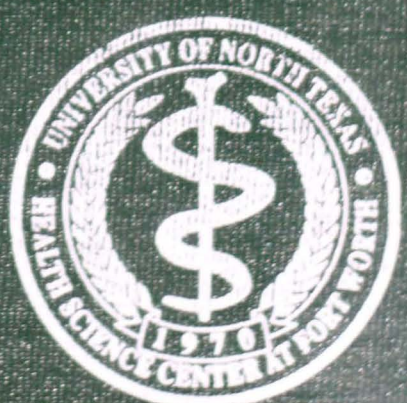
UNIVERSITY OF NORTH TEXAS
HEALTH SCIENCE CENTER AT FORT WORTH
1970

Lin, Rick H, Firefighter Medical Surveillance/Duty Fitness Evaluation of Content And Reporting Format: Compliance with Federal And Other Recognized Standards. Master of Public Health (DO/MPH Dual Degree Track), May, 2001, 41 pp., 7 tables, bibliography, 11 titles.

The University of North Texas Health Science Center analyzed data collected by the Public Health Preventive Medicine (PHPM) Clinic at the University of North Texas Health Science Center (UNTHSC) in the course of medical surveillance and duty fitness exams for the City of Rowlett, Texas, HAZMAT Team. Data was analyzed for content and reporting format to determine compliance with federal and other recognized standards. An aggregate report of continuous and categorical data was also created.

The subjects were all firefighters in the City of Rowlett Fire Department, Rowlett, Texas. The data was collected from the results of physical exams performed on the members of this population between the period of 1-1-1996 to 12-31-1996. There were a total of sixteen subjects. (n=16) These firefighters are all HAZMAT Team members. The overall content of the medical surveillance and duty fitness examinations was evaluated. The compliance in content of medical history and physical examination to the recognized standards established by OSHA, EPA, and NFPA was examined. The physical characteristics and health of this population of firefighters is described based on the data collected.

The result of the comparison shows that the UNTHSC PHPM Clinic's forms for the history and medical exams did not completely incorporate the recognized standards. The content of the medical surveillance and duty fitness exams was in compliance with and often exceeded recognized standards.

FIREFIGHTER MEDICAL SURVELLANCE/DUTY FITNESS EVALUATION OF CONTENT AND REPORTING FORMAT: COMPLIANCE WITH FEDERAL AND OTHER RECOGNIZED STANDARDS

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FIREFIGHTER MEDICAL SURVELLANCE/DUTY FITNESS EVALUATION OF CONTENT AND REPORTING FORMAT: COMPLIANCE WITH FEDERAL AND OTHER RECOGNIZED STANDARDS

PROJECT IN LIEU OF THESIS

Presented to the School of Public Health

University of North Texas Health Science Center at Fort Worth

In Partial Fulfillment of the Requirements

For the Degree of

Master of Public Health

By

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CHAPTER I

INTRODUCTION

There are approximately 1 million firefighters in the United States. They protect life and property from fires, respond to medical emergencies, and deal with the containment of hazardous materials. In addition, they perform building inspections for fire code ordinances, and attend to the regular maintenance and repair of related emergency and protective equipment.

Firefighters face many hazards at the fire scene. Heat, smoke, and fumes from various toxic chemicals pose a serious danger. In addition, falling objects, potential burn injuries and the loud noise of alarm sirens and explosions further add to the significant threats firefighters must face. The scene of an emergency situation often generates risk for severe injuries from falling objects. The demand of peak physical level performance under dangerous situations adds other ergonomic stressors. (Morse, Owen, and Becker, 1993) Due to all these potential threats, firefighters have been trained to use personal protective equipment (PPE) to prevent injuries and protect them from hazards. The duty fitness of the firefighters is also extremely important on the job. Lifestyle, medical history, and fitness level each have a great impact on the firefighters' ability to react efficiently on duty.

The proper use of respiratory personal protective equipment is promulgated by standards of different organizations and government agencies. The Occupational

Safety and Health Administration (OSHA) publishes regulations and standards for respirator protection for general industry. The applicable regulations are included in 29 Code of Federal Regulations (CFR) 1910.134 (Respiratory Protection). This regulation delineates the situations in which employers are required to provide respirators, testing required prior to the use of respirators, establishment and maintenance of a respiratory protection program, and requirements for adequate training and equipment. National Firefighter Professional Association (NFPA) also took part in approving consensus standards for respiratory protection, training programs, and defining the essential elements for an incident management system. In addition, NFPA also publishes the standards for clothing, helmets, gloves, and footwear.. (National Firefighter Professional Association, 1997)

Firefighters also face daily exposure to loud noise from sirens, horns, and explosions. OSHA also addressed the issue of occupational noise exposure. In 29 CFR 1910.95 it discusses hearing protection requirements, proper audiometric testing procedures, testing equipment calibrations, and other relevant issues. The measurement of threshold shift is also addressed in this regulation. NFPA also has a similar standard on the frequency which threshold shift is to be measured. (National Firefighter Professional Association, 1997)

OSHA, in conjunction with the United States Environmental Protection Agency (EPA) also set the standards for Hazardous Waste Operation and Emergency

Response (HAZWOPER) with 29 CFR 1910.120. HAZWOPER contains guidelines for medical surveillance frequency but not for medical exam content. Also, in conjunction with EPA, the National Institute for Occupational Safety and Health (NIOSH), and United States Coast Guards (USCG), OSHA also published an Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. (US Department of Health and Human Services, 1998) In this book, guidelines for pre-employment physicals and medical surveillance for the HAZWOPER team members were specified. The standard requires medical examination prior to job assignment and periodic medical examination every year thereafter. Recommended content of the examination includes medical and work history, past history of hazardous exposure with special emphasis on associated symptoms, and duty fitness as relating to the use of PPE. (US Department of Health and Human Services, 1998). These standards apply to HAZMAT team members.

