

Reviewers' Comments for "Preventing Fire Fighter Fatalities Due to Heart Attacks and Other Sudden Cardiovascular Events"

Reviewer #1

1. Page 3 – under CURRENT STANDARDS

NFPA 1500 should also be discussed, especially the portions dealing with physicals and provision of Emergency Medical Care at incidents. You may want to insert wording such as this:

NFPA 1500 Fire Department Occupational Safety and Health Program, stipulates that fire departments shall establish an Occupational Health and Safety Committee to research, develop recommendations, as well as study and review matters pertaining to occupational health. The standard stipulates requirements for standby emergency medical care at a minimum of Basic Life Support (BLS) level at certain incidents and the requirement at all incidents for the incident commander to evaluate the need for emergency medical care and patient transportation. The standard also requires compliance with NFPA 1582 and NFPA 1853 Standards.

2. Would recommend that discussion in this report of any NFPA standards should be run by the NFPA.

RESPONSE: One of the external reviewers of the entire document was from the NFPA.

3. – under the USFA and NVFC discussion

Could you add the web link for the USFA Health and Wellness Guide for the Volunteer Fire Service? <http://www.usfa.fema.gov/downloads/pdf/publications/fa-267.pdf>

4. USFA did not initiate the Heart Healthy Program, it as supported by an AFG Fire Act Grant.

5. Would recommend that this section be reviewed by the NVFC.

6. Page 10 – under RECOMMENDATIONS

During fire suppression and training operations

Suggest adding:

- Ensure standby emergency medical care at a minimum of Basic Life Support (BLS) level at all emergency incidents, with Advanced Life Support (ALS) and patient transportation preferred.

Reviewer # 2

These are the questions you posed:

1) Does the background section appropriately summarize the current literature regarding heart disease and fire fighting?

See Below

2) Do the case reports identify the important findings from the NIOSH cardiovascular disease investigations?

Mostly – see comments below.

- 3) Are these findings adequately discussed in the section "Data from the NIOSH CVD Investigations"?

See below.

- 4) Are the conclusions supported by the body of the document?

Yes.

- 5) Are the recommendations appropriate?

See below.

- 6) Are there any additional recommendations you think should be included in this document?

Fire Service agencies need to better define the Essential Job Functions of the fire fighter. What is needed is some performance criteria for the tasks. For example, the task is that the fire fighter needs to be able to climb a ladder and enter a building. What is needed in this is how fast he/she needs to do this. Without this piece of data, the needed aerobic capacity cannot be defined, and thus, one cannot evaluate a candidate or an incumbent as to their ability to safely do the job. As relates to CVD this will allow the physician evaluating the fire fighter to set a level of performance that must be achieved without evidence of ischemia before clearing the person for full duty.

COMMENTS:

Introduction – We know that 44% of the deaths with medical info had prior CAD. Do we know, of those who did not have a cardiac event, how many had prior CAD?

Background –

1. It would be nice to have quoted in the paper the rate of cardiac events in fire fighters and in other classes of workers. What really is the difference?

RESPONSE: No change. The SMR studies show the rates compared to both the general population, and, in a few studies, compared to police officers. As mentioned in the background section, the findings are mixed: some show increased rates, other do not.

2. This does not address the changes in the fire fighter life style. Much of the literature about the increased risk is from a group that did not use SCBA's regularly, smoked, ate poorly and tended to be overweight and inactive. The current attitude toward healthy life style in the firehouse is vastly different now, and it would be nice to have this section address the difference in the rates of cardiac events in older literature and more recent literature.

Current Standards –

1. NFPA – suggest also reference 1581 and 1584 (infection and rehabilitation) that are issues that can impact on morbidity and mortality.

Case Reports-

Case 3 – Report his aerobic capacity in METS too.

Case 4 – May not be a good example – with that amount of CAD, AED shocks may not have made any difference. A better example would be a case that is more likely arrhythmic.

