6-1-2011

Foundation for Evaluating Injured Firefighters Returning to Work

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LOMA LINDA UNIVERSITY
School of Nursing
in conjunction with the
Faculty of Graduate Studies

Foundation for Evaluating Injured Firefighters Returning to Work

by

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A Dissertation submitted in partial satisfaction of
the requirements for the degree of
Doctor of Philosophy in Nursing

June 2011

Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to Dr. Betty Winslow for being my dissertation chair and personally mentoring me through this scholarly journey. Her dedication to the practice of research and profound patience allowed me to continue on with my scholarly work. Dr. Winslow allowed me the freedom to complete this unique research experience, which could not have been done without her support and guidance.

I would also like to thank Dr. Mark Haviland for his depth and breadth of knowledge and expertise that enhanced my learning. His ability to ask tough questions, demand strong answers and dedication to this research project will not be forgotten. To Dr. Patricia Pothier who supported the research project and provided me unsolicited support and encouragement. Her open door approach was a welcomed experience and the chocolates, somewhat of a reward system, were heart warming. The encouragement she provided me during data analysis was comforting.

In the end, I would also like to thank the staff in the Department of Nursing that assisted me in my academic journey. When computer support was needed, the support was provided. When administrative assistance was needed, the support was provided. Frequently when I walked the halls of the Department, faculty and staff would ask me for an update on my research. To be honest, I did not always recall their names, nonetheless I responded and felt a sense of belonging and accomplishment for being asked. The professionalism and dedication to the advancement of nursing science at Loma Linda University School of Nursing is evident and I can only hope to represent the School well in my future endeavors. Thank you all!

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ABBREVIATIONS

NFPA	National Fire Protection Association
OA	Osteoarthritis
CPG	Chronic Pain Grade
ADA	Americans with Disability Act
PAT	Physical Ability Test

ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy, Graduate Program in Nursing
Loma Linda University, June 2011
Dr. Betty W. Winslow, Chairperson

The purpose of this study was to establish a foundation for developing an evidence-based assessment guideline to be used by nursing and medical personnel when evaluating a firefighter's ability to return to work after a lower extremity injury. Two on-line survey instruments were used to record the opinions and beliefs of healthcare providers and firefighters. The final samples included 63 California healthcare providers (with and without professional work experience with firefighters) and 312 California firefighters. Most of the healthcare providers with professional work experience with firefighters use the National Fire Protection Association (NFPA) 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments as a guide when performing medical evaluations on firefighters returning to work after an injury (66.7% responded either sometimes, often, or always). Among the providers, physicians reported more frequent use of the NFPA 1582 firefighter essential job function list than did nurse practitioners. Overall, 33 of the 63 healthcare provider respondents agreed that an evidence-based guideline would always be useful when evaluating a firefighter returning to work after a lower extremity injury. Healthcare providers were less familiar with the NFPA 1582 standard than were firefighters (chi-square test, $p < .000$). Among the

firefighter respondents, 22.8% reported that their fire department had adopted NFPA 1582 in their fire agency. The job duties considered essential for a firefighter job varied among the firefighter respondents. Six job duties were believed to be essential by all the non-officers. There was no such agreement among the officers. Firefighter respondents who work in County fire departments differed in what job duties they believed to be essential from those in urban/city fire departments. This study provided information on testing and assessment modalities used by healthcare providers, the use of evidence-based guidelines by healthcare providers, the adoption and use of NFPA 1582, and the essential functions for a firefighter job from a firefighter's perspective, with comparisons based on firefighter rank and the type of fire agency where the firefighter worked. Further research is recommended to develop the needed evidence-based guideline and for policy implementation at the State and local levels.