Another very important standard related to the firefighter's duty fitness is the National Fire Protection Association (NFPA) 1582, Standard on Medical Requirements for Firefighters, prepared by the Technical Committee on Fire Service Occupational Medical and Health and acted on by the NFPA. This document specifies the medical conditions that would prohibit a person from performing fire fighting operations (Category A) and the medical conditions that would require a physician to evaluate the firefighters on a case by case basis (Category B). (NFPA 1582, 1997) Medical evaluations, record keeping, and confidentiality were also addressed in this document.

In NFPA 1582, the content of medical examination is discussed. NFPA clearly defined the minimum number of examinations for each age group and each age condition.

The National Institute for Occupational Safety and Health (NIOSH) and American College of Occupational and Environmental Medicine (ACOEM) prepared statements regarding medical surveillance recommendations. (Weeks, Peters, and Monson, 1981) American College of Occupational and Environmental Medicine recommends the following content for medical surveillance: (1) Baseline Medical examination, (2) Periodic Medical surveillance, and (3) Post-illness or injury.

Record storage is an importance as some occupationally related illnesses often have delayed onset. Records of the medical examinations must be maintained since any future hazardous exposures or injuries may cause this information to become more relevant. Comparison of future and current test results is needed to determine the occurrence of a suspected toxic effect. OSHA regulations require that employers preserve these records for the employment period plus 30 years. These records must be available upon request to OSHA. (Matte, Fine, and Meinhardt, 1990) The exam components of these various standards are noted in Table 1.

This retrospective study compared the medical requirement, the content and frequency of exams, the reporting format, the duty fitness recommendations from the University of North Texas Health Science Center (UNTHSC) Preventive Medicine and Public Health (PHPM) Clinic of the Rowlett firefights to the recognized standards, as published by NFPA, OSHA, NIOSH, and other related agencies. The comparison of the standards with the actual evaluation process was made in hope to determine: Did the contents of

the evaluations comply with the recognized standards? Were the individual tests performed according to recognized standards? Was the overall evaluation of an entire municipality's firefighter personnel ever characterized so as to provide recommendations regarding occupational noise exposure, respiratory protection, and medical surveillance?

TABLE 1: Recommended or Regulated Exam Content for HAZMAT Team Members

	History	Physical Exam	Spirometry	Audiogram	Visual Acuity	Exam Frequency	Baseline Exam
NFPA	Required	Required	Required	Required	Required	Age 29 or under, every 3 years Age 30-39, every 2 years Age 40 or above, every year	Required at the time of employment
Respiratory Protection (OSHA)	Required	Required initially	Not addressed	Not addressed	Not addressed	Not addressed	Required prior to use
Hearing Protection (OSHA)	Not addressed	Not addressed	Not addressed	Required. Discuss Threshold Shift monitoring	Not addressed	Recommended annually	Required prior to exposure
HAZWOPER (OSHA/EPA)	Required	Required	Refers to Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities	Refers to Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities	Refers to Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities	Required annually	Required at the time of employment
Respiratory Protection (NIOSH)	Not addressed	Not addressed	Recommended	Not addressed	Not addressed	Not addressed	Not addressed
Spirometry (ACOEM)	Required	Not addressed	Required	Not addressed	Not addressed	Required every 2 years	Required at the time of employment
Hearing (ACOEM)	Required	Not addressed	Not addressed	Required	Not addressed	Required every 2 years	Required at the time of employment
RESULT OF ROWLETT FIREFIGHTERS							
UNTHSC PHPM CLINIC	Performed, but concurrent job, contact lenses, and facial features information	Performed	Performed. Additional lab tests, CRI and BMI are also obtained	Performed	Performed. Color and depth vision is also evaluated.	Performed every 2 years	Performed

CHAPTER II

METHODS

In this study, two major areas of the overall content of the examination will be addressed. These include: (1) The compliance in content of medical history and physical examination to recognized standards and (2) the physical characteristics and health of this population of firefighters based on the data collected and how this data compares to the standards of NFPA.

Data Collection

The subjects are all firefighters of the City of Rowlett Fire Department, Rowlett, Texas. The data was collected from the results of physical exams performed on the members of this population between the periods of 1-1-1996 to 12-31-1996. There were a total of sixteen subjects. (n=16)

The examinations were performed by the attending physicians at the Preventive Medicine and Public Health (PHPM) Clinic of the University of North Texas Health Science Center (UNTHSC). All examination results were recorded in a similar fashion with an identical pre-printed form.

The components of the examination utilized by the University of North Texas Health Science Center, PHPM Clinic included a detailed medical exam and a detailed occupational history (see Appendix); visual acuity and audiometric booth testing; body fat analysis; body mass index; routine laboratory tests (complete blood count, general

chemistry profile including lipid profile, liver and kidney function, electrolytes), and spirometry. Modified Bruce Protocol Stress Tests were performed to determine aerobic capacity.

The height measurements was taken in inches and the weight measurement was collected in pounds. Height measurement was converted to meters by multiplying the measurement by 0.45359. Weight measurement was converted to kilograms by multiplying the measurement by 0.0254. Body Mass Index is calculated by the following formula:

$$BMI = (\text{weight in kilograms}) / (\text{height in meters})^2$$

The cardiovascular risk index of the firefighters is calculated by dividing serum cholesterol value by high density lipoprotein (HDL) value. Serum triglyceride is also monitored as part of this cardiovascular panels. All calculations were done by Microsoft Excel computer software.

Data Analysis

The cumulative data collected on the defined population of firefighters in this study was analyzed; means and plus and minus one standard deviation was calculated. Calculations were performed and results are reported in metrics units and rounded to 2 decimal points.

CHAPTER III

RESULTS

From the medical evaluation, the following parameters were recorded and analyzed: Vitals/Anthropomorphics (Age, Gender, Height, Weight, Body Mass Index, Systolic BP, Diastolic BP), History Content of the Medical Records (Presence and Absence of the following content within the medical record: job descriptions, occupational history, immunization status, tobacco use, alcohol use, hobbies, family medical history, record of past surgery, and audiometric history), Audiometric testing (threshold shift, categorization of hearing ability), vision testing, pulmonary function (FVC, $FEV_{1\ sec}$, FVC percent predicted and, $FEV_{1\ sec}$ percent predicted), physician interpretation of resting and stress ECG, and blood work.