Case 5 – This category is not the same as the others. The others are causes of the event. This is just about when they happened and is not a factor that can be considered to have cause and effect.

Data from NIOSH CVD Investigations –

1. Medical evaluation: Did the 31% of departments who did periodic exams have a lower rate of cardiac events in their department?
2. Medical clearance: third suggestion: put in a comment to NFPA to adopt a PMD letter such as the one being developed by the ACOEM LEO guideline Task Group.
3. SCD While Operating A Vehicle: I reiterate that I do not think this is an issue that is causative. There are many scenarios where the sudden incapacitation of a fire fighter would cause harm to co-workers and the public, and I do not see why this one is singled out – especially since it has not caused any collateral damage yet.

Recommendations –

1. Fire Departments:
 - a. Typo – Candidates – 3rd bullet conducted not conducted.
 - b. During fire suppression ... - Need to talk about fire scene (and training) rehabilitation (NFPA 1584).
 - c. Why test for CO only in arrests, this is when the horse is out of the barn. Maybe, this should be part of the rehabilitation to catch it before it causes a problem.

Reviewer # 3

Are there any additional recommendations you think should be included in this document?

- (Revise the following) Ensure medical clearance for full-duty fire suppression and SCBA use is conducted by either 1) the fire department physician, or 2) a primary care physician certified or otherwise confirmed by the fire department as knowledgeable about the physical demands of fire fighting and the consensus guidelines developed by the fire service [NFPA 2003].

Reviewer # 4

General Comments:

This is a powerful document that has the potential to decrease LODD and to generally improve the health of Fire Fighters.

I especially like the WARNING statement on the front page. Very dramatic.

The document is logically organized and effectively pulls together appropriate standards and illustrates them with case studies.

The recommendations are a strong feature of the current document and have wisely addressed what department, individuals, and agencies can do to lessen the incidence of CVD in the FS.

General Recommendations – the following list of recommendations address ways that I think the document might be improved, either in terms of making it more attractive, or more complete. I certainly understand that some of these suggestions may not be able to be incorporated at this stage, but I offer them for your review.

1. Consider adding more graphics and using them to make the document more attractive (for example, fire fighters engaging in physical exercise, fire trucks and FF working at a fire!).
2. I would like to see a section devoted to describing HOW FF increases the risk for sudden cardiac death. The section on “Exposures Associated with Cardiac Effects” is excellent and I expect it will be well received. But, I also think it is important to note that, for the most part, heart attacks and sudden cardiac events occur in individuals with underlying cardiovascular disease. So, adding a section that briefly describes cardiovascular disease (atherosclerotic heart disease) and how FF might cause this chronic condition to become an acute, emergency condition seems helpful. You may also want to consider this in an accompanying document.
3. I recommend also including NFPA 1584, Recommended Practice on the Rehabilitation of Members Operating at Incident Scene Operations and Training Exercise. I believe there is a plan to upgrade this to a standard, and I think it dovetails nicely with 1582 and 1583 in terms of addressing cardiovascular strain associated with FF. 1582 recognizes that a FF must be medically fit to safely perform FF tasks. 1583 recognizes that physical fitness enhances cardiovascular fitness and lessens the strain associated with an absolute workload. 1584 recognizes that FF causes significant thermal, cardiovascular and physiological strain – and that FF should have their vital signs measured for early signs of more severe problems.

Specific Recommendations.

1. Introduction, toward the end of 1st paragraph. It would be useful to also note the number of non-fatal HA that occur in the FS. While the emphasis is clearly on CV deaths, and should be, the number of deaths underestimates the problem.
2. Introduction, end of 2nd para. Separate the sentence, “This document...” into a new paragraph to avoid awkward transition from previous sentence. Also consider expanding the sentence, perhaps something like, In an attempt to share

lessons learned from previous investigations, and to integrate that information with other meaningful data, this document...