CHAPTER ONE

INTRODUCTION

Research Problem

The National Fire Protection Association (NFPA) estimated that during 2009 there were 78,150 on-duty firefighter injuries, a decrease of 1.9% from the previous year (Karter & Molis, 2010). Of these injuries 15,150 (19.4%) resulted in lost work time for the affected firefighter and his/her agency. The highest percentage (48.2%) of injuries sustained was reported as strains, sprains, and muscular pain. The lowest percentage (6.2%) of injuries and illnesses reported were a result of smoke or gas inhalation. For 2009, the NFPA reported that 82 firefighters died while on duty, with 27 of the deaths occurring while the firefighters were in the field fighting fires (Fahy, LeBlanc, & Molis, 2010). When analyzing firefighter injuries, the NFPA uses a five-category classification system representing the type of duty performed when the injury occurred: (1) Responding to or returning from an incident, (2) fire ground (includes structure fires, vehicle fires, brush fires, and so forth) which refers to all activities from the moment of arrival at the scene to departure time (e.g., setup, extinguishment, and overhaul), (3) non-fire emergency (includes rescue calls, hazardous calls, such as spills, and natural disaster calls), (4) training, and (5) other on-duty activities (e.g., inspection or maintenance duties) (Karter & Molis, p. 3, 2010). Regardless of how the injury was sustained, a firefighter working with an injury poses a potential threat to public safety.

The National Fire Protection Association's (NFPA) 1582 standard on comprehensive occupational medical program for fire departments available for adoption by fire agencies indicate that a firefighter returning to work after a lower extremity injury

may not be able to safely perform job duties (2007). When a firefighter with a lower extremity injury is unable to perform job duties, the firefighter's role performance is compromised. To determine if the firefighter can perform the job duties, a medical evaluation may be performed to determine the firefighter's ability to perform job tasks.

When a firefighter with a lower extremity injury returns to duty, evidence-based methods used for making a medical assessment of the individual's ability to perform the job duties (role performance) are not readily available. As noted above, the National Fire Protection Association (NFPA) has a medical program standard that is available for adoption by fire agencies. The medical program standard was developed by an expert technical committee that included physicians, firefighters, fire department safety staff, union representatives from fire agencies, and college level fitness authorities (National Fire Protection Association, 2007). The standard undergoes review and revision approximately every three years; however there is no mention in the NFPA medical program document of validation or empirical testing of the standard. The NFPA states that the next revision of the standard will be in 2013 (http://www.nfpa.org, April 12, 2011).

It is not known whether or to what extent the National Fire Protection Association's medical standard has been adopted and whether medical assessments of firefighters returning to work after a lower extremity injury are evidence-based. This limitation means that there are times when a firefighter may be denied the opportunity to return to work, whereas others may be cleared for work without being able to perform all of the required job duties. This is a problem for public safety (concerns for adequate fire protection), for the firefighters (issues of just treatment), and for health professionals

(lack of standardized assessments resulting in inconsistent recommendations). The other concern is that the use of the NFPA medical standard alone may not comply with State and Federal disability laws. With recent changes to the disability laws, both California (Thomson & West, 2006) and Federal disability laws (www.eeoc.gov/policy/ada.html, April 21, 2009) stipulate that an individualized medical assessment is required to determine the employee's ability to perform the job duties, with or without reasonable accommodation. The present study is needed to establish the foundation for developing an evidence-based assessment guideline that meets the need of fire agencies and complies with medical assessment criteria stipulated in disability laws.

Purpose and Aims of the Study

The purpose of the study was to establish the foundation for developing an evidence-based assessment guideline that can be used by nursing and medical personnel when evaluating a firefighter's ability to return to work after a lower extremity injury. A survey was employed to determine currently used testing and medical assessment modalities used by healthcare providers when evaluating a firefighter's ability to perform the job duties, determine current application of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments in fire agencies, and to describe essential functions of the firefighter job from the firefighters perspective. The implementation of an evidence-based assessment guideline may assist employers and healthcare providers with performing return to work medical evaluations and at the same time complying with state and federal disability regulations. This researcher suggests that agencies employing firefighters (such as cities and other governmental fire agencies) and do not have on-site nursing or medical services may opt

to use an evidence-based assessment guideline as the standard when establishing contracts with outside medical agencies to perform medical evaluations on firefighter applicants and employees. There were six specific aims of the study:

(1) Determine testing and assessment modalities currently being used by healthcare providers when evaluating a firefighter's ability to return to work after an injury, particularly lower extremity injuries,

(2) Determine the use and adoption of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments,

(3) Determine whether healthcare providers and firefighters differ in familiarity with the National Fire Protection Association standards,

(4) Describe essential job functions for a firefighter job from the firefighter's perspective,

(5) Determine the use of firefighter job duties or essential function lists by healthcare providers, and

(6) Determine the beliefs and use of evidence-based assessment guidelines by healthcare providers.