This population was composed of male firefighters, who ranged from age 21 years to 55 years, with a mean age of 37 years and standard deviation of ±10 years. Fourteen (88%) of these subjects experienced previous surveillance examinations at this clinic. Two of these examinations were baseline examinations performed prior to assignment.

This population of firefighters has an average height of 1.85 meter in height with a standard deviation of ±0.12 meter. The mean weight for this population is 92 kg with a standard deviation of ±13 kg. The group had a mean body mass index of 26.9 and standard deviation of ±3. The range of Body Mass Index (BMI) for normal male is 20-

25. The 25-30 range is considered overweight. BMI above 30 is considered obese. The BMI of the population ranged 20-31. The mean (26.9) lies well outside of the normal range. Four of the firefighters (25%) are within the normal range and other 9 (56%) are in the range of 25-30. 3 (19%) members are above 30 of BMI. The overall profile of this population is overweight. (Table 2)

Audiometric Testing

University of North Texas Health Science Center Preventive Medicine and Public Health Clinic evaluated hearing acuity in 500,1000,2000,3000, 4000, 6000, 8000 Hz frequencies, and any threshold shift from the baseline measurement when available. This complies with the standards published by both NFPA and OSHA.

One of 16 firefighters did not pass the hearing acuity criteria specified by NFPA 1582 medical condition category A. This constitutes 6% of this defined population. Of the sixteen, twelve of the subjects had baseline data. Among the twelve subjects (75%) with baseline measurements, two (13%) of the firefighters experienced a threshold shift as defined by OSHA Standard (29 CFR 1910.95.G, Standard Threshold Shift). The threshold shift was calculated by an audiometer and confirmed by examining physicians. These two firefighters with threshold shift meet the recommendation for the Standard on Medical Requirements for Fire Fighters defined by NFPA 1582. Additionally, one (6%) of the subjects who did not exhibit threshold shift, also did not fit the criteria for category B medical condition of NFPA 1582. (Table 3)

TABLE 2: Body Mass Index Breakdown of Rowlett Firefighters

Body Mass Index	Numbers of Firefighters	Percent of Firefighters
Less than 25	4	25%
25-30	9	56%
Greater than 30	3	19%

TABLE 3: General Characteristics of Rowlett Firefighters under Medical Surveillance on Year 1996 (ALL MALE)

Total Subjects (n=16)	Range	Mean	Standard Deviation
Age (years)	21-55	37	10
Height (m)	1.68-2.11	1.85	0.12
Weight (kg)	67-117	92	13
BMI	20-31	26.9	3.1

The result of the audiometric testing shows 1 subject with hearing deficiency not measuring up to NFPA standards. On the clinic chart, this information is simply denoted by a check mark in the appropriate category with no obvious notation from the clinic physician.

Visual Acuity

The firefighters were evaluated for their color vision, depth perception, and visual acuity (near and far vision) using the Titmus II Vision Screener.

Among the firefighters, only 11 (69%) met the standard set forth by NFPA 1582 for uncorrected vision. Four (25%) of the firefighters did not meet the standard for uncorrected vision, and one of firefighter's uncorrected vision data was unavailable. However, this same firefighter does have satisfactory corrected vision.

Of the 16 firefighters, 14 firefighters have satisfactory corrected vision and 1 firefighter did not have the corrected vision recommended, as specified by NFPA 1582, to perform the duties of a firefighter. 1 firefighter did not have available data on his corrected vision, and his uncorrected vision was unsatisfactory for duty fitness as specified in the same standard. (Table 4, Subject 10) Also, another subject (Table 4, Subject 15) had proper evaluation of corrected vision and met the standard, yet his uncorrected vision data was unavailable. Visual acuity data as required by NFPA was not collected in this case.

TABLE 4: Audiometric Data of Rowlett Firefighters

	Threshold Shift	Hearing Acuity
	Yes/No (OSHA)	Meet Criteria? (NFPA)
Subject 1	No	Yes
Subject 2	Yes	Yes
Subject 3	No	Yes
Subject 4	No	Yes
Subject 5	No	Yes
Subject 6	No	Yes
Subject 7	No	Yes
Subject 8	No	Yes
Subject 9	Yes	Yes
Subject 10	No	No
Subject 11	Baseline	Yes
Subject 12	Baseline	Yes
Subject 13	Baseline	Yes
Subject 14	No	Yes
Subject 15	Baseline	Yes
Subject 16	No	Yes

In the medical records of the subjects, only one (6%) note was made on whether the subject uses contact lenses. For rest of the population, this information was unavailable.

In addition to visual acuity, the color perception and depth perception of this population of firefighters was also measured. Four (25%) firefighters out the total population had deficits in color vision. Five (31%) firefighters had deficits in depth perception, and one of these five firefighters is also one of the four firefighters who had deficits in color vision. (Table 5)

In summary, only 7 (44%) out of the 16 firefighters had normal vision in all aspects. The 9 (56%) of the subjects experience at least one type of vision deficit.

Spirometry

The mean forced vital capacity value of the subjects was 5.81 liters with a standard of deviation of ±0.97. The values ranged between 4.48 to 7.64. The percent of predicted value for FVC ranges between 88.3% to 165.4% with the mean of 112% and standard deviation of ±18.5%

The 1-second forced expiratory value (FEV1) of the subjects was 4.45 liters with a standard of deviation of ±0.76. Ranges between 3.34 to 5.51. The percent of predicted value for FEV1 ranges between 84.6% to 156.3% with the mean of 107.6% and standard deviation of 18.4%.