3. Background, Increased HR and Heavy Physical Exertion – The Smith 1995 ref. is not the most appropriate since that study was conducted in a laboratory. For your convenience I will attach a list of articles that may be relevant-especially if you wanted to include a more inclusive description of the effect of FF on the CV system. I recommend the starred, 2001 article because it specifically addresses cardiovascular strain – including HR and stroke volume (which is significantly decreased following FF).
4. Background, Exposures Associates with Cardiac EVENTS – not effects?
5. FF and Heart Disease – the first para is a bit confusing. The first sentence seems to be addressing the occupational risk of FF relative to CVdisease. Guidotti's conclusion is really about the acute stress of FF and its ability to cause an acute cardiac event (implicitly in individuals who have CVD), but not necessarily the likelihood that the occupation of FF is associated with developing the disease. The rest of the para again addresses occupational risk.
6. In the same para, what does SMR mean?
7. Current Standards, I suggest adding NFPA 1584, as discussed in my general recommendations.
8. Current Standards, Occupational Safety and Health Admin, about half way into the 1st para. The OSHA standard regarding...is relevant to... You need to clarify why it is relevant rather than just assert that it is.
9. Conclusions. 1st sentence. This is a very strong sentence. Great. Consider also placing it at the beginning of the document.
10. Recommendations consider adding
 - FD, Candidates. Designate personnel who can assist FF in understanding results of medical exam and how to personally implement lifestyle changes that decrease the risk factors associated with cardiovascular disease and the likelihood of suffering a sudden cardiac event.
 - FD, During fire suppression. Provide on-scene rehabilitation to monitor vital signs for indication of excessive cardiovascular strain, and to cool and rehydrate the FF.
 - FD, Members. Designate personnel who can assist FF in understanding results of medical exam and how to personally implement lifestyle changes that decrease the risk factors associated with cardiovascular disease and the likelihood of suffering a sudden cardiac event.
 - FD, Members. Encourage proper hydration and healthy eating habits at the station.

- FF Candidates and FF. Educate yourself about the cardiovascular demands of Firefighting and about the risk factors for developing cardiovascular disease. Seek ways to modify your cardiovascular risk profile.
- FF Candidates and FF. Make sure you understand the results of your medical exam and how your cardiovascular risk profile has changed over time.
- Fire Service Agencies. Conduct research aimed at understanding how the stress of firefighting affects all components of the cardiovascular system (cardiac function, ECG changes, coagulatory events) and investigate strategies directed at mitigating these changes.
- Fire Service Agencies. Conduct research into novel risk factors and early detection tests that may predict which FF are at risk for cardiovascular events.
- Fire Service Agencies. Conduct research into the effectiveness of on-scene rehabilitation to mitigate against cardiovascular strain.
- Fire Service Agencies. Conduct research to better understand the long-term effects of FF on cardiovascular health.

Reviewer # 5

I have some minor comments.

- 1) Does the background section appropriately summarize the current literature regarding heart disease and fire fighting?

In general the background section is good. However, I believe that more than carbon monoxide and physical exertion contribute to the problem of heart disease among fire fighters. Fire smoke contains many other toxic substances that could increase the risk for acute cardiac problems. Some examples would be cyanide and hydrochloric acid found in significant amounts in many fires and small particulate matter found in nearly all fires.

Acute respiratory effects from fire smoke exposures have been documented in studies of lung function among fire fighters after a fire. I would recommend changing the title of that paragraph from carbon monoxide to fire smoke exposures and briefly summarizing the exposures that may contribute to cardiac effects including carbon monoxide. I would also mention that acute cardiac events can be delayed in onset.

- 2) Do the case reports identify the important findings from the NIOSH cardiovascular disease investigations?

I thought that the case examples were very good and useful illustrations in helping the intended audience to understand the problems and the factors that may contribute to these problems.

- 3) Are these findings adequately discussed in the section "Data from the NIOSH CVD Investigations"?

