

## **Decreasing Line of Duty Injuries for Union Township Firefighters**

By: Mark A. Fyffe  
Lieutenant  
Union Township Fire Department  
Cincinnati, OH 45245

A research project submitted to the Ohio Fire Executive Program

30 July 2010

## CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

2. I have affirmed the use of proper spelling and grammar in this document by using the spell and grammar check functions of a word processing software program and correcting the errors as suggested by the program.

Signed: \_\_\_\_\_

Printed Name: \_\_\_\_\_

## ABSTRACT

The Union Township Fire Department (UTFD) is facing a problem. From July 2002-July 2009, the UTFD has had an average of one and one-tenth (5.5%) of its firefighters off regular duty at any given time. The overtime costs that result from the vacant shifts are expected to exceed \$397,000 for the year 2010. By utilizing descriptive research, this study has sought to identify ways to reduce the number of line of duty (LOD) injuries in order to limit the overtime expense. By utilizing existing research, reviewing injury trends, and conducting a study, the following questions have been answered.

1. What are the most common LOD injuries nationally and in the UTFD?
2. How can these injuries be prevented?
3. What are other fire departments doing to reduce firefighter LOD injuries?

The results of this research have identified the most common injuries suffered by firefighters to be strains, sprains, and muscular pain, accounting for 52% of all injuries. Cuts and Bruises account for the second most common injuries at 18%. Also, this research has identified programs or techniques that can be introduced or reinforced in order to reduce LOD injuries and cut the associated cost. Most notably, the literature emphasizes the importance of a formal health and wellness program that addresses all aspects of a firefighter's well being

It is the recommendation to establish a health and wellness program that includes a physical fitness program, back safety program, and supervisor training that focuses on early recognition of firefighter injury or illness. Members should be required to attend a safety officer class. Also, once a safety committee is formed, all current SOG's should be reviewed and updated to ensure the safest policies possible.

**TABLE OF CONTENTS**

CERTIFICATION STATEMENT..... 2

ABSTRACT..... 2

TABLE OF CONTENTS..... 3

INTRODUCTION ..... 4

    Statement of the Problem..... 4

    Purpose of the Study ..... 4

    Research Questions..... 5

BACKGROUND AND SIGNIFICANCE..... 5

LITERATURE REVIEW ..... 6

PROCEDURES..... 14

RESULTS ..... 16

DISCUSSION..... 21

RECOMMENDATIONS ..... 23

REFERENCES ..... 26

APPENDIX 1 – QUESTIONER..... 28

APPENDIX 2 – QUESTIONER (RESPONDENT SUMMARY) ..... 30

APPENDIX 3 – QUESTIONER (UTFD RESPONSE)..... 32

## INTRODUCTION

### **Statement of the Problem**

The problem this study has investigated was that the Union Township Fire Department (UTFD) has sustained an average of one and one-tenth (5.5%) of its personnel being off each shift because of (LOD) injuries. This statistic is the average number of the shifts that required overtime to backfill for the time period of July 2002-July 2009.

The loss of a firefighters on the “front line” due to injuries has had a negative impact on the UTFD. Historically, when a firefighter went on restricted duty, the UTFD had no option but to pay another firefighter overtime to fill the vacant position or allow the company to “run short”. When UTFD fills the opening with an overtime firefighter, that one roster position cost UTFD an additional one and one-half time pay. The cost incurred by UTFD to fill overtime created by firefighters on restricted duty in 2009 was \$370,495 (P. Gerome), personal communication, February 13, 2010). Based on the current pay rates, the cost for 2010 will be \$397,234. That cost equates to one-fifth of the entire overtime budget for UTFD. For every position not filled with overtime, a fire station is left to operate with its staffing reduced by 25%. This practice increases the likelihood of getting additional firefighters injured and decreases UTFD’s capability to respond as efficiently.

### **Purpose of the Study**

The purpose of this study was to reduce the number of UTFD firefighters that are on restricted duty status because of LOD injury. The results of this study will be utilized to develop proposed policy(s) and procedures for the UTFD administration to consider.

## **Research Questions**

The following questions will be answered by this descriptive research:

1. What are the most common LOD injuries nationally and in the UTFD?
2. How can these injuries be prevented?
3. What are other fire departments doing to reduce firefighter LOD injuries?

## **BACKGROUND AND SIGNIFICANCE**

The UTFD is located on the eastside of Cincinnati. The UTFD employs a total of 63 personnel including five administrative personnel and 58 line firefighters that are cross trained as professional firefighters, certified paramedics, hazardous material technicians, and fire safety inspectors. Additionally, most firefighters have other certifications in specialty areas such as fire investigation, training, or fire prevention. The fire department provides essential emergency and non-emergency services to Union Township and the Village of Amelia. The coverage area includes 33 square miles, 50,000 residents, two major highways, and a variety of residential, commercial, and industrial occupancies. Firefighters work 24 hour shifts and are exposed to physically and mentally demanding and stressful conditions. Frequently, firefighters are challenged with multiple emergency details with little to no rest in between. In 2009, firefighters responded to 5,338 emergency medical calls and 1,827 fire details for a total of 7,165 emergency details from five stations, each staffed with four firefighters per day.

It was important to conduct this study in order to find ways to reduce injury risks to Union Township firefighters. By identifying modifiable risk factors that contribute to firefighter injuries, steps can be taken to reduce the frequency and severity of injuries and ultimately reduce the cost associated with firefighters on restricted duty. One particular concern is aging

firefighters. Many of the original firefighters hired when the UTFD was established in 1990 are no longer employees. A large turnover of employees took place between 1998 and 2002, which resulted in the UTFD hiring many young new employees. Now, many of those employees are in their middle to late thirties. As the workforce ages, it is more likely to have an increase in firefighter injury frequency and severity.