Definition of Major Constructs

Constructs applied to the study were operationally defined by the author as follows: (a) public safety – no risk of harm, actual or potential, to the public, community or co-workers; (b) role expectation - the behavior likely to be exhibited by a firefighter while on duty as a result of understanding the essential functions of the job; and (c) role performance - the firefighter's ability to perform the essential functions of the job, and (d) lower extremity injury - an orthopedic condition affecting one or both lower

extremities and includes injuries to a bone(s), joint(s), muscle(s) or other soft tissue that cause the firefighter to miss more than one week of full duty. The injury may have required surgical repair and/or rehabilitation.

Background of Problem

The National Fire Protection Association (NFPA) promulgates the document titled NFPA 1582 Standards on Comprehensive Occupational Medical Program for Fire Departments (2007). The document contains pre-employment and employee medical criteria that may be adopted by fire agencies when performing medical evaluations on firefighters. In the preface section at the beginning of the NFPA 1582 document, the author's state that the document is not sanctioned or published by regulatory agencies, and adoption of the standard by fire agencies is voluntary. It is also stated within this section that the NFPA does not guarantee the accuracy of the information and recommends that anyone using the document seek advice from a competent professional. Based on the voluntary nature on the application of the medical standard, it is this researcher's belief that it may be more appropriate to classify the document as a guideline. Nonetheless, NFPA 1582 is the only known comprehensive firefighter medical evaluation tool. The purpose of the medical standard, according to NFPA, is to reduce occupational injuries and illnesses of firefighters and to "reduce the risk and burden of fire service occupational morbidity and mortality while improving the safety and effectiveness of firefighters operating to protect civilian life and property" (p. 5). Revisions in the current NFPA 1582 document (2007) contain changes to the standards for medical evaluations for firefighter applicants and incumbents with diabetes mellitus. In the endocrine section of the standard, the evaluation of diabetes mellitus was expanded

to provide more guidance on evaluating insulin-dependent firefighter applicants and incumbents. There were no noticeable changes to the essential job functions list or the medical evaluation process of firefighters with lower extremity injuries.

Unique to this document are the categories listed by the National Fire Protection Association that identify medical conditions that would categorically preclude a firefighter from being able to perform the essential duties of the job (classified as category A), and medical conditions that could preclude a firefighter from performing the essential duties of the job (classified as category B) (p. 7). The category A and B designations were the result of the panel's determination of the extent of significant risk to the safety and health of the individual firefighter or others for each medical condition contained in the medical program standard. However, when evaluating a firefighter's physical function, the medical professional cannot rely on NFPA's preclusions alone. An individualized medical evaluation is required because the California Fair Employment and Housing Act (Thomson & West, 2006) and the federal Equal Employment Opportunity Commission's Americans with Disabilities Act (www.eeoc.gov/policy/ada.html, April 21, 2009) mandate that individualized evaluations be performed. The laws preclude the provider from listing known medical condition(s) and rendering a work status solely based on the work preclusions listed in the NFPA medical program document. Therefore, the section of the NFPA document that contains the work preclusions is unable to be applied when performing return to duty evaluations. This study addressed this limitation by identifying alternative diagnostic testing and assessment methods that can be applied when return to duty medical evaluations are performed.

The essential functions or job duties of the firefighter occupation are outlined in the National Fire Protection Association 1582 medical standards. The thirteen essential functions are listed in Table 1. When determining the thirteen essential functions, the NFPA technical committee took into account the physical, psychological, intellectual, and physiological demands of the fire fighting job. The essential functions were designed to represent fire fighting job tasks for a broad application; therefore NFPA asks that each jurisdiction use the functions that apply to their specific fire agency. A review of the thirteen essential job functions conducted by this researcher revealed that eight of the thirteen are directly related to the use of the firefighter's lower extremity (legs) when performing essential job duties described in the NFPA medical standards (Table 1). In summary, the pertinent job functions are: (1) performing fire fighting operations including rescue operations, (2) climbing six or more flights of stairs, (3) rescue dragging or carrying victims up to and over 200 pounds, (4) carrying water filled fire hoses up to 150 feet, (5) walking and crawling, (6) carrying out fire fighting duties for prolonged period of times without rest periods, (7) performing physical tasks in hazardous environments and with fatigue, and (8) functioning as an integral member of the team where sudden incapacitation may result in personal death or injury.