TABLE 5: Visual Acuity Data of Rowlett Firefighters

	Corrective Visual Acuity	Uncorrected Visual Acuity	Depth Perception	Color Perception
Name	Meet Standard?	Meet Standard?	Normal?	Normal?
Subject 1	Yes	Yes	NORMAL	NORMAL
Subject 2	Yes	No	DEFICIENT	NORMAL
Subject 3	Yes	Yes	NORMAL	NORMAL
Subject 4	Yes	Yes	NORMAL	DEFICIENT
Subject 5	Yes	Yes	DEFICIENT	NORMAL
Subject 6	Yes	Yes	NORMAL	NORMAL
Subject 7	Yes	Yes	NORMAL	NORMAL
Subject 8	Yes	No	NORMAL	DEFICIENT
Subject 9	Yes	Yes	NORMAL	DEFICIENT
Subject 10	N/A	No	DEFICIENT	DEFICIENT
Subject 11	Yes	Yes	NORMAL	NORMAL
Subject 12	Yes	Yes	DEFICIENT	NORMAL
Subject 13	Yes	Yes	NORMAL	NORMAL
Subject 14	Yes	Yes	NORMAL	NORMAL
Subject 15	Yes	N/A	NORMAL	NORMAL
Subject 16	No	No	DEFICIENT	NORMAL

TABLE 6: Pulmonary Function Test of the Rowlett Firefighters

	Smoker?	FVC	% Predicted	FEV1	% Predicted
Subject 1	Yes	6.14	114.9	4.4	102.8
Subject 2	Yes	6.82	165.4	5.2	156.3
Subject 3	No	6.88	127.2	5.15	118.9
Subject 4	No	4.53	108	3.68	111.3
Subject 5	No	5.05	88.7	3.9	86
Subject 6	No	5.03	113	4.22	118.9
Subject 7	No	4.98	91.8	4.11	94.9
Subject 8	No	5.41	111.9	4.39	113.6
Subject 9	No	6.43	110.1	4.21	90.2
Subject 10	Yes	4.66	88.3	3.63	85.8
Subject 11	No	4.48	95.6	3.34	84.6
Subject 12	No	5.45	106.6	4.49	103.8
Subject 13	No	6.62	119.6	5.51	115.2
Subject 14	No	6.59	122.6	4.47	102.9
Subject 15	No	7.64	110.3	6.1	109
Subject 16	No	6.18	119.9	5.28	126.9
Mean		5.80563	112.119	4.505	107.569
+/- 1 Std Dev		0.97648	18.5429	0.756007	18.4452

The percent of 25-75% of the Force Expiratory volume percent of predicted value ranges between 46.9% to 135.8% for these firefighters, with the mean of 91.2% and a standard deviation of ±27%. (Table 6)

Cardiovascular Risk

The firefighters underwent annual resting 12-lead electrocardiogram (ECG), cardiac stress tests. Blood pressure and lipid profile are also collected. The results were interpreted by occupational medicine physicians at PHPM Clinic at University of North Texas Health Science Center.

A total of 2 out of 16 firefighters (12.5 %) had high resting blood pressure measurements. (systolic >140 or diastolic >90). The mean systolic blood pressure of this defined population is 121.5 mmHg ± 11 and the mean diastolic 80.6 mmHg ± 11.9. No firefighter had a systolic blood pressure exceeding 179, which is the value used in the proposed revision of NFPA 1582. There is one firefighter whose diastolic blood pressure exceeded 99 mmHg, which is the upper limit of diastolic pressure set by the proposed revision of NFPA 1582.

The result of both resting ECG and cardiac stress test shows all firefighters(16) to be unremarkable with no notable abnormalities such as arrhythmia or s-t elevation.

The serum cholesterol of the 16 firefighters ranged from 142 to 290 mg/dl, with a mean of 205.94 mg/dl and a standard deviation of ±39.25 mg/dl. Seven (44%) of the firefighters have cholesterol lower than 200 mg/dl while 9 (56%) are higher than 200

TABLE 7: Serum Cholesterol Level of Rowlett Firefighters

Serum Cholesterol Level	Number of Firefighters	Percent of Firefighters
lesser than 200 mg/dl	7	43.8%
greater than 200 mg/dl	9	56.3%

mg/dl.(Table 7) Serum HDL ranged from 38 to 77 mg/dl, with mean of 55.56 mg/dl and a standard deviation of 11.7 mg/dl. Triglyceride levels of the firefighters ranged from 23 mg/dl to 299 mg/dl with a mean of 122.06 mg/dl and a standard deviation of ±77.12 mg/dl.

The Cholesterol to HDL ratio was calculated to range from 2.06 mg/dl to 6.39 mg/dl with a mean of 3.88 mg/dl and a standard deviation of ±1.17 mg/dl.

Fitness for Respirator use

Of the data collected, none of the physical exams collected information on physical appearance that could affect the donning of the respirator. No facial hair, facial bone structure, skin conditions and other relevant information was noted on the physical examination forms

Medical History

The format of the physical examination and medical history was analyzed. Certain key medical information, such as occupational history, immunization, tobacco

and alcohol use, is important for the overall picture of the firefighters duty fitness. The medical history was examined for the presence and absence of these components.

Of the sixteen subjects, 2 (12.5%) were missing components of occupational history. The documentation of two different firefighters past exposure history was absent. Past exposure and past occupational history were present in most of firefighter charts. However, the information on additional jobs held by the firefighters at the time of examination was absent.

The social history component of the exam adequately met the medical history standards of NFPA, ACOEM, and HAZWOPER. Social History demonstrates that a portion of the firefighters (3 out of 16) were smokers. Other relevant social history was documented as part of the medical history. Among the sixteen firefighters, 3 (25%) used tobacco on a daily basis. Among all 16 firefighters, there was no apparent correlation between PFT and tobacco use (Table 6). A significant number of the firefighters (12 out of 16) in this population used alcohol. Based on the lack of details regarding alcohol use in the current data, it is unclear how many of the firefighters have developed dependence. 12 (75%) of the firefighters were daily alcohol drinkers. 3 (19%) of these sixteen are both smokers and alcohol drinkers. Exercise information was also collected: 13 (81%) of the sixteen firefighters considered themselves to be exercising regularly.