The potential impact this study could have on the Union Township Fire Department is crucial in terms of identifying factors that affect firefighter injuries, learning how to modify or reduce those factors and reducing the cost associated with the injuries. The results will be utilized to influence policy that will contribute to the reduction of restricted duty usage by decreasing the frequency and severity of LOD injuries. The reduction in firefighter injuries will help ensure longer and healthier careers of firefighters while the cost reduction will provide the fire department an opportunity to redirect financial resources to other areas.

## **LITERATURE REVIEW**

### **Question 1**

#### **What are the most common LOD injuries nationally and in the UTFD?**

FEMA (1997) analyzed 506 injuries that occurred in fire stations of medium sized fire departments for the years 1992 to 1994. The analysis found that 60% of those injuries resulted in lacerations while 30% of the injuries were strains or sprains. In addition, the analysis showed that over 20% of the 506 injuries were result of performing vehicle maintenance. Accounting for nearly 20% of the fire station injuries, performing physical fitness on duty was the second leading cause.

Karter and Molis (2006) reported on the 80,100 firefighter LOD injuries that occurred in 2005. Of these injuries, 41,950 (48.6%) occurred as a result of fireground operations while an estimated 13,325 injuries took place during other on duty activities, and 12,250 occurred at nonfire emergency incidents. “The major types of injuries received during fireground operations were: strain, sprain, muscular pain (44.4%); wound, cut, bleeding, bruise (18.1%); burns (7.0%); smoke or gas inhalation (5.9%). Strains, sprains and other muscular pain accounted for 55.4% of all nonfireground injuries” (p.1). Karter (2007) reported that for the years 2001-2004, an average of 38,545 firefighter fireground injuries occurred in the US. The most common injuries were strains or sprains. Similarly, U.S. Fire Administration (2008) reported on 3411 firefighter injuries that occurred in 2004 and identified “Overexertion/strain” as the leading reported cause of injury, accounting for 16.4%. The second most commonly reported cause was “exposure to hazard”, making up 15.8% of known injury causes. Moore-Merrell, Zhou, McDonald-Valentine, Goldstein & Slocum (2008) studied 3450 injured firefighter cases and evaluated several factors including injury characteristics and contributing factors. The most common injury type was bone and muscle injuries accounting for 2128 (61.7%) of all injuries. The second most common injuries were cuts and wounds making up 509 (14.8%) of the injuries. Additionally, the study identified the number of injuries that resulted in “lost days of work” or restricted duty. Of the 3450 injuries, 865 (25%) resulted in at least one day of work lost while 345 (10%) led to a minimum of one day on restricted duty. Of these, 144 (4.2%) lost 30 days or more of work, 87 (2.5%) were assigned to light duty for at least 30 days. Eleven (3%) of the firefighters were injured so severely, they did not return to work.

In an interview with (P. Gerome, personal communication, Feb. 13, 2010), he indicated that from July 2002-June 2009, there had been 2,810 shifts or 67,452 hours of overtime paid out

because of injuries. There had been two major injuries during that time period resulting in 360 (12.8%) of the shifts. The remaining 2,450 shifts derived from a variety of minor injuries, primarily, strains, sprains, and lacerations, collectively accounting for 78.8% of all UTFD injuries.

The literature is clear and it is consistent with the findings in the UTFD, firefighter injuries vary in nature and severity but musculoskeletal sprains and strains along with lacerations are the most frequent injuries encountered by firefighters.

## **Question 2**

### **How can these injuries be prevented?**

FEMA (1997) was developed to provide detailed guidelines for designing or remodeling fire and emergency medical services (EMS) stations with a focus on safety and health concerns. Specifically, the guide alerts personnel to safety and health hazards within fire stations, identifies health and safety regulations regarding station design, assist with design/construction bid packages, and provides a checklist for health and safety issues.

IFSTA (1999) reported that there are over 100,000 injuries reported by firefighters each year. "Many firefighter injuries can be prevented by effective supervision, training, use of personal protective equipment, and high levels of physical fitness for firefighters" (p. 300). Improper attitude, lack of knowledge or skill and being physically unsuited are three human factors that are explored in terms of how they influence firefighter injuries. Wellness programs are discussed as a way to maintain the health of firefighters. Specifically, a medical program should be in place to evaluate firefighter's ability to physically perform assigned tasks. Additionally, a physical fitness program must be in place to insure firefighter strength, endurance, and flexibility.

TriData Corporation (2004) took a multi-faceted look at reducing firefighter injuries. They found that “One of the best ways to reduce injuries to firefighters is through improved prevention and public education programs that reduce the number of emergency calls” (p.41). Firefighter risks can be reduced by earlier detection of fires, improving personal protective equipment (PPE) technology, and focusing on firefighter attitudes towards safety. Additionally, focusing on training, incident command, early detection of fire ground hazards, early recognition of firefighter injury or illness, use of resource modeling, and physical fitness programs can reduce firefighter injuries.

Gerome (2005) says there are many unnecessary work related injuries that could be prevented if firefighters maintained proper physical conditioning and preparation. The decrease in firefighter injuries would reduce overall operating cost of the fire department by a reduction in workers compensation, less sick time, and less cost covering the shifts of injured workers. A workplace fitness program promotes a career with less injuries and stress. This portion of the interview with Gerome was beneficial because he had researched and written about similar topics and had firsthand knowledge of the wellness program at nearby Anderson Township Fire Department (ATFD). Also, as a staff officer at UTFD he was aware of the financial and staffing burden placed on the UTFD because of duty related injuries. As a result of the interview, I was also able to get a deeper understanding of the wellness program initiated within the ATFD several years ago.