The discussion is also very good given the constraints of space, etc. Some of the language may be too technical for the audience especially in the work-relatedness and limitations sections.

- 4) Are the conclusions supported by the body of the document?

I thought that the conclusions were appropriate.

5) Are the recommendations appropriate?

I thought that the recommendations were also good. The heading of Fire Department Members is confusing.

6) Are there any additional recommendations you think should be included in this document?

No.

Reviewer # 6

I have reviewed the report. I like the section on "Data from the NIOSH CVD Investigations" very much. I was not aware of the temporal death patterns and the OR's for active firefighting.

1) The main problems that I have with the report is that the information provided does not support the recommendation of mandatory annual comprehensive medical examinations regardless of age. This recommendation would require an analysis of both the appropriate frequency of testing and age-related factors. Regarding the latter, I am sure that you have data on the age of death for your cases. This could be used to generate risk rates by age. I would be very surprised if you had any sudden cardiac deaths under 40. If so, NIOSH could recommend cardiac risk factor screening programs beginning at this age or within 5 years of it.

2) While I support the goals of the firefighter wellness programs, I would argue that the shotgun approach of the IAFF and NFPA (doing every test possible, every year, in everyone) is a terrible waste of resources, whose cost creates a barrier to wider adoption of appropriate cardiac health promotion programs such as those endorsed by various medical organizations such as the American Heart Association. I would recommend NIOSH recommend these types of programs rather than those promoted by employee advocacy groups that are not evidence-based.

Reviewer # 7

Page: 1

1) Can you consistently use the word cardiovascular throughout the document instead of the word cardiac

Page: 2

2) While we all know tobacco use is a risk for all, I think the reference to environmental tobacco smoke (I assume here it means 2nd hand smoke). Maybe you just pull it.

Page: 3

3) No the standard has stringent pass/fail criteria for candidate fire fighters, as well as a more flexible guidance for medical determinations for incumbent fire fighters based upon

the specific nature of their condition and the duties and functions of their job. The medical determinations for incumbent fire fighters are highly dependent on the affected individual's particular circumstances and is not blanket prohibition that prevents an incumbent member from continuing to perform the essential job tasks. It is important that the evaluating physician (s) have a clear understanding of the fire fighter's essential job requirements, capabilities, and history; and a dialogue regarding potential job accommodations should occur between the affected fire fighter, the fire department, and the evaluating physician

Page: 4

4) Further, OSHA provides medical requirement for structural fire fighters and fire fighters that respond to hazardous material incidents. The employer shall assure that employees who are expected to do interior structural fire fighting are physically capable of performing duties which may be assigned to them during emergencies. The employer shall not permit employees with known heart disease, epilepsy, or emphysema, to participate in fire brigade emergency activities unless a physician's certificate of the employees' fitness to participate in such activities is provided. (29 CFR 1910.156 (b)(2)) Fire departments where fire fighters respond to hazardous material incidents have additional legal responsibilities. The medical requirements for hazardous materials responders are contained in the Code of Federal Regulations at 29 CFR 1910.120 (f).

5) Should read "The IAFF, a labor union, and the IAFC, a management organization, are devoted to the safety and health of their members, among other fire service issues. In the late 1990's they worked together in a labor management structure to publish three programs addressing medical, fitness and wellness issues".

6) [When referencing NFPA 1582] add all editions, 1997, 2000, 2007

7) [When references NFPA 1583] add all editions 1999, 2000, 2007

8) Add new bullet:

Peer Fitness Trainer Certification

A certification program is to provide a fitness trainer standard consistent with the health and fitness needs of the North American Fire Service. Those successfully passing the certification exam will have demonstrated they possess the knowledge and skills required to design and implement fitness programs, improve the wellness and fitness of their departments, assist in the physical training of recruits, and assist the broader community in achieving wellness and fitness.

Page: 11

9) Develop a nation-wide data base on medical data of fire fighters.

