation of Permanent Impairment*, hearing is considered normal if the individual can first detect noises at 25 decibels or less in the typical speech frequencies (500, 1,000, 2,000, and 3,000 hertz). The wildland firefighter medical standard for hearing was set at 40 decibels, which is considerably worse than normal, but is still within the range at which conversation can effectively occur. The ability of a firefighter to hear natural sounds, as well as heavy equipment sounds, is important for safety. Most such sounds are in the low frequency range (1 to 500 hertz).

Hearing aids are not permitted under the medical standards

because of a problem with feedback in the hearing aid during the hearing test, the problem of maintenance of these high-tech devices under fire and fire-camp conditions, the risk of dislodging them in an emergency when they may be most needed, and the common problem of loss of critical and safety-sensitive directional hearing when they are being used. Studies have documented the directional hearing problem with hearing aids (Noble, W.; Byrne, D. 1990. *A comparison of different binaural hearing aid systems for sound localization in the horizontal and vertical planes*. British Journal of Audiology. 25(4): 285. Kimberly B.P.; Dymond R.; Gamer, A. 1994. *Bilateral digital hearing aids for binaural hearing*. Ear, Nose, and Throat Journal. 73(3): 176-179. A waiver may be considered for individual firefighters who require hearing aids to meet the hearing standard if they can demonstrate that their directional hearing is not significantly impaired, as several studies indicate may be possible (Byrne, D.; Noble, W.; Glauert, B. 1996. *Effects of earmold type on ability to locate sounds when wearing hearing aids*. Ear Hear. 17(3): 218-228. Kojbler, S.; Rosenhall, U.; Hansson, H. 2001. *Bilateral hearing aids—effects and consequences from a user perspective*. Scandinavian Audiology. 30(4): 223-235).

Needed Research

Visual Acuity and Depth Perception—Several factors are involved in normal depth perception by humans, including such things as overlay, shadows, texture density, known size, and stereopsis, or binocular vision.

Binocular vision depends upon visual acuity in both eyes, which is why both eyes are tested and recorded separately in the medical standards exam. When visual acuity is impaired, due to loss of an eye or inadequate correction with lenses, such as contacts or glasses, stereopsis also is impaired, which may interfere with good depth perception. Depth perception also is tested directly, using a vision testing device in the clinic (during the baseline and periodic exams, but not during the more limited annual medical screenings). It is not clear just how limited a person's depth perception can be and still provide for a margin of safety, particularly in low-light situations, or on steep slopes, when a firefighter must move quickly. The medical standards team would like to see research conducted on visual acuity and depth perception, to determine more precisely the standards that should be applied, particularly to new hires who may not have the experience and field judgment of a seasoned firefighter.

Causes of Injury, Illness, and Death—Glenn Fischer, the Northeast Oregon area inventory coordinator, prepared a summary in December 2002 of the almost 30,000 fire camp medical unit visits recorded during 2002. The data provide critical information that can assist planners making staffing and supply decisions. Most visits are for minor, acute illnesses that are predictable and difficult to prevent in a crowded fire camp. Measures to assure that firefighters have adequate rest, nutrition, fluid intake, and hygiene have been addressed in previous issues of *Wildland Firefighter Health*

and *Safety Reports*, and will continue to be emphasized because of their importance to firefighter health. Many of the visits, however, involve injuries or more serious illnesses. It is not known how many of these visits relate to medical conditions that might be prevented by enhanced preassignment medical evaluations.

On-the-job fatalities among wildland firefighting were summarized in the 1999 report, *Wildland Fire Fatalities in the United States: 1990 to 1998* (9951–2808–MTDC) by Richard Mangan, through the Forest Service's Technology and Development Program. During the study period, 133 deaths were associated with 94 separate events. Causes cited for these deaths included burnovers (29 percent), aircraft accidents (23 percent), heart attacks (21 percent), vehicle accidents (19 percent), and falling snags (4 percent). Four percent of deaths were due to other causes. What is not clear from available data is the role that a firefighter's medical status might have played in these deaths.

To what extent was impaired vision or hearing a factor in the accidents that occurred? Could any of the heart attacks have been prevented by better screening? Did nutritional or immunological stresses reduce the ability of some firefighters to recognize dangerous situations, and to take steps to avoid them? Better data on the medical status of firefighters, which the medical standards program will provide, and more complete reporting of contributory factors when serious illnesses, injuries, or deaths occur, may help

improve the health and safety of firefighters.