Bledsoe (2006) stresses the importance of physical fitness for paramedics. Some of the well known benefits include, decrease in blood pressure, increased muscle mass, and increased ability to resist illness or injury. There are key elements to physical fitness, muscular strength, cardiovascular endurance and flexibility. Muscular strength can be increased by a regular

exercise routine that requires muscles to exert force and build endurance. Cardiovascular endurance is a result of exercising three or more days each week with one's pulse at its "target" rate. Improving one's flexibility allows joints and muscles to be utilized more effectively and reduces the likelihood of injury. Additionally, Bledsoe identifies obesity as a major risk factor for sustaining back injuries in addition to a multitude of other health problems. Bledsoe makes specific mention of back safety and contends that safe lifting techniques should be practiced with a trainer that is knowledgeable about EMS provider tasks.

Granito, Trench, England, & Neal (2006) completed a research project in order to assist fire departments in reducing the number of firefighter deaths and injuries that occur. The idea was to provide a collection of ideas and practices that would result in effective safety oriented leadership and management. Several recommendations were made such as: establish and maintain a comprehensive health and wellness program; include medical exams; include physical and mental fitness components; and recommended stronger prevention and public education programs.

The improved program would include streamlined code enforcement, civil liability for preventable fires and restricting the use of lightweight building materials. Several other recommendations were made regarding training, structural firefighting, and wildland firefighting. Along with the recommendations, several obstacles to success were identified.

Elliot and Kuehl (2007) summarized multiple studies regarding the effect of unusual sleep patterns to which firefighters are subjected to. The author explained that firefighters are subject to physical and mental problems associated with long hours and night work. The report identifies fatigue as a possible cause for higher fire ground injury rates during early morning hours (25.7% injuries for 16.4% fires). The summary of studies also credits fatigue as a possible

factor in the elevated risk of vehicle crashes following work shifts. The report associates chronic sleep loss with a general increase in health problems, higher body weights, and greater risk of obstructive sleep apnea.

Karter (2007) reported that injuries occurred most often during the peak fire frequency period of noon to 6:00 p.m. (27.3%), but surprisingly, there was a high ratio of fireground injuries compared to the frequency of fires in the midnight to 6:00 a.m. slot (26.3%), compared to the (15.3%) of fires occurring in this time period. The highest injury rates per 100 fires occurred between midnight and 8:00 a.m., when 9.9 to 14.6 injuries occurred per 100 structure fires attended. Karter concluded that there are several factors contributing to the high injury rates during the nighttime hours including lack of visibility, cold temperatures, and lower alertness of firefighters.

IFSTA (2008) identified life safety and the economy as two motivating factors for accident control. These factors are addressed by implementing three primary objectives in a safety program: prevent human suffering, deaths, injuries, illnesses, and exposures to hazardous atmospheres and contagious diseases; prevent damage/loss of equipment; and reduce the incidence of severity of accidents and hazardous exposures.

Several common safety concerns are addressed such as, safety on the apparatus, safety in the fire station, safety in training, and emergency scene safety. The most frequent danger a firefighter faces is riding to the emergency scene and back to the station. Safety precautions such as wearing seatbelts and riding in enclosed cabs are essential to firefighter safety. Fire station injuries are of great concern since so much time is spent at the station and much of the firefighters work is done at the station. Eliminating slip and trip hazards can reduce fire station injuries. Training should focus on safe techniques, personnel safety and keep equipment safe. On

emergency scenes, careful consideration should be given when evaluating risk vs. benefit and avoid unnecessary risks. Also, maintaining crowd control and personnel accountability can reduce firefighter injuries. Moore-Merrell, Zhou, McDonald-Valentine, Goldstein & Slocum (2008) conducted a study of 3450 firefighter injuries and identified the leading contributing factors for injuries as; lack of situational awareness (37.3%), lack of wellness/fitness (28.5%), and human error by a firefighter or officer (10.6%).

There are several NFPA standards that were developed in part to provide direction for fire departments trying to create a safer environment for firefighters. NFPA 1582 (2000) is a standard addressing the well being of firefighters. Specifically, the standard requires fire departments to provide annual physicals for members and provide a health and fitness coordinator, health and safety officer, infection control officer, and a health and safety committee. The fire department must also provide for a rehabilitation or fitness program to assist its members when recovering from illness or injury. Further, the fire department's physician must be a member of the department's occupational safety and health committee. Lastly, the standard requires an annual non-punitive fitness evaluation for members NFPA 1583 (2000) provides specific information as to how the fire department fitness programs must operate. All programs must have a health and fitness coordinator and all members are required to participate in a periodic fitness evaluation. Also, when members return to duty following an extended leave due to illness or injury, an exercise program should be developed for the employee. NFPA 1500 (2007) addresses a comprehensive wellness and fitness program and includes several key elements. The standard requires that fire department candidates and members be required to meet physical performance standards each year. Those members that do not meet the physical requirements must not be permitted to participate in emergency functions of the fire department

and must take part in a performance rehabilitation program. Additionally, the standard requires that fire departments provide education programs that contribute to firefighter well being and offer a program that educates members on the negative impact of tobacco and offer a tobacco cessation plan.

According to the literature, there are many ways to reduce firefighter injuries. There are standards and initiatives in place that were designed to reduce injury-contributing factors. Some of the factors are lack of fitness and health, firefighter error, and fatigue, to name a few.