Frequency of Exams

The frequency of medical examinations and occupational medical surveillance and duty for fitness examination is recorded for the subjects of this study. The

frequency of the medical surveillance examination of these firefighters was compared to the NFPA 1582 guideline, HAZWOPER, and ACOEM Position Statement. Among the sixteen firefighters, three of the examinations were baseline examinations. Of the thirteen periodic examinations, four of the firefighters did not meet the standards of NFPA, ACOEM, and HAZWOPER because the last medical surveillance was greater than 2 years prior to the 1996 exam. 9 of the firefighters (56%) met the requirements since they were evaluated within the 2 years period.

CHAPTER IV

DISCUSSION

It is essential that the contents of the medical evaluation for the duty fitness and occupational surveillance program reflect the recognized standards of NFPA, OSHA, NIOSH, and other relevant recommended standards. In this study, the overall content of the medical evaluation of UNTHSC PHPM Clinic complies with these standards.

Medical History

As part of the medical history, the occupational history is particularly important because it includes information regarding prior exposure to hazardous environments. Past exposure to hazardous materials, past injuries, and current employment at a second job, are other examples of how occupational history can give clues to the duty fitness of a firefighter.

Visual Acuity

There are some obvious deficiencies in the proper recommendations to the employer on data regarding visual acuity in this study. Visual acuity is the most important function for safe operation of mobile equipment and activity as firefighter.

Spirometry and Respiratory Protection

The pulmonary function tests (PFT) of this population demonstrated a large range in the performance of these firefighters. Since pulmonary function of a firefighter affects

performance under stress and safe use of a respirator, it is important to monitor PFT of the firefighters. The Occupational Medicine clinic has adequately collected PFT data as designated by the NFPA standard.

Overall Compliance of the Recognized Standards

In the area of audiometric testing and visual acuity testing, UNTHSC PHPM Clinic met and exceeded the recognized standards. The exam baseline requirement met all the standards; new employees all received their baseline exams at the time of their employment. The frequency of the medical surveillance exam also met the recognized standards in most cases.

CHAPTER V

RECOMMENDATIONS

Based on the results of this study, the following recommendations are made to improve the compliance of medical surveillance and duty fitness examinations of the UNTHSC PHPM clinic. The following areas will be discussed: medical history, visual acuity testing, respiratory protection, and laboratory tests.

Medical History

The medical history questionnaire was utilized and the exams were performed in 1996. Since 1999, the respirator questionnaire was published by OSHA as part of the revised 29 CFR 1910.134. The medical history questionnaire should be revised to reflect on this new standard. Additional improvement can be made to further ensure the completeness of the occupational history, reflecting the concurrent jobs which the firefighters maybe holding outside of the fire department. This can be done by redesigning the questionnaire to elicit information on firefighter's additional jobs.

Based on the results obtained from the social history, it is recommended that a program be developed to eliminate nicotine addiction among firefighters. Health education on smoking cessation may be of value to implement within the municipality. Smokers need to be identified and referred to the program or other external programs available to them. Similarly, recommendation can be made on the prevalent use of alcohol among the firefighters. Questionnaires can be used to identify potentially

alcohol dependent individuals. They can then be referred to employment assistance programs and alcoholics anonymous for additional treatment.

Visual Acuity Testing

Although the content of the visual acuity data is complete, the interpretation and recommendation were lacking. A protocol for quality assurance should be developed to ensure complete visual acuity information is collected and proper recommendations are made to the employer.

Another relevant factor regarding the vision acuity is the use of contact lenses. Proper advice should be dispensed to the subjects about using contact lenses at the work place because fumes at a fire scene can damage the eyes due to the trapping of the chemical beneath the contact lenses. Eye irritation may prevent firefighters from carrying out their duties effectively at the fire scene. In all subjects needing corrected vision, information regarding the use of contact lenses should be collected. It is also recommended that contact lens information should be incorporated as part of the questionnaire in the medical history.

Although NFPA does not state any criteria for the duty fitness of firefighter in the depth vision and color vision, the University of North Texas Health Science Center PHPM Clinic did collect this information as part of the examination. Since up to 25 percent of the subjects are experiencing deficits in color vision, depth vision, or both, it is worthwhile to explore whether color vision and depth vision have significant impact on the duty fitness of firefighters. Although these are not addressed by NFPA, it can be

an issue recognizing dials, knobs, lights, placards which are color coded. Depth perception deficit can be a hazard when operating moving or mobile equipment or in situations involving working at elevated heights. A guideline should be developed for evaluating the severity of color vision and depth perception.

Spirometry and Respiratory Protection

ACOEM published a position statement regarding spirometry and respiratory protection in 1999. ACOEM defined the content, documentation, performance, and interpretation requirements. These should be incorporated to the medical surveillance exams of UNTHSC PHPM clinic. (ACOEM, 2000)

It is important to note that in no case during the medical exam were relevant facial features discussed. This information may be a factor in firefighter's duty fitness for donning respirators and is relevant to the fit test standards set by OSHA. This information should be collected in the future. It can be done by redesigning the physical form to reflect the information.

Cardiovascular risk

Various data was collected from the firefighters to evaluate their cardiovascular risks. These include serum triglyceride, cholesterol (HDL and LDL), and systolic and diastolic blood pressure to calculate the cardiovascular index. A study was done in 1999 to show that body mass index has more cost-effective correlation with the fitness and cardiovascular risk than Cardiovascular Risk Index.[11] Since the study was done on HAZMAT team members as well, it is highly applicable to the medical surveillance of

Rowlett firefighters. It is therefore recommended that the lipid profile be eliminated from the medical exams. The overall content will still be compliant with the recognized standards with the elimination of lipid profile.

CHAPTER VI

CONCLUSION

The result of the comparison shows that the UNTHSC PHPM Clinic forms for the history and medical exams did not completely incorporate the recognized standards. The medical history was lacking in the area of concurrent job, contact lenses, and facial feature information. The content of the medical surveillance and duty fitness exams was in compliance with and often exceeded recognized standards. Improvements can be made by updating the history forms and physical exams content to reflect the latest standards and research literature. The result of this study can serve as a model for other occupational medicine clinics to tailor their medical surveillance and duty fitness exam content to better reflect on the recognized standards.