In Annex C of the National Fire Protection Association (NFPA) 1582 standard are examples of assessment protocols that may be employed to assess the firefighter employee's work fitness and ability to perform the essential job functions (Table 2). The use of the assessment protocols are for informational use only and not part of the medical standard otherwise contained in the NFPA 1582 document. The protocols cover the evaluation of aerobic capacity, percentage of body fat, muscular strength, muscular

endurance, and flexibility. Specific methods on how to perform the various testing modalities and standard values are not provided, which limits the medical provider's ability to perform an assessment using the protocols.

Table 1

NFPA's Firefighter Essential Job Functions

	Essential Job Function	Pertinent to Lower Extremity Function
1	Performing fire-fighting tasks, rescue operations and other emergency response actions under stressful conditions while wearing personal protective ensembles and self-contained breathing apparatus, including working in extremely hot or cold environments for prolonged time periods.	X
2	Wearing a self-contained breathing apparatus, which includes a demand valve-type positive pressure face piece or high-efficiency air (HEPA) filter masks, which requires the ability to tolerate increased respiratory workloads.	
3	Exposure to toxic fumes, irritants, particulates, biological and nonbiological hazards, and/or heated gases, despite the use of personal protective equipment.	
4	Climbing 6 or more flights of stairs while wearing fire protective ensemble weighing at least 50 pounds or more and carrying equipment/tolls weighing an additional 20 to 40 pounds.	X
5	Wearing fire protective ensemble that is encapsulating and insulated. Wearing this clothing will result in significant fluid loss that frequently progresses to clinical dehydration and can elevate core temperature to levels exceeding 102.2 degrees Fahrenheit.	
6	Searching, finding, and rescue-dragging or carrying victims ranging from newborns up to adults weighing over 200 pounds to safety despite hazardous condition and low visibility.	X

Table 1 *continued*

7	Advancing water-filled hose lines up to 2.5 inches in diameter from fire apparatus to occupancy (approximately 150 feet), can involve negotiating multiple flights of stairs, ladders, and other obstacles.	X
8	Climbing ladders, operating from heights, walking or crawling in the dark along narrow and uneven surfaces, and operating in proximity to electrical power lines and/or other hazards.	X
9	Unpredictable emergency requirements for prolonged periods of extreme physical exertion without benefit of warm-up, schedules rest period, meals, access to medications or hydrations.	X
10	Operating fire apparatus or other vehicles in an emergency mode with emergency lights and sirens.	
11	Critical, time-sensitive, complex problem solving during physical exertion in stressful, hazardous environments, further aggravated by fatigue, flashing lights, sirens, and other distractions.	X
12	Ability to communicate while wearing personal protective equipment and self-contained breathing apparatus under conditions of high backgrounds noise, poor visibility, and drenching from hose lines and/or fixed protections systems (sprinklers).	
13	Functioning as an integral component of a team where sudden incapacitation of a member can result in mission failure or in risk of injury or death to civilians or other team members.	X

From the National Fire Protection Association 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments, p. 8-9, (2007).

A role of nurses, physicians, and allied health professionals who work in occupational health is to evaluate employees and make a determination if an injured employee has work limitations (restrictions) or is able to return to full duty and perform job functions (McPhaul & Lipscomb, 2005). The medical and nursing staff, using current and relevant resources, must properly evaluate employees that desire to return to duty.

The void of evidence-based standards and research in the area of conducting work place assessments along with the burden of firefighters to ensure public safety prompted this research study on the medical evaluation practices for firefighters.

Table 2

Assessment Protocols

Protocol
Aerobic Capacity
1 mile walk
1.5 mile run/walk
12-minute run
Step test
Stair climbing machine
Cycle ergometer
Treadmill
Percentage of body fat
Skinfold
Circumference
Bioimpedence
Hydrostatic weighing
Body mass index
Waste-to-hip ratio
Muscular Strength
Handgrip dynometer
Static bicep curl with dynometer
Static leg press with dynometer
Bench press
Leg press
Muscular Endurance
Push-ups
Modified push-ups
Pull-ups
Bent knee sit-ups
Crunches

Table 2 *continued*

Flexibility
Sit and reach
Modified sit and reach
Trunk extension
Shoulder elevation

From the National Fire Protection Association 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments, (2007, p.55).