### **Question 3**

#### **What are other fire departments doing to reduce their firefighter LOD injuries?**

Schaper and Gerner (1997) reported on the reduction of firefighter injuries in the city of St. Louis. The St. Louis Fire Department decided to capitalize on the theory that safety is an attitude that must be instilled throughout all ranks of the fire department. The fire department has identified and teaches the “three E’s of safety”. The three E’s are engineering, education, and enforcement. The idea of evaluation is to see what and how the fire department is doing to create a zero-injury environment. Education is keeping up to date with changes in training and study groups and safety committee members are expanding and sharing their knowledge in order to positively influence coworkers while creating a safer work environment. Enforcement is simply the practice of ensuring that expected behaviors are adhered to.

Riddle (1999) showed worthy results from a health and wellness program initiated in 1993. The Las Vegas Fire Department (LVFD) decreased its injuries and loss of time from injuries over a four-year period. In 1994, LVFD documented 628 days of missed work and 154 days of restricted duty. In 1997, LVFD’s statistics had dropped to very impressive numbers having only 20 missed days and 70 restricted duty days.

Gerome (2005) discusses the program used by the Anderson Township Fire Department (ATFD) to reduce firefighter injuries. An outside professional assesses ATFD firefighters yearly in order to determine fitness levels. Feedback of the evaluation is given to ATFD administration and individual feedback is given to each firefighter. The feedback is used to design or revise an individual fitness plan for each firefighter. Gerome was not able to conclusively identify a positive or negative result of the program stating that poor and inconsistent documentation by employees made it difficult to evaluate reliable results.

USFA (2006) released a study assessing the needs of fire departments in the U.S. The study estimated that fire departments serving a population of 25,000 to 49,999 were protected by 44,850 career firefighters and 28,000 volunteer firefighters for a total of 72,850 firefighters. It was estimated that 38,850 (53%) of those firefighters belonged to fire departments with a health and fitness program.

According to the literature, about half of U.S. firefighters are members of fire departments with a health and wellness program geared at decreasing firefighter injury and improving firefighters overall well being. Overwhelmingly, the literature reveals that the fire departments participating in a wellness program see significant results in injury reduction.

## **PROCEDURES**

The procedures utilized for this research included several steps in order to answer the specific research questions. For question one, existing information published in books, journals, UTFD records, and other documents by established researchers was the focus for information gathering and reporting. Information, research, and statistics on the topic of fire service injuries at the national level were plentiful, as it is a well-researched topic. More difficult was the task of

locating statistics for the UTFD. While documentation for injuries and “lost time” were available, it was difficult to link some of the incidents to the amount and cost of “lost time”. For accuracy, it was necessary to review the staffing schedule dating back to July of 2002.

Question number two was answered by analyzing current research on injury prevention, specifically as it relates to firefighters injuries. This analysis included the works of physicians, fire service training agencies, and other groups committed to decreasing firefighter line of injuries. Specifically, NFPA standards such as NFPA 1500, NFPA 1582, and NFPA 1583 were reviewed for their focus on firefighter safety, health, and wellness.

Question number three was addressed by researching established injury prevention programs imposed by other fire departments. This process included Internet data, an interview, and a short questioner distributed to several fire departments. The Internet search produced two results that were used to study the effectiveness of an injury prevention program. The questioner consisted of 12 questions directed at the fire chief. The questions focused on health and wellness implementation and satisfaction of departmental safety guidelines. There were 17 surveys sent out to departments across the state via email (See Appendix 1). The departments chosen to participate were picked randomly from a list of Ohio fire departments serving a population of 25,000 to 99,999 citizens. The questioner had a return rate of just over 60% with 11 being returned. A representative of the UTFD took the same questioner with opinion based question number 12 omitted in order to make a comparative analysis between the UTFD and the respondent fire departments (See Appendix 3). This research paper is limited to the accuracy of the previous research used in the literature review and records maintained by UTFD. In addition, it is important to understand that this research is limited to injuries that have been appropriately documented and reported.

## **RESULTS**

The result of this research has identified the most common injuries suffered by firefighters nationally and within UTFD. Furthermore, this research has identified programs or techniques that can be introduced or reinforced to reduce injuries and cut the associated cost of the injuries. To a lesser extent, the research has identified some programs that other fire departments have implemented and evaluate their success. The data used was based on UTFD records regarding injured firefighters, types of injuries, and time spent on restricted duty.

### **Question 1**

#### **What are the most common LOD injuries nationally and in the UTFD?**

Previous research conducted on the topic of firefighter LOD injuries clearly identifies certain injury types and injury patterns to be more prevalent than others. FEMA (1997), Karter and Molis (2006), Karter (2007), and Moore-Merrell et al. (2008) concur that the most common firefighter injuries are strains, sprains, lacerations, and bruises. These findings are consistent with the types of injury that UTFD firefighters typically incur with 68% of all injuries being minor injuries, primarily, strains, sprains, and lacerations. FEMA (1997) established that 90% of the 506 injuries it studied that occurred at the fire stations from 1992 to 1994 resulted in lacerations, strains, or sprains.

Figure 1 depicts the comparative breakdown of injury patterns for UTFD and the national average for the years 2003 to 2008.