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APPENDIX

HAZARDOUS MATERIALS HANDLER SCREENING QUESTIONNAIRE

HAZARDOUS MATERIALS HANDLER SCREENING QUESTIONNAIRE

Rev 4/6/93

(13 pages)

To be completed by Employee:

PRESENT INFORMATION

Name | Date of Birth (Mo., Day, Yr.) | Date of Visit (Mo., Day, Yr.)

Mailing Address (Street/PO Box, City, State, Zip) | Home Phone # | Daytime Phone #

Company Requesting Exam

Type of Medical Exam Initial ☐ Annual ☐ Exit ☐ Special ☐

Sex: F ☐ M ☐ Social Security Number

PERSONAL PHYSICIAN

Name

Address (Street, City, State, Zip) | Physician's Phone Number

When were you last examined by him/her? Why?

TOBACCO USE

Yes	No		Yes	No	
☐	☐	Have you ever smoked cigarettes regularly?	☐	☐	Did you used to smoke cigarettes regularly?
☐	☐	Do you smoke cigarettes now?			How many years did you smoke? _____ Yrs.
		If "yes", for how many years? _____			How many packs per day on the average? _____
		How many packs per day on the average? _____			How long ago did you stop? _____
☐	☐	Ever smoked cigars/pipe?	☐	☐	Ever used oral tobacco?

ALCOHOL USE

On the average, how much of the following do you drink per week?

Beer: _____ cans (12 oz) Wine: _____ glasses (3 1/2 oz) Whiskey/Liquor: _____ jiggers (1 oz)

MEDICATION

Indicate any medications you are presently taking or regularly take. Include non-prescription medications such as aspirin, laxatives, vitamins, etc.

EXERCISE

Yes	No	
☐	☐	Do you regularly exercise?
		If "Yes", what type? (circle): aerobic strength stretching How many days per week? _____
		How long have you been exercising regularly? _____ months
		How fit do you think you are? (circle): excellent good average poor

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HOBBIES

Do you have any present or past hobbies (e.g., arts/crafts, gunning, furniture refinishing) or home construction/gardening activities that expose you or may have exposed you to any hazards?

Yes ☐ No ☐ If "Yes", specify activities and kind of materials used:

_____

_____

FAMILY HISTORY

If any of your family noted in the following table has had any of the stated conditions, please indicate by the appropriate code number.

CODE:
1 - Father
2 - Mother
3 - Grandparent
4 - Brother
5 - Sister
6 - My Children

_____ Allergy (asthma, eczema, hay fever)
_____ Blood Disease
_____ Cancer or Leukemia
_____ Cirrhosis
_____ Congenital Malformation
_____ Diabetes
_____ Emphysema
_____ Seizures
_____ Heart Disease (heart attack/angina/by-pass surgery)
_____ Hypertension (high blood pressure)
_____ Kidney Disease
_____ Hyperlipidemia (cholesterol/triglycerides)
_____ Migraine Headaches
_____ Rheumatic Heart Disease
_____ Sickle Cell Disease
_____ Stroke
_____ Tuberculosis
_____ Other Disease Not Listed (please specify)

_____

Yes ☐ No ☐ Is your father still living? If "No", at what age did he die? What was the cause of his death?

_____

_____

☐ ☐ Is your mother still living? If "No", at what age did she die? What was the cause of her death?

_____

_____

ALLERGIES

Yes ☐ No ☐ Are you allergic to any foods or pollens? If "Yes", specify: _____

☐ ☐ Are you allergic to any medication? If "Yes", specify: _____

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GENERAL HEALTH

Yes ☐ No ☐ Have you been examined or treated by any doctor within the last year? If "Yes", for what?

_____

_____

Indicate what you believe your health status is now:

☐ Excellent ☐ Good ☐ Fair ☐ Poor

Yes ☐ No ☐ Have you had a chest X-ray within the last five years? If "Yes", specify when, where, and results:

_____

IMMUNIZATION HISTORY

Have you had any of the following immunizations?

Yes	No		Yes	No	
☐	☐	Smallpox	☐	☐	Diphtheria
☐	☐	Measles	☐	☐	Whooping Cough
☐	☐	Mumps	☐	☐	Influenza
☐	☐	German Measles	☐	☐	Hepatitis B
☐	☐	Tetanus	☐	☐	Polio
☐	☐	____/ ____/ ____ If "Yes", date of last tetanus booster			

EMPLOYER HISTORY

Chronologically list all jobs beginning with your present job as #1. Then list previous jobs, starting with #2. Include all jobs through your entire work history. The job just prior to job #2 will be #3, etc. Include jobs held at least six months or more or any jobs which had significant health hazards. If more space is needed, please use the back of this page.

EMPLOYER NUMBER	NAME OF EMPLOYER (CITY, STATE)	DATES WORKED		JOB TITLE	JOB DESCRIPTION
		FROM (yr)	TO (yr)		
1					
2					
3					
4					
5					
6	—				

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HAZARD EXPOSURE HISTORY

Place a check (✓) in the appropriate box/boxes (present, past, or both) if you work or have worked around the particular hazard or agent listed. If you check either or both boxes, were you ever definitely exposed to the hazard (the agent entered the body by inhalation, ingestion, or skin absorption)? Example: your mask leaked, your Tyvek suit had a tear in it, the hazard got directly on your skin, etc. If definitely exposed, indicate which company or companies where exposed by placing the appropriate employee number(s) previously assigned on page 3 under "Employer History". Finally, did you use or wear Personal Protective Equipment (PPE) when working around the hazard? If so, please indicate type(s) of gear used.