Significance of the Study

In October 2010 the National Fire Protection Association published a U.S. Fire Department Profile providing various firefighter statistics. The document contains data collected and analyzed through 2009. Of particular note is that the total number of firefighters in 2009 was estimated at 1,148,100, working in approximately 30,165 fire departments throughout the United States (Karter & Stein, 2010). Less than a third (29%) of the 1,148,100 firefighters were categorized as career and 71% volunteer. Volunteer firefighters account for staffing of the many smaller fire agencies. Larger agencies tend to have a greater number of career firefighters. The statistics show a 41% growth in career firefighters over the past 23 years. Career firefighters working in various fire agencies in California is the targeted group for the present study.

During 2009 alone, fire agencies across the United States responded to an estimated 1,348,500 fires that were the cause of 3,010 civilian deaths (Karter, 2010). During this same period the fires accounted for 17,050 civilian injuries and $12,531,000,000 of direct property loss (Karter, 2010). To further magnify the destruction that fires cause, the NFPA notes that in 2009, "there was a civilian death every 175 minutes and an injury every 31 minutes" (p. ii). With the magnitude of damage that fires cause, it is imperative that each firefighter be capable to perform job duties to

preserve public safety.

Current medical testing and assessment practices may be inconsistently applied by healthcare providers when evaluating firefighters due to the lack of evidence-based guidelines. Findings from this study may establish the foundation for developing an evidence-based assessment guideline for use by nursing and medical practitioners and provide a basis for establishing employment and public policy in the area of evidence-based medical evaluations for firefighters. Developing a valid method for determining the work fitness of employees, such as firefighters, is important to nursing science as the process can be used in professional nursing practice areas. Two such areas where a valid evaluation process may be applied are employee health and occupational health because a primary duty of the occupational health nurse is to assess an individual's ability to perform the essential functions of their designated job (United States Department of Labor, 2010). In addition to increasing the understanding of the physical demands and essential functions of the firefighter job and determining assessment techniques used to evaluate the ability of a firefighter to do the essential job duties, this study will contribute to the body of knowledge on return to duty evaluations and the development of evidence-based assessment guidelines.

Implications for Knowledge Development

This study has implications for policy and knowledge development in the areas of evidence-based nursing and medical practice and establishing state and national firefighter medical evaluation criteria. Implementation of an evidence-based assessment guideline may lead to consistent medical evaluations, fewer firefighter injuries or fatalities, and increased public safety.

Overview of Remaining Chapters

In the chapters to follow, there will be a comprehensive review and analysis of literature pertinent to the study. The literature review in chapter two includes physical examination and testing methods, legal review of court cases related to performing medical evaluations, application of the theoretical framework, and evidence-based practice research. In chapter three, the research design, research questions, philosophical perspective, and the methods for analyzing the data are presented. The final two chapters, chapter four and five, respectively, include the results section with data analysis and the discussion of the findings, study limitations, and conclusion.

CHAPTER TWO

LITERATURE REVIEW

This chapter contains a detailed literature review in support of the study. The review includes literature on firefighter job performance; evaluation of lower extremity function; workplace accommodation; legal cases on the topics of accommodation, discrimination and medical evaluations; disability law; and theoretical framework and evidence-based practice. An extensive literature search was performed using available databases such as CINAHL, EBSCOhost, Google Scholar, LexisNexus, and PubMed. There were many key words (e.g. fitness for duty evaluation, work fitness evaluations, essential functions and work, employment law and return to work, lower extremity and assessment, lower extremity injury and assessment, firefighter and assessment, work capacity and firefighter, assessment and lower limb amputation, functional capacity testing and lower extremity, firefighter and return to work evaluation) entered as single and combined terms.

Firefighter Job Performance

Sobeih, Davis, Succop, Jetter, and Bhattacharya (2006) investigated the effect of long work shifts and turnout gear, including the self-contained breathing apparatus on firefighters' postural stability. This is relevant to the present study as postural balance is an issue for firefighters with or without a lower extremity injury. Understanding postural balance enhanced this researcher's knowledge on some of the physical demands required of firefighters.