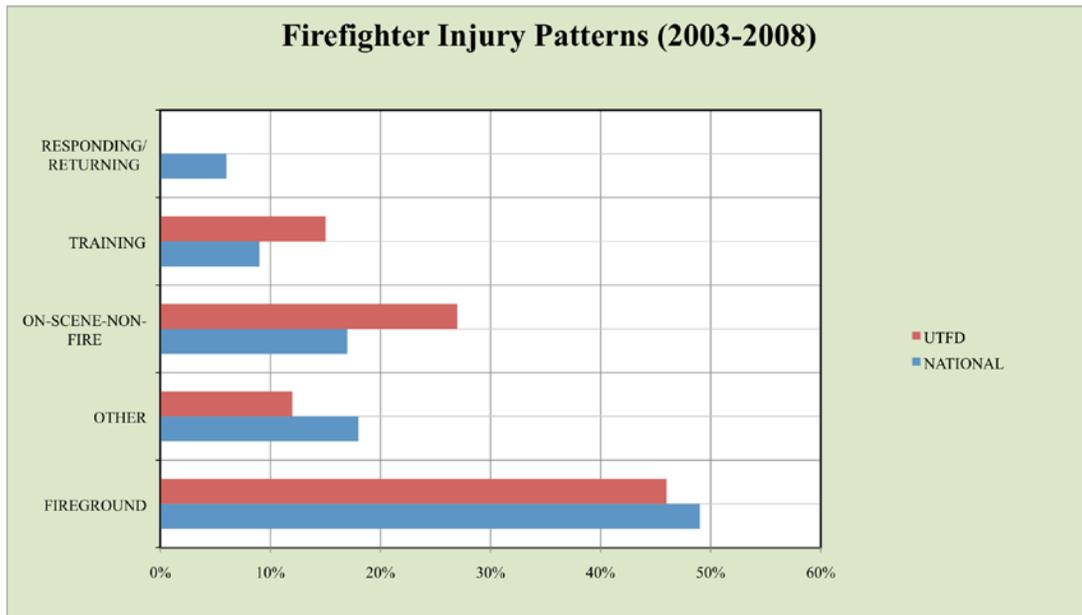


Figure 1.

The comparison of national and UTFD firefighter injury patterns for the years 2003 to 2008

Sources: National Fire Protection Association [NFPA]. (2009). *Firefighter injuries by type of duty*; (P. Gerome, Personal communication, Feb. 13, 2010).

## Question 2

### How can these injuries be prevented?

For many years, the fire service has sought ways to decrease the number and severity of firefighter injuries. In light of ample research done on the topic, several standards and initiatives have been put in to place to reduce injury contributing factors. Some of the key factors are lack of fitness and health, firefighter error, and fatigue (Moore-Merrell et al., 2008).

In order to counteract the lack of health and fitness, fire departments can adopt NFPA 1500 (NFPA 1500, 2007). The standard outlines a comprehensive wellness program by requiring three provisions.

1. Fire department candidates and members are required to meet physical performance standards each year.
2. Members that do not meet the physical requirements must not be permitted to participate in emergency functions of the fire department and must take part in a performance rehabilitation program.
3. Fire departments provide educational programs that contribute to firefighter well being and offer a program that educates members on the negative impact of tobacco and offer a tobacco cessation plan.

NFPA 1583 (2000) provides the specific information as to how the fire department fitness programs must operate.

1. All programs must have a health and fitness coordinator and all members are required to participate in a periodic fitness evaluation.
2. When members return to duty following an extended leave due to illness or injury, an exercise program will be developed for the employee.

NFPA 1582 as outlined below can assist fire departments (NFPA 1582, 2000).

1. Provide annual physicals for members and provide a health and fitness coordinator, health and safety officer, infection control officer, and a health and safety committee.
2. Provide for a rehabilitation or fitness program to assist its members when recovering from illness or injury.

3. Have a physician that is member of the department's occupational safety and health committee.

4. Require an annual non-punitive fitness evaluation for members

To combat firefighter error that results in injuries, fire departments must ensure proper attitude, effective supervision, training, and proper use of personal protective equipment (Tridata Corporation 2004). IFSTA (2008), training and SOG's regarding safety on the apparatus, safety in the fire station, safety in training, and emergency scene safety is essential to the prevention of firefighter injuries.

Fatigue is a possible cause for higher fire ground injury rates during early morning hours (25.7% injuries for 16.4% fires) and a variety of other mental and physical problems (Elliot and Kuehl 2007). Ensuring that supervisors are trained to quickly recognize firefighter exhaustion, illness, and injury can decrease the likelihood of firefighter injury (TriData Corporation 2004).

### **Question 3**

#### **What are other fire departments doing to reduce their firefighter LOD injuries?**

The research indicates that there is a large variation in what fire departments are doing to reduce injuries. According to USFA (2006), it was estimated that 38,850 (53%) of all firefighters serving a population of 25,000 to 49,999 were members of fire departments with a health and wellness program while the remaining 47% of firefighters serving that population have no such program.

One example of a fire department taking action to decrease firefighter LOD injuries is in the case of the Las Vegas Fire Department. According to Riddle (1999), the LVFD established a health and wellness program in 1993. The Las Vegas Fire Department (LVFD) was able to reduce its number of injuries and loss of time from injuries over a four-year period. From 1994 to

1997, the LVFD's days of missed work decreased from 628 to twenty. Also, the number of restricted duty days decreased from 154 days of restricted duty to seventy.

Another demonstration of a fire department program having success took place in the St. Louis Fire Department. Schaper and Gerner (1997) described how the department was having success with its "three E's of safety" program. The three E's are engineering, education, and enforcement have led to a significant reduction of injuries over a six-year period of time. The reported injuries fell from 1110 in 1990 to 377 during the 1996-1997 fiscal year.

Gerome (2005) explained how the Anderson Township Fire Department (ATFD) took several steps in an attempt to reduce firefighter injuries beginning in 2000. Their program consisted of utilizing an outside agency to conduct an annual fitness evaluation on employees. Feedback from the evaluation was given to ATFD administration and individual feedback was given to individual firefighters. The feedback was then utilized to design or revise the individual firefighter's fitness plan. (Gerome, 2005; P. Gerome, personal communication, Feb. 13, 2010) was not able to conclusively identify a positive or negative result of the program stating that poor and inconsistent documentation by employees made it difficult to evaluate reliable results.