Reviewer # 8

Comments on the NIOSH Alert:

Page 1: Our number for fatalities due to sudden cardiac death from 1998 through 2004 is 304.

Page 2: First sentence describing NFPA: The NFPA develops voluntary codes and standards to protect firefighters and civilians from fire-related injuries and deaths, among other hazards. [or something like that to reflect the fact that NFPA does a range of things, much like the description of the IAFF shows that their issues extend beyond safety and health]

Page 3 and throughout: The Alert references the 2003 edition of NFPA 1582. The current standard is the 2007 edition.

Page 4: The 5th category of 'frequent' factors is very different from the other four, and seems out of place. The deaths in these categories aren't different, in cause, from the first four categories, just in circumstances. Why is driving singled out as a special category? Is it really the 5th most significant category of cardiac deaths? (See also Ques #2 below.)

Page 5: Case 1 doesn't mention 'over 45' as a risk category, while Case 3 does. Shouldn't they be consistent?

Page 5: typo in Case 2 -- there's a ')' after 128 steps that doesn't belong.

Page 5: two references for 2003 ed. of NFPA 1582 which should probably be 2007.

Page 7: reference to 2003 ed. of NFPA 1582.

Page 7: 51 is 39 percent of 131, not 40 percent.

Page 8: It doesn't sound like a significant problem if there were only four cases identified where access or function of AED contributed to deaths. I think you can probably mention that AED wasn't even available in a large number of other cases, which is why this appears fourth on the list of significant categories of cardiac deaths.

Page 8: reference to 2003 ed. of NFPA 1582.

Page 9: The USFA report is referenced here as 2004 and listed on the reference page as 2002.

Page 10: four references to 2003 ed. of NFPA 1582.

Page 11: typos -- 8th bullet misspells 'participate' and second to last bullet point uses 'FF' instead of spelling out the word 'firefighter' (or 'fire fighter').

Page 14: Reference 2007 edition of NFPA 1582.

Answers to Specific Questions:

1) Does the background section appropriately summarize the current literature regarding heart disease and firefighting?

It includes everything I've ever heard about, and probably more.

2) Do the case reports identify the important findings from the NIOSH cardiovascular disease investigations?

I have a bit of a problem with the fifth category -- sudden death while driving. I didn't think it fit when I first saw it on page 4. It wasn't until the discussion on page 8 that I understood (or think I understand) that the issue isn't driving as much as it is the risk to others if a firefighter could be a victim of a sudden incapacitating event. For that reason, I think the fifth category should be generalized (not specifically focusing on driving) to something like -- the sudden death (or incapacitation) of a firefighter that could result in injury to other firefighters or civilians. The case report used is a good illustration of that danger from a cardiac event.

3) Are these findings adequately discussed in the section "Data from the NIOSH CVD investigations?"

Yes, I thought this section was very good. One question I had, though, was whether NIOSH's focus on cardio-related deaths of younger firefighters might have skewed these results at all? Should that be mentioned in the 'Limitations' section?

4) Are the conclusions supported by the body of the document?

Yes.

5) Are the recommendations appropriate?

Yes.

6) Are there any additional recommendations you think should be included in this document?

No.

Reviewer # 9

I have reviewed the document you sent me.

I have a few observations.

1. The entire report is written with a connotation of career firefighters. ie references to work, shift, and on-duty.
2. The NFFF has some great materials with the "Everyone Goes Home" Program. Should it be added to page 4.
3. Case 5 makes no mention if any medical evaluations were available to the department.

4. Under the areas that discuss smoke and the elements found in it, should cyanide be included?

I really appreciate the opportunity to review the report and only offer these items as suggested elements to consider.