CHEMICAL AGENTS	PRESENT	PAST	EMPLOYER NUMBER(S) WHERE EXPOSED	TYPE OF PPE USED
Acid (concentrated)	☐	☐		
Alkali (concentrated)	☐	☐		
Allyl Chloride	☐	☐		
Ammonia Gas	☐	☐		
Arsenic	☐	☐		
Asbestos	☐	☐		
Benzene	☐	☐		
Beryllium	☐	☐		
Cadmium	☐	☐		
Chlorine Gas	☐	☐		
Chromium	☐	☐		
Coal Dust	☐	☐		
Coke Oven Emissions	☐	☐		
Cyanide	☐	☐		
Dioxin	☐	☐		
Ethylene Oxide	☐	☐		
Fluorides (inorganic)	☐	☐		
Formaldehyde	☐	☐		
Freon	☐	☐		
Glycol Ethers	☐	☐		
Halogenated Hydrocarbons	☐	☐		
Halogenated Aromatics	☐	☐		
Hydrogen Sulfide	☐	☐		

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CHEMICAL AGENTS (cont)	PRESENT	PAST	WHERE EXPOSED	TYPE OF PPE USED
Lead	☐	☐		
Mercury	☐	☐		
Methylene Chloride	☐	☐		
Natural Gas	☐	☐		
Nickel	☐	☐		
Nitric Acid	☐	☐		
Nitrogen Oxides	☐	☐		
Pcb	☐	☐		
Pesticides/Herbicides	☐	☐		
Phosgene	☐	☐		
Silica (crystalline)	☐	☐		
Solvents	☐	☐		
Tar Vapors	☐	☐		
Toluene Diisocyanate	☐	☐		
Vinyl Chloride	☐	☐		

OTHER CHEMICAL AGENTS NOT LISTED	PRESENT	PAST		
_____	☐	☐		
_____	☐	☐		
_____	☐	☐		
_____	☐	☐		

BIOLOGICAL AGENTS	PRESENT	PAST	EMPLOYER NUMBER(S) WHERE EXPOSED	TYPE OF PPE USED
Bacteria or Viruses	☐	☐		
Primate Animals	☐	☐		
Rickettsia	☐	☐		
Blood	☐	☐		
Feces	☐	☐		

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PHYSICAL AGENTS	PRESENT	PAST	EMPLOYER NUMBER(S) WHERE EXPOSED	TYPE OF PPE USED
Smoke	☐	☐		
Fire	☐	☐		
High Voltage	☐	☐		
Vibration	☐	☐		
Radiation (ionizing)	☐	☐		
Radiation (non-ionizing)	☐	☐		
Extreme Temperatures	☐	☐		
Noise	☐	☐		

OTHER SUSPECT OR KNOWN CARCINOGENS NOT LISTED	PRESENT	PAST	EMPLOYER NUMBER(S) WHERE EXPOSED	TYPE OF PPE USED
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		

ANY OTHER AGENTS NOT LISTED ABOVE	PRESENT	PAST	EMPLOYER NUMBER(S) WHERE EXPOSED	TYPE OF PPE USED
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		

AVOCATION HISTORY

Do you have any other part-time jobs other than the ones listed in the Employer History Section that may have exposed you to hazards?

Yes ☐ No ☐

If "Yes", specify activities and kind of hazard:

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RECENT MEDICAL HISTORY

Have you regularly or chronically experienced any of the following symptoms or problems over the last 2-3 years? (Elaborate to the right of each section as necessary.)

EYES

Yes	No	
☐	☐	Blurred Vision/Double Vision
☐	☐	Burning/Itching
☐	☐	Excessive Tearing/Discharge
☐	☐	Redness
☐	☐	Swelling of Eyelids
☐	☐	Other

NOSE AND SINUSES

☐	☐	Burning/Itching
☐	☐	Congestion
☐	☐	Sneezing
☐	☐	Bleeding
☐	☐	Drainage/Discharge - Type: _____
☐	☐	Pain
☐	☐	Lesions/Sores
☐	☐	Other

MOUTH/THROAT

☐	☐	Burning/Soreness
☐	☐	Lesions/Sores
☐	☐	Painful Swallowing
☐	☐	Other

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EARS

- [ ] [ ] Ringing
- [ ] [ ] Muffled Sounds
- [ ] [ ] Reduced Hearing
- [ ] [ ] Other

JOINTS/EXTREMITIES/BACK

- [ ] [ ] Pain/Aching
- [ ] [ ] Numbness
- [ ] [ ] Swelling
- [ ] [ ] Redness/Warmth
- [ ] [ ] Swelling of Ankles or Feet
- [ ] [ ] Other

CARDIAC

- [ ] [ ] Chest Pain/Pressure
- [ ] [ ] Racing Heart Beat
- [ ] [ ] Palpitations (irregular or skipped beats)
- [ ] [ ] Syncope (passed out/fainted)
- [ ] [ ] Other

RESPIRATORY

- [ ] [ ] Shortness of Breath
- [ ] [ ] Wheezing/Asthma
- [ ] [ ] Painful Breathing
- [ ] [ ] Chronic Dry Cough
- [ ] [ ] Chronic Cough with Phlegm
- [ ] [ ] Coughing up Blood
- [ ] [ ] Other

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SKIN

NAME: _____ SS#: _____

- ☐ ☐ Easy bruising
- ☐ ☐ Itching/Burning
- ☐ ☐ Chronic cracking or bleeding of the skin on your hands
- ☐ ☐ Dryness or peeling and scaling of the skin on your hands
- ☐ ☐ Rash - describe: color (skin colored, white, dark, etc.)
  texture (flat, bumpy, scaly, crusty, etc.)
- ☐ ☐ Spots - size (circle): grain of sand pea-size dime-size quarter-size silver dollar-size
- ☐ ☐ Other

GASTROINTESTINAL

- ☐ ☐ Nausea/Vomiting
- ☐ ☐ Vomiting blood
- ☐ ☐ Lower abdominal pain
- ☐ ☐ Heartburn or indigestion
- ☐ ☐ Diarrhea
- ☐ ☐ Red blood in stool
- ☐ ☐ Black stool
- ☐ ☐ Constipation
- ☐ ☐ Other

UROLOGIC

- ☐ ☐ Painful urination
- ☐ ☐ Blood in urine
- ☐ ☐ Discharge/Pus
- ☐ ☐ Reduced pressure of stream
- ☐ ☐ Difficulty starting stream
- ☐ ☐ Getting up at night to urinate (>2 times)
- ☐ ☐ Prostate disease
- ☐ ☐ Other