Results from a survey instrument utilized to gather responses from 11 fire departments regarding departmental implementation of a health and wellness program were analyzed. The responses indicate a wide variety of the program implementation. Many departments indicate that they do not have a formal program but do have some features of a program in place. Other responses indicate a significant commitment to a health and wellness program. Of the 11 respondents, four (36%) indicated that their department had a formal health and wellness program. All respondents had at least one major component of a health and wellness program in

place. All respondents indicated that their department provided annual medical physicals for all members as described in NFPA 1582. (See Appendix 2).

## **DISCUSSION**

An informative interview with UTFD Administrative Captain Perry Gerome, MPA, took place at UTFD station 51 (personal communication, Feb. 13, 2010) where he was able to answer all questions as they pertained to the this research. Finances, LOD injury history, and details of a research project that he had conducted several years ago were major areas of discussion. (P. Gerome, personal communication, Feb. 13, 2010 shared firsthand knowledge and access to injury and “lost time” records that were essential in conducting this research.

The cost endured by the UTFD over the past several years as a result of LOD injuries has been significant. With one-fifth of the fire departments overtime budget being absorbed by the overtime cost associated with the injured firefighters being off the front line (P. Gerome, personal communication, Feb. 13, 2010), it is important to act promptly.

The literature review revealed information similar to the research conducted into the UTFD and the results of the questioner instrument. It is evident that injuries encountered by UTFD firefighters and firefighters nationally are similar by type. This conclusion can be made when comparing UTFD statistics (P. Gerome, personal communication, Feb. 13, 2010) and the national statistics as presented by (FEMA, 1997; Karter and Molis, 2006; Karter, 2007; Moore-Merrell et al., 2008). The literature identifies strains, sprains, and lacerations as the most common injuries for firefighters. Similarly, there is relationship between national and UTFD injury patterns. National statistics as presented by NFPA (2009) and UTFD statistics (P. Gerome,

personal communication, Feb. 13, 2010) recognize that majority of firefighter injuries occur on the fireground.

While the statistics indicate that the UTFD injury types and injury patterns are no more significant than the national averages, there is still an opportunity for the UTFD to develop and carry out a program that will enhance firefighter safety and well being that will lead to lower personnel cost and longer careers for firefighters. The literature clearly points out that there are several actions that can be taken to reduce the number of firefighter injuries. The UTFD would benefit from adopting portions of NFPA 1500 as they relate to a firefighter health and wellness program. The recommendation to require an annual non-punitive fitness evaluation for members as described in NFPA 1582 would give the fire department another tool to recognize potential health problems of employees, identify areas of weakness that need addressed, and motivate firefighters to stay focused on their fitness levels.

The UTFD reported not having a formal health and wellness program and only met three of the essential criteria to develop a successful program. It is estimated that only half of all firefighters are members of a fire department that has a health and wellness program in place (USFA, 2006). The results of the survey instrument utilized for this study reveals that only 36% of the respondent fire departments had a health and wellness program.

In order to make the changes that are necessary for the UTFD, it will be important to do more than just implement policies. Change is difficult for many people especially when it comes to life style changes. Therefore it will be crucial to get “buy in” and participation from firefighters. Perhaps taking a lesson from the St. Louis Fire Department and implementing the three E’s of safety would be the best place to start.

## RECOMMENDATIONS

The UTFD has every reason to make a better effort to reduce LOD injuries. It is in the best interest of all parties including the firefighters, UTFD administration, and the citizens served. A reduction in injuries will result in longer careers for the firefighters, a cost reduction for the administration, and a better prepared, healthier, and happier firefighting core to meet the demanding needs of the public. In order to accomplish this, it is essential for the UTFD to make some changes. The immediate recommendations are;

1. establish a formal wellness program,
2. provide all supervisors and firefighters a safety officer class, and
3. improve current safety SOG's regarding fire station, apparatus, emergency scenes, and training.

A formal health and wellness plan should be implemented immediately. One major missing component to a wellness plan is a physical fitness program. The fitness program should include strength, endurance, and flexibility training in coordination with a physician or exercise specialist. The fitness program would help control obesity, high blood pressure, and a multitude of other conditions that contribute to firefighter injuries.

Also, it is important for the wellness program to include a "back safety program". The back safety program would include safe lifting techniques training from a professional.

Another important aspect of the wellness program should be supervisor training that focuses on early recognition of firefighter injury or illness.

The UTFD must find ways to combat firefighter fatigue with personnel resources stressed and firefighter "downtime" at a minimum. One option that should be investigated is changing the way firefighters are alerted to calls. The current system alerts all five stations for every detail,

alerting only the stations that are required to respond to an event will reduce sleep interruptions and may improve firefighters alertness.

Requiring all employees to attend a safety officer class should begin immediately. Firefighters could be sent for “outside training” at the Ohio fire Academy or other location with similar class offerings. As a cost cutting option, the UTFD could elect to “train the trainer” which would mean sending select employees out for the training and in turn those firefighters would train the remaining firefighters while on duty. Regardless of how the training gets accomplished, it is essential for all firefighters to have the training in order to better be able to “look out” for themselves and others.

The UTFD should review, edit, and make additions to current safety SOG’s. Fire station injuries occur frequently because it is where firefighters spend much of their time doing a variety of activities. SOG’s must address safety issues as they pertain to the fire station and common activities that take place at the station. High-risk activities such vehicle, station, and equipment maintenance activities should be identified and evaluated for ways to reduce risk.

A policy requiring hearing and eye protection should be implemented. Also, apparatus safety SOG’s should be updated to require seat belt usage at all times, use of “spotters” when apparatus is being backed up or is operating in tight areas.