Kevin Jensen is the manager of the Interagency Medical Standards Program. Jay Paulsen, M.D., of the U.S. Public Health Service's Federal Occupational Health Program is the program's medical advisor.

Australian Medical Examinations

The Division of Natural Resources and Environment, Victoria, Australia, requires firefighters to take a medical examination before seasonal employment as a bush firefighter. The examination is a comprehensive look at health issues directly related to firefighting within the bush environment. All project firefighters must successfully complete the medical examination and a task-based (job-related work capacity) assessment before being offered employment within the organization. The medical assessments are conducted by doctors who receive special training in the conduct of the firefighter examination. Services are provided by local physicians and by mobile physicians.

In the 1996-1997 fire season, 7 percent of 395 applicants failed the medical examination, and in 1997-1998, 3 percent of 832 applicants failed the exam. The major health categories associated with exam failure in 1997-1998 were: vision (22 percent); respiratory (18 percent); cardiovascular (9 percent); ear, nose, throat (6 percent); musculoskeletal (6 percent); and endocrine (6 percent). The failure rate for vision was a decrease over the

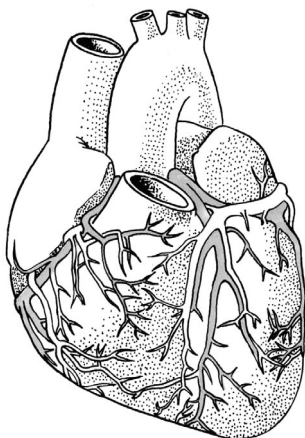
previous year. However, even though the vision standard had been relaxed, vision was still the major factor in failure.

In the 1996-1997 fire season, the task-based assessment, included the pack test and a timed circuit with a bag carry and hose drag. The circuit was dropped in 1997-1998 and replaced with the requirement that the applicant be able to carry the 45-pound pack used for the pack test. Pass rates on the pack test were 97 percent in 1996-1997 and 96 percent in the 1996-1997 fire season.

Ellis, S. 1998. Evaluation of Medical and Taskbased Assessment. Natural Resources and Environment, Victoria, AU. Sue.Ellis@nre.vic.gov.au

Heart Attacks

About 10 percent of all heart attacks occur during exertion. Physically inactive individuals are 56 times more likely to experience a problem during exertion.



Risk Management



Employee Health Program

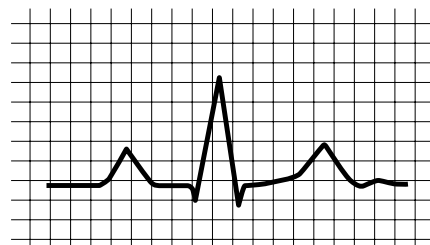
In 1980 the Missoula Technology and Development Center piloted portions of an employee health and wellness program that included health risk analysis and cost-effective screening tests (blood pressure, blood chemistry, and so forth), as well as counseling for stress, nutrition, and physical activity. An expanded employee health program, including educational programs (stress management, nutrition, weight loss, smoking cessation), and several exercise options, was implemented widely throughout the Forest Service. Since then, a series of budget cutbacks have eliminated most aspects of the program.

Studies indicate cost-savings of \$2 to \$7 for each dollar spent on employee health programs. Savings come from reduced costs for health care and worker's compensation, reduced absenteeism, and greater productivity. Smoking cessation, weight loss, stress reduction, healthy eating, and exercise classes help reduce health risks and medical expenditures. In the private sector, employee health programs are often provided as an employee benefit. In one public university the

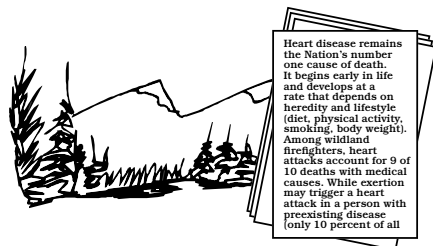
program receives an 89-percent approval rating, even though it is funded with a small portion of employee contributions for health insurance.

"No more than 5 percent of total health expenditures are devoted to prevention, despite the fact that only 5 of the total 30 years of increased life expectancy over the last century are related to advances in clinical medicine." (McGinnis 2001)

The employee health program is preventive because it reduces health risks before they generate medical costs; it emphasizes personal responsibility by focusing on the only one able to make necessary changes in health behaviors, the individual participant; and it is cost-effective because it uses low-cost screening methods to identify those in need of more extensive tests or procedures. An employee health program, combined with a year-round fitness program, would prepare employees for the arduous duties of wildland firefighting and help to keep experienced fire managers in the system.