The significance of the Sobeih et al. (2006) study was to determine if a safety threat (exhibited by a decrease in postural stability) exists between long work shifts and

the wearing of fire fighting protective equipment. The researchers found postural sway increased with longer work shifts, after 24 hours on the job: however, the results were not found to be statistically significant. Counter to their hypothesis, the wearing of protective equipment actually decreased sway in work shifts less than 24 hours. Postural sway and sway length were found to significantly increase when tasks were performed (foam task, and reach task, $p = 0.0001$). The authors concluded that additional research should be done to evaluate the effects that long work shifts have on a firefighter's ability to complete job tasks. They suggest that although their findings on the effect of long work shifts were not statistically significant, a firefighter with decreased postural stability may experience slips and falls. The decrease in postural support affects the ability of the firefighter to perform job duties, which may have an adverse effect on public safety.

This analysis is important when assessing a firefighter's ability to return to duty, and when considering the ability of the firefighter to don protective equipment and wear it safely. The outcome of the Sobeih et al. (2006) study suggested that postural sway, or balance, may be affected after a 24-hour work shift. A firefighter with a lower extremity injury may experience postural sway issues due to the work hours alone, with or without wearing of the turnout gear. Therefore, evaluating postural stability when a firefighter with a lower extremity injury is retuning to work was included in this study.

Harley and James (2006) performed a small qualitative ($N = 6$) study in a fire station in Australia to determine the firefighter's perception of the validity of the pre-employment physical ability test (PAT) they completed during the application process. The PAT was used by the fire agency in the hiring process to determine the physical capability of applicants and contained elements that evaluated strength, flexibility, and

fitness. The researchers used an ethnographic approach to data collection and had specific participant inclusion criteria. Six firefighter participants were randomly selected and completed the interview process.

Each interview was precisely transcribed and analyzed using the constant comparative method. Four major themes emerged: (1) Firefighting work is physically demanding, (2) the physical ability test (PAT) does reflect job tasks, (3) the physical ability test should reflect the physical nature of the firefighting job, and (4) the physical ability test does not adequately reflect the physical demands of the job, and therefore participants lacked confidence in the abilities of their co-workers. Based on the review of the interviews and themes, the researchers concluded that the PAT does reflect job duties, but does not account for the physical demanding aspects of the firefighting job. Additionally, the PAT could be enhanced by adding more endurance testing, having the applicants wear firefighter equipment during the physical tests, and increasing the passing score (more stringent). The authors, nevertheless, noted some important limitations of their study: (1) participants were from the same fire agency, and (2) there was only one female out of the six participants. The study provided valuable information on the beliefs or perspectives of firefighters that can be included in an evidence-based study as values or perspectives is a component of evidence. A much broader study could be conducted that includes a variety of fire agencies and a greater mix of participants based on age, gender, and time on the job.

Evaluation of Lower Extremity Function

One aim of the present study was to determine testing and assessment modalities currently being used by healthcare providers when evaluating a firefighter returning to

work after an injury, particularly lower extremity injuries. Lower extremity injury for this study was defined as an orthopedic condition affecting one or both lower extremities and includes injuries to a bone(s), joint(s), muscle(s) or other soft tissue that cause the firefighter to miss more than one week of full duty. The injury may have required surgical repair and/or rehabilitation. According to Karter and Molis (2010), the majority (48.2%) of injuries reported by the National Fire Protection Association in 2009 were strains, sprains, and muscular pain. In the following section, some methods for assessing muscle strength and bone and joint integrity of the lower extremity are identified.

According to the authors of DeGowin's Diagnostic Examination text (Leblond, Brown, & DeGowin, 2009), the beginning of a medical evaluation comprises gathering the past medical history and allowing the patient to describe how the injury occurred. This initial data gathering was a consistent theme in the majority of the literature reviewed. Donatelli and Wooden (2010), in their orthopedic physical therapy book, provided specific evaluation methods for evaluating lower extremity strength and function. The authors made the point that when evaluating an individual after an injury, the medical evaluator also needs to inquire how the injury occurred so the evaluator can understand the mechanism of injury. The complete medical evaluation should include a gait, neurovascular, and visual assessment of both the injured and non-injured lower extremity. The non-injured extremity is evaluated first and is used to establish the baseline functional status for outcome comparison against the injured extremity. Donatelli and Wooden (2010) provided the most comprehensive and systematic process for evaluating workers that are returning to work after an injury. Lower extremity testing methods that may aid the healthcare provider in determining lower extremity function are

provided in the site specific testing methods contained in Table 3.