Emergency scene SOG’s need to be revamped in order to address several issues. Emphasis should be placed on the following; evaluating risk vs. benefit, personal accountability, maintaining crowd control, early detection of fire ground hazards, use of personal protective equipment, incident command operations, lack of visibility conditions, and operations in extreme temperatures.

Future researchers may consider additional research in the area of firefighter fatigue and its overall effects on firefighter health and performance. It is a topic that is often overlooked but is worthy of addressing. Research on the topic may lead to important discoveries or ideas that will contribute to the effort to reduce firefighter injuries and improved the health and wellness of the fire service in general. Previous studies such as Elliot and Kuehl (2007) and Karter (2007) provide an excellent starting point for literature review on the topic.

## REFERENCES

- Bledsoe, B., Porter, R., & Cherry, R (2006). The well-being of the paramedic. In *Paramedic care principles and practice* (2nd ed., Vol. 1, pp. 16-39). Upper Saddle River, NJ, USA; Julie Alexander
- Elliot, D., & Kuehl, K (2007) *Effects of sleep deprivation on firefighters and EMS responders*. Final Report, Oregon Health and Science University, Division of Health Promotion & Sports Medicine, Portland, OR: Author
- Federal Emergency Management Agency [FEMA]. (1997). *Safety and health considerations for the design of fire and emergency medical services stations*. Washington, DC: Author
- Gerome, P (2005) *Preparing our firefighters for combat "a physical fitness objective"*. Cincinnati: Author
- Granito, J., Trench, N., England, R., & Neal, C (2006) *Identifying leadership and management best practices for reducing firefighter deaths and injuries*. Oklahoma State University. Stillwater, OK: Fire Protection Publications.
- International Fire Service Training Association [IFSTA] (1999). Firefighter safety and health. In IFSTA, Fire Department Company Office (3rd ed., pp. 297-313) Stillwater, OK: Fire Protection Publications.
- International Fire Service Training Association [IFSTA] (2008). Firefighter safety and health. In IFSTA, Essentials of Firefighting (5<sup>th</sup> ed., pp. 49-80). Stillwater, OK: Fire Protection Publications.
- Karter, M (2007). *Patterns of firefighter fire ground injuries*. National Fire Protection Agency, Fire Analysis and Research Division. Quincy, MA: National Fire Protection Agency.
- Moore-Merrell, L., Zhou, A., McDonald-Valentine, S., Goldstein, R., & Slocum, C. (2008). *Contributing factors to firefighter line-of-duty injury in metropolitan fire departments in the United States*. International Association of Firefighters. Washington: International Association of Firefighters.
- National Fire Protection Association [NFPA] (2000). NFPA 1582: Standard on comprehensive occupational medical program for fire departments. 2003 Quincy, Massachusetts: Author.
- National Fire Protection Association [NFPA] (2000). NFPA 1583: Standard on fire department occupational safety and health program. Quincy, Massachusetts: Author.

- National Fire Protection Association [NFPA] (2009). *Firefighter injuries by type of duty*. Retrieved June 6, 2010, from [http://www.nfpa.org/itemDetail.asp?categoryID=955&itemID=23466&URL=Research/Fire statistics/The U.S. fire service](http://www.nfpa.org/itemDetail.asp?categoryID=955&itemID=23466&URL=Research/Fire%20statistics/The%20U.S.%20fire%20service)
- Riddle, Ken, Deputy Fire Chief, Las Vegas Fire Department, (April 1999) Evaluating fire department health and wellness programs, National Fire Academy, EFO Program, Retrieved from the World Wide Web 1-24-10 at <http://www.usfa.dhs.gov/pdf/efop/efo29429.pdf>
- Schaper & Gerner, (1997, Spring). Firefighter death and injuries they don't have to happen. *Speaking of Fire*, 5, 2.
- TriData Corporation (2004). The economic consequences of firefighter injuries and their prevention. National Institute of Standards and Technology, U.S. Department of Commerce. Arlington, VA; Author
- U.S. Fire Administration [USFA] (2006). Four years later-a second needs assessment of the U.S. fire service. Emmitsburg, MD: Author.
- U.S. Fire Administration [USFA] (2008). Fire-related firefighter injuries in 2004. Emmitsburg, MD: Author.

## APPENDIX 1 – QUESTIONER

**INSTRUCTIONS: For questions 1-11, please respond with Yes, Not Sure, or No.**

1. Does your organization have a formal health and wellness program in place?  
**Yes Not Sure No**
2. If so, do you believe that the program is accomplishing what it was designed to do?  
**Yes Not Sure No**
3. Does your organization maintain physical performance requirements for candidates and members as addressed in NFPA 1500? **Yes Not Sure No**
4. Are all members of your organization required to qualify annually in order to meet the physical performance requirements as addressed in NFPA 1500?  
**Yes Not Sure No**
5. Are members who do not meet the required level of physical prevented from engaging in emergency operations as addressed in NFPA 1500? **Yes Not Sure No**
6. Are members who are unable to meet the physical performance requirements entered into a physical performance rehabilitation program to facilitate progress in attaining a level of performance commensurate with the individual's assigned duties as addressed in NFPA 1500?  
**Yes Not Sure No**
7. Does your organization provide health promotions that enhance firefighter well being as addressed in NFPA 1500? **Yes Not Sure No**
8. Does your organization provide a program on the health effects of tobacco products and a tobacco use cessation program as addressed in NFPA 1500? **Yes Not Sure No**
9. Does your organization provide annual medical physicals for all members as described in NFPA 1582? **Yes Not Sure No**
10. Does your organization provide the following as addressed in NFPA 1582:
  - 8a. Health and Fitness Coordinator? **Yes Not Sure No**
  - 8b. Health and Safety Officer? **Yes Not Sure No**
  - 8c. Infection Control Officer? **Yes Not Sure No**
  - 8d. Health and Safety Committee? **Yes Not Sure No**
11. Does your organization provide or arrange for a prescriptive rehabilitation and/or fitness program when indicated to aid a members' recovery from illness as addressed by NFPA 1582?  
**Yes Not Sure No**

**For question 12, select the choice that best describes how you feel about the statement.**

12. My organization's policies (procedures, SOP's, SOG's, etc.) adequately address:

12a. Safety in the fire station?