Reviewer # 10

I've reviewed the draft Warning regarding cardiovascular deaths in FF's and offer the following comments:

- 1) First, it's overall a terrific document. My only over-arching issue with it is the question of its target audience. If it's for fire departments, officers, and firefighters, I'm worried that the technical level of some of the research findings (both current and from the literature) may exceed typical comprehension level for this audience. I'm sure you have some line fire officers and/or firefighters reviewing it as well.
- 2) With respect to your section on Data from the NIOSH CVD investigations, I wonder if in addition to the great discussions you already have, you should also include a Subsection on working alone. In one of the vignettes you present here (Case 4) help was delayed by the fact that he was alone at HQ because he'd made his last emergency response call alone. In another of our cases, everyone left the victim to put all the apparatus in their respective bays after a response. He died alone and was found dead hours later by police investigating open apparatus bay. Were these the only 2 cases, or is that another thing that maybe happens a little too frequently in the VFD world, and decreases survivability in this population?

Going through page-by-page:

- 3) Bottom of page 1: It looks like "This document... that appears as the last sentence of the last paragraph should actually be starting a new paragraph that is followed by the list. It doesn't make sense in its current position.
- 4) Page 2: Middle of paragraph on Carbon Monoxide: The sentence that begins 'these studies...' shouldn't be left to stand alone without more explanation and some perspective. Simply indicating that high CO levels have been found inside SCBA masks will terrify some and cause others to not bother wearing them.
- 5) Page 2: 2nd column, beginning of 7th line: e.g. should actually be i.e.
- 6) Page 3: 1st column, line 14: I can't find a previous use of SMR, so it should be spelled out here.
- 7) Page 3: Bottom of 2nd column: Isn't 2-in, 2-out for IDLH entry actually HAZWOPER (29CFR 1910:120) rather than the respiratory standard (1910:134) which IS the proper reference for respiratory clearance for SCBA discussed earlier in the paragraph?

- 8) Page 4: Middle of column 1: Though you've already discussed NFPA standards, would it be useful to add after the Joint Labor-Management W-F Initiative that the last 2 revisions of 1582 have been consistent with the provisions of the W-F initiative?
- 9) Page 6: Column 2. The previous vignettes have had brief explanations of the message(s) they were being used to illustrate. This one doesn't have a message paragraph at the end.... Access to AED's? Not allowing fire personnel to be performing duties alone in HQ, on apparatus, or on-scene?
- 10) Page 7: Case 5: Message paragraph for vignette?
- 11) Page 7: Bottom of column 1: FD's not providing med eval's are also not following NFPA 1582... NFPA are voluntary standards, but are also considered consensus standards with legal implications for industries that choose not to follow them....
- 12) Page 7: Near bottom of column 2: [IAFF/IAFC 1997] reference might also include NFPA 1583.
- 13) Page 8: Bottom of paragraph on AED's: AHA 2000 is out of date. Suggest referencing AHA 2005 ECC Guidelines
- 14) Page 8: Section on Carbon Monoxide: although environmental tobacco smoke is listed in the second paragraph as an 'unrecognized source' of COHB in FF's, I'd suggest the first paragraph ought to indicate that low levels of COHB in the 2.5-5.0 range are typical for cigarette smokers, and is an excellent reason for FF's to quit smoking (and one reason why smoking is Category A condition in candidates)
- 15) Page 10: For both candidates and members, insert "and essential job tasks" in the second bullet(s)... i.e., "Ensure that the physicians conducting the post-offer/pre-placement medical examinations are knowledgeable about the physical demands and essential job tasks of firefighting and the consensus guidelines....etc.
- 16) Page 10: For both Candidates and members: consider deleting the bullet regarding keeping information confidential. This is law anyway, and doesn't reinforce the point of the paper at all.
- 17) Page 10: Consider adding a bullet in column 2, under members recommending explicitly that members be restricted from duties that cannot safely be performed. Throughout the paper, this is implicit when you talk about using the standard, but I think this is a huge point that the fire service simply hasn't gotten its arms around: Not only do physicians need to know what they are clearing FF's to do in the line of duty, but they must know what to restrict them FROM doing to prevent CV deaths.