Table 3

Site Specific Testing Methods

Body Part	Type of Test	Affected Bone, Joint, Muscle, or Soft Tissue	Indications of Impairment
Foot & Ankle	Range of Motion (ROM) Dorsiflexion Plantar flexion	Ligaments, tendons, and muscle tears of the foot and ankle	Less than 30 degrees of plantar flexion and 60 degrees of dorisflexion
Hip	Thomas Test	Internal and external rotation abilities of the hip	Range of motion difficulties
Knee	Abduction Stress Test	Posterior Cruciate ligament Medial compartment	A tear of the medical compartment ligaments and instability
Knee	Adduction Stress Test	Cruciate ligament and medial compartment, may indicate instability	Posterolateral rotatory instability
Knee	Anterior Drawer Test	Anterior cruciate ligament, Posterior cruciate ligament	Foot in external rotation, anteromedial rotatory instability, Foot in neutral position - anterolateral rotatory instability, Foot in internal rotation, posterior cruciate tear
Knee	Jerk Test	Subluxation of the lateral femoral condyle on the tibia	Anterolateral rotator instability

Donatelli and Wooden (2010), *Orthopedic Physical Therapy.*

A review of orthopedic, occupational medicine, and physical therapy literature revealed that there is not a standardized method for performing medical evaluations to determine lower extremity strength and function. This researcher found that lower

extremity strength and function evaluation methods outlined in the physical therapy literature were clear and concise compared to the orthopedic and occupational literature. It appears from the literature review that the method of the medical evaluation performed is based on the medical professional's preference.

Radomski and Latham (2008) argue that the medical evaluator must be aware of the Americans with Disability Act and the essential job functions for the worker's job position when assessing individuals returning to work after an injury or disability. It was noted that assessing balance, coordination, flexibility, and strength may be used to determine functional ability. To evaluate the ability of an individual to lift and carry an injured person, an aerobic treadmill may be used. Chapter 33 of Radomski and Latham (2008) contained information on the medical evaluation of employees, identified ways to evaluate a worker's ability to perform job specific tasks, and provided guidance on how to return the injured worker to their role. The authors introduced the concept of performing work simulation testing, which they described as a way to provide a medical assessment of functional ability using the individual's job specific essential job functions as the reference for designing the medical evaluation. The work of a firefighter was outlined in the text as an example with a work simulation test application. For the firefighter assessment example, they described the job duty requirement to lift, carry, and use a filled water hose to fight a fire. Although using a water filled fire hose in a medical office setting may not be feasible, the author's provided an alternative that may be applied in an office setting. For example, the medical professional may ask the individual to simulate the use of a filled water hose by having the individual carry and push (move) an object with the same weight as a filled water hose. Having the individual perform this

test would allow the medical professional to make an assessment of strength, coordination, agility, and balance. This example provided a practical approach to assessing an individual's ability to perform a simulated job task in a medical office setting that may be applied when assessing firefighters returning to duty after a lower extremity injury.

Franchignoni, Brunelli, Orlandini, Ferriero, and Traballes (2003) performed a study on 140 participants to examine the internal consistency and validity of the Rivermead Mobility Index, a widely used tool to evaluate mobility changes in patients undergoing rehabilitation. However, as stated in the introduction of the article, there is a lack of agreement on a valid tool for evaluating mobility in lower limb amputees. The point of the study was to assess mobility in men and women with a recent unilateral lower limb amputation. Exclusion criteria for participation included individuals with dementia, residual limb deformities, and cardiac and respiratory diseases.

The mobility tool was administered at the beginning and ending of each patient's prosthetic training. The tool consisted of 15 questions. Of the 15 questions, only one is an observed mobility assessment performed while the patient is standing unsupported. The other 14 questions are patients' perceptions of their status. As noted in the article, the use of the mobility index tool is not recommended for clinical decision making and, therefore, is not recommended as an appropriate tool when evaluating a firefighter returning to work after a lower extremity injury or amputation. The Franchignoni et al. (2003) study supports the premise that there may not be readily available mobility evaluation tools and that the development of an evidence-based guideline would be beneficial for healthcare providers.

Deathe and Miller (2005) identified a need to develop a walk test that may be used to assess ambulation of individuals with lower limb amputations and prosthetic devices. Rationale for the empirical study included citing limitations of existing testing modalities. Participants of the study were adults, 19 years and older, who had a single (unilateral) amputation and a prosthetic device for at least six months. Recruitment was performed at a regional outpatient clinic. Ninety-three participants completed phases I and II of the study with only 27 completing phase III. The total number of subjects participating in the observational testing process was 120. This was a test-retest design.