**Strongly Agree    Somewhat Agree    Do Not Agree or Disagree    Somewhat Disagree    Strongly Disagree**

12b. Safety on apparatus?

**Strongly Agree    Somewhat Agree    Do Not Agree or Disagree    Somewhat Disagree    Strongly Disagree**

12c. Safety on emergency scenes?

**Strongly Agree    Somewhat Agree    Do Not Agree or Disagree    Somewhat Disagree    Strongly Disagree**

## APPENDIX 2 – QUESTIONER (RESPONDENT SUMMARY)

**INSTRUCTIONS: For questions 1-11, please respond with Yes, Not Sure, or No.**

1. Does your organization have a formal health and wellness program in place?  
**Yes (4) Not Sure (1) No (6)**
  
2. If so, do you believe that the program is accomplishing what it was designed to do?  
**Yes (2) Not Sure (1) No (1)**
  
3. Does your organization maintain physical performance requirements for candidates and members as addressed in NFPA 1500? **Yes (5)Not Sure (0) No (6)**
  
4. Are all members of your organization required to qualify annually in order to meet the physical performance requirements as addressed in NFPA 1500? **Yes (3)Not Sure (0) No (8)**
  
5. Are members who do not meet the required level of physical prevented from engaging in emergency operations as addressed in NFPA 1500? **Yes (2)Not Sure (0) No (9)**
  
6. Are members who are unable to meet the physical performance requirements entered into a physical performance rehabilitation program to facilitate progress in attaining a level of performance commensurate with the individual’s assigned duties as addressed in NFPA 1500?  
**Yes (4)Not Sure (0) No (7)**
  
7. Does your organization provide health promotions that enhance firefighter well being as addressed in NFPA 1500? **Yes (7)Not Sure (0) No (4)**
  
8. Does your organization provide a program on the health effects of tobacco products and a tobacco use cessation program as addressed in NFPA 1500? **Yes (0)Not Sure (0) No (11)**
  
9. Does your organization provide annual medical physicals for all members as described in NFPA 1582? **Yes (11) Not Sure (0) No (0)**
  
10. Does your organization provide the following as addressed in NFPA 1582:
  - 8a. Health and Fitness Coordinator? **Yes (5) Not Sure (1)No (5)**
  - 8b. Health and Safety Officer? **Yes (8) Not Sure (1)No (2)**
  - 8c. Infection Control Officer? **Yes (11) Not Sure (0)No (0)**
  - 8d. Health and Safety Committee? **Yes (8) Not Sure (1) No (2)**
  
11. Does your organization provide or arrange for a prescriptive rehabilitation and/or fitness program when indicated to aid a members’ recovery from illness as addressed by NFPA 1582?  
**Yes (8)Not Sure (1) No (2)**

**For question 12, select the choice that best describes how you feel about the statement.**

12. My organization's policies (procedures, SOP's, SOG's, etc.) adequately address:

12a. Safety in the fire station?  
Strongly Agree (4)      Somewhat Agree (3)      Do Not Agree or Disagree (2)      Somewhat Disagree (2)  
Strongly Disagree (0)

12b. Safety on apparatus?  
Strongly Agree (3)      Somewhat Agree (3)      Do Not Agree or Disagree (4)      Somewhat Disagree (1)  
Strongly Disagree (0)

12c. Safety on emergency scenes?  
Strongly Agree (3)      Somewhat Agree (5)      Do Not Agree or Disagree (3)      Somewhat Disagree (0)  
Strongly Disagree (0)

**APPENDIX 3 – QUESTIONER (UTFD RESPONSE)**

**INSTRUCTIONS: For questions 1-11, please respond with Yes, Not Sure, or No.**

1. Does your organization have a formal health and wellness program in place?  
**No**
2. If so, do you believe that the program is accomplishing what it was designed to do?  
**OMIT**
3. Does your organization maintain physical performance requirements for candidates and members as addressed in NFPA 1500? **No**
4. Are all members of your organization required to qualify annually in order to meet the physical performance requirements as addressed in NFPA 1500? **No**
5. Are members who do not meet the required level of physical prevented from engaging in emergency operations as addressed in NFPA 1500? **No**
6. Are members who are unable to meet the physical performance requirements entered into a physical performance rehabilitation program to facilitate progress in attaining a level of performance commensurate with the individual's assigned duties as addressed in NFPA 1500?  
**No**
7. Does your organization provide health promotions that enhance firefighter well being as addressed in NFPA 1500? **No**
8. Does your organization provide a program on the health effects of tobacco products and a tobacco use cessation program as addressed in NFPA 1500? **No**
9. Does your organization provide annual medical physicals for all members as described in NFPA 1582? **Yes**
10. Does your organization provide the following as addressed in NFPA 1582:
  - 8a. Health and Fitness Coordinator? **No**
  - 8b. Health and Safety Officer? **No**
  - 8c. Infection Control Officer? **Yes**
  - 8d. Health and Safety Committee? **Yes**
11. Does your organization provide or arrange for a prescriptive rehabilitation and/or fitness program when indicated to aid a members' recovery from illness as addressed by NFPA 1582?  
**Yes**