Field Notes



Risk Reduction

Heart disease remains the Nation's number one cause of death. It begins early in life and develops at a rate that depends on heredity and lifestyle (diet, physical activity, smoking, body weight). Among wildland firefighters, heart attacks account for 9 of 10 deaths from medical causes. While exertion may trigger a heart attack in a person with preexisting disease (only 10 percent of all heart attacks occur during exertion), it does not cause the disease. Reducing the risk of heart disease is a personal obligation that cannot be delegated. Risk reduction strategies include:

Regular physical activity—Exercise reduces heart disease risk from 30 to 70 percent. Inactive individuals are 56 times more likely to experience heart problems during exertion.

Diet—A healthy diet includes a moderate amount of calories and fat with five or more daily servings of fruits and vegetables (for vitamins and antioxidants).

Body weight—A body mass index between 19 and 24 is associated with a lower risk of heart disease and type 2 diabetes.

Smoking cessation—Smoking increases the risk

of heart disease, lung cancer, emphysema, and many other conditions.

Alcohol—Moderate (one to two drinks daily) alcohol consumption lowers risk by raising high-density lipoprotein cholesterol and lowering inflammation (see C-reactive protein below).

Aspirin—One small aspirin (81 milligrams) daily reduces platelet stickiness, inflammation, and heart disease risk (use an enteric-coated aspirin to avoid stomach problems).

Vitamins C and E—These vitamins are related to reduced risk of heart disease.

C-Reactive Protein—This protein is an independent risk factor for heart disease and sudden death. This risk factor may be a better predictor of a future cardiovascular event than low-density lipoprotein cholesterol.

Statins—This class of cholesterol-lowering drugs has proven effective in reducing the risk and incidence of heart disease. Statins lower cholesterol and raise high-density lipoprotein cholesterol. Recent evidence suggests that statins may also lower inflammation and C-reactive protein.

Summary

Individuals with a family history of heart disease and those with significant risk factors (smoking, inactivity, overweight, hypertension, elevated cholesterol, and elevated blood glucose) should take every step to reduce their risk. If

diet, exercise, weight control, and other steps do not reduce the risk, their physician may recommend drug therapy.

C-Reactive Protein

This blood test has been linked to heart disease. The test reflects the response of the body to inflammatory reactions in diseased coronary arteries. The C-reactive protein may interact directly with the fatty plaque lining coronary arteries, leading to inflammation and formation of clots (thromboses). This unstable plaque can rupture, form clots, and clog an artery, leading to a heart attack and sudden death. This protein may emerge as a marker of unstable plaque, a serious risk for a sedentary individual who engages in exertion. C-reactive protein is associated with coronary risk factors such as elevated blood pressure, increased body mass index, diabetes, low HDL cholesterol, and high triglycerides. C-reactive protein is also associated with estrogen and progesterone hormone use, chronic infection (such as gum disease), and chronic inflammation, as in rheumatoid arthritis. Increased physical activity, endurance exercise, weight loss, moderate alcohol intake, aspirin, and cholesterol medications (such as statins) are associated with decreased levels of C-reactive proteins, inflammation, and the risk of sudden cardiac death.

How Much Activity?

In September 2002, the Institute of Medicine, a branch of the National Academy of Sciences, made the following announcement: "To prevent weight gain as well as to accrue additional weight-independent health benefits of physical activity, 60 minutes of daily moderate intensity physical activity is recommended." This recommendation doubles the Surgeon General's 1996 recommendation that adults accumulate at least 30 minutes

of moderate physical activity most days of the week. The increase is aimed at slowing the rise in overweight and obesity that has reached epidemic proportions in the population.

Coming up. . .

The next *Wildland Firefighter Health and Safety Report* will consider:

- 2003 field studies
- Project summary
- Upcoming 2004 Wildland Firefighter Health and Safety conference

If you have comments, questions, or suggestions about this project, send them to Brian Sharkey at: bsharkey@fs.fed.us.



Library Card

Sharkey, Brian. 2003. Wildland firefighter health and safety report No. 7. 0351-2818-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 12 p.

This issue focuses on the interagency medical standards and examinations now being required for wildland firefighters in the United States. The research section provides additional information about specific tests and the results of examinations conducted on wildland firefighters in Australia. The risk management section outlines employee health programs that can be used to prevent health problems. The field notes section outlines steps firefighters can take to reduce the risk of heart disease.

Keywords: Australia, employee health programs, fire fighting, firefighting, heart disease, interagency, medical examinations, medical standards, safety at work

Additional single copies of this document may be ordered from:

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