NAME:_____ SS#:_____ ___

SLEEP

- ☐ ☐ Difficulty falling asleep
- ☐ ☐ Difficulty staying asleep
- ☐ ☐ Other

REPRODUCTIVE

- ☐ ☐ Have you or your partner ever had difficulty having children or getting pregnant?
- ☐ ☐ Have you ever had any children born with a handicap or congenital malformation?
- ☐ ☐ Have you or your partner ever had a miscarriage or stillborn child?
- ☐ ☐ Other

NEUROLOGIC

- ☐ ☐ Headache not relieved by aspirin or Tylenol
- ☐ ☐ Dizziness (feeling faint)
- ☐ ☐ Vertigo (feeling the room is spinning or you are spinning
- ☐ ☐ Incoordination
- ☐ ☐ Slurred speech
- ☐ ☐ Difficulty remembering recent events
- ☐ ☐ Numbness or tingling of the hands or feet or any other part
- ☐ ☐ Other

ENDOCRINE

- ☐ ☐ Diabetes
- ☐ ☐ Extreme thirst
- ☐ ☐ Extreme hunger
- ☐ ☐ Hormone problems
- ☐ ☐ Thyroid disease
- ☐ ☐ Other

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PSYCHIATRIC NAME:-_____ SS#:_____

☐ ☐ Depression

☐ ☐ Extreme mood swings

☐ ☐ Suicidal thoughts

☐ ☐ Other

GENERAL

☐ ☐ Fatigue

☐ ☐ Weakness

☐ ☐ Anemia

☐ ☐ Loss of >5 pounds within the last six months <u>without</u> trying

☐ ☐ Swelling or lumps in your breast, neck, armpits, or groin

☐ ☐ Other

OTHER

☐ ☐ Do you have or have you had any other symptoms or medical problems not covered by these questions?

If "Yes", elaborate below:

_____

_____

_____

_____

PAST MEDICAL HISTORY

List significant medical illnesses, hospitalizations, and/or surgeries (continue on back of page if needed).

Illness or Condition	Hospitalization? Yes	No	Approximate Date(s)
a.	☐	☐	
b.	☐	☐	
c.	☐	☐	
d.	☐	☐	

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Check "Yes" or "No" to answer each question and give specific information when asked; referring to medical problems throughout your entire lifetime. (Continue on back of page if needed).

GENERAL

Yes	No	
☐	☐	Thyroid Disease/Goiter
☐	☐	Diabetes
☐	☐	Gout
☐	☐	Frequent Night Sweats/Fever
☐	☐	Hemorrhoids

CARDIOVASCULAR

Yes	No	
☐	☐	Heart Murmur
☐	☐	Angina/Chest Pain or Pressure
☐	☐	Heart Attack
☐	☐	High Blood Pressure
☐	☐	Vascular Disease in Arms/Legs
☐	☐	Abnormal EKG's/Stress Test
☐	☐	Other Heart Disorders (specify) _____

GASTROINTESTINAL

Yes	No	
☐	☐	Peptic Ulcer
☐	☐	Hiatal Hernia
☐	☐	Gall Bladder Disease
☐	☐	Hepatitis
☐	☐	Liver Disease/Jaundice
☐	☐	Cirrhosis
☐	☐	Other Gastrointestinal Disorders (specify) _____

GENERAL (cont)

Yes	No	
☐	☐	Hernia (specify type) _____
☐	☐	Cancer (specify site) _____
☐	☐	Dental/Gum Problems (specify)
☐	☐	Other Conditions or Disease Not Listed (specify) _____

GENITOURINARY

Yes	No	
☐	☐	Nephritis
☐	☐	Kidney Disease (indicate type) _____
☐	☐	Urinary Infection
☐	☐	Kidney/Urinary Bladder Stones
☐	☐	Blood/Protein/Pus in Urine
☐	☐	Venereal Disease
☐	☐	Prostate Disease
☐	☐	Other Kidney or Bladder Disorders (specify) _____

BLOOD

Yes	No	
☐	☐	Anemia/Sickle Cell
☐	☐	Problems with blood clotting/bleeding
☐	☐	Leukemia
☐	☐	Other Blood Disorders (specify) _____

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SKIN

Yes	No	
☐	☐	Psoriasis
☐	☐	Eczema
☐	☐	Contact Dermatitis
☐	☐	Other Skin Disorders (specify) _____

EYES

Yes	No	
☐	☐	Require Corrective Lenses (contacts/glasses)
☐	☐	Glaucoma
☐	☐	Cataracts
☐	☐	Optic Neuritis
☐	☐	Eye Infection
☐	☐	Other Eye Disorders (specify) _____

PULMONARY

Yes	No	
☐	☐	Pneumonia
☐	☐	Pleurisy
☐	☐	Asthma
☐	☐	Bronchitis
☐	☐	Emphysema
☐	☐	Bronchiectasis
☐	☐	Tuberculosis
☐	☐	Silicosis
☐	☐	Asbestosis
☐	☐	Other Lung Disorders (specify) _____

NERVOUS SYSTEM

Yes	No	
☐	☐	Seizure Disorder
☐	☐	Stroke
☐	☐	Peripheral Neuritis
☐	☐	Other Disorders of Nervous System (specify) _____

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EAR, NOSE AND THROAT

Yes	No	
☐	☐	Chronic Sinusitis
☐	☐	Impaired Hearing
☐	☐	Ringing in the Ears
☐	☐	Easy Nasal Bleeding
☐	☐	Nasal Allergies
☐	☐	Tonsillectomy
☐	☐	Other Ear, Nose, Throat Disorder (specify) _____

_____

MUSCULOSKELETAL

Yes	No	
☐	☐	Rheumatoid Arthritis
☐	☐	Back Injuries
☐	☐	Degenerative Disc Disease
☐	☐	Sciatica/Disc Herniation
☐	☐	Bone Lesions/Infections
☐	☐	Other Musculoskeletal Disorders/Injuries (specify) _____

_____

_____ _____

SIGNATURE DATE