To develop the new walk test, called the L test, the researchers studied various walking assessments to include a two-minute walk and a ten-meter walk. Reliability and validity of the instrument was determined based on the analysis of data using various methods that included the Bland-Altman plot and Pearson correlation. The tool was found to have excellent interrater (.96) and intrarater (.97) reliability.

Although the study was not performed on employees or in the work place, the development of the walk test is a method that may be used to develop other assessment tools for use when evaluating other lower extremity injuries. Additionally, this researcher believes this study highlights the need to perform a proper assessment of functional mobility to determine functional status. A use of a walk or gait test may be used by healthcare providers when evaluating a firefighter's ability to return to work after a lower extremity injury.

Ross, Guskiewicz, Gross, and Yu (2008) conducted a case-controlled study to identify assessment tools that can determine ankle instability. The researchers evaluated functional limitations of participants with and without ankle instability. A twelve

question ankle joint functional assessment tool was used to collect self-reported data. In addition to having the participants complete the assessment tool, an assessment test called the single-leg jump was administered. The single-leg jump required each participant to jump up in the air to 50% or 55% of their maximum jump height and land on one leg.

The research was conducted in a research laboratory and a total of 30 individuals were matched for participation. There were 15 participants selected with unilateral functional ankle instability arising from ankle sprains and 15 participants with stable ankles, no ankle impairment. Potential participants with ankle instability were excluded if their ankle sprain occurred within 6 weeks of the study. The participants were placed into the two study groups and then matched by age, height, mass, and gender.

The functional assessment tool asked the participants to rate their ankle according to the following questions: 1) ankle pain, 2) swelling, 3) ability to walk on uneven surfaces, 4) overall feeling of stability, 5) overall ankle strength, 6) ability to descend stairs, 7) ability to jog, 8) ability to change direction when running, 9) overall activity level, 10) ability to sense a rollover event, 11) ability to respond to a rollover event, and 12) ability to return to activity after a rollover event. Each participant was tested using the single-leg jump. Leg stabilization, following the single-leg jump, was measured using a floor-mounted force plate. When the participants landed on the force plate, and subsequently stabilized on one leg, the ground reaction force was collected. Ground reaction force data were analyzed to determine each participants time to stabilization.

The results of the research showed that the Ankle Joint Functional Assessment Tool accurately identified functional impairment (100%). Sensitivity (the probability that participants with functional ankle instability were correctly identified) and specificity (the

probability that stable ankle participants were correctly identified) values were calculated and receiver operating characteristics were obtained. An area under the curve of 1.0 was found for the assessment tool (asymptotic significance < 0.05) and 0.72 (asymptotic significance < 0.05) was found for the single-leg jump assessment. The use of this tool may allow the healthcare provider to assess impairment or limitations that may be present with an individual after an ankle injury. In fact, the use of this type of questionnaire may aid the healthcare provider when evaluating a firefighter returning to duty after an ankle injury.

Gibson and Strong (2003) clarified the process of functional capacity assessments for assessing an injured workers ability to return to work. The authors reviewed literature and assessment tools to examine available occupational therapy frameworks in an attempt to describe or identify the factors associated with functional evaluations. In their paper, they provided literature and assessment tools currently available to the occupational therapist along with a diagram and explanation of a work assessment continuum model. The model provides a conceptualization of the injured employee's evaluation process from the determination of impairment to the assessment of the employee's role performance for a specific job. Impairment may be evaluated using diagnostic testing such as strength testing using a dynamometer, or job specific functional capacity testing. Understanding the application and use of the continuum model was valuable for the present study as it contains elements for assessing an individual's level of impairment, activity limitations, and on the job role performance. Evaluating a firefighter's ability to return to work after a lower extremity injury may require the healthcare providers to use diagnostic testing and assessment modalities.

An article by Norvell et al. (2005) was reviewed for understanding of complications that may affect an amputee's ability to rehabilitate. This retrospective study that evaluated the secondary effects of osteoarthritis on lower limb amputees was relevant to this study that addresses the ability of a firefighter to return to work after a lower extremity injury, which includes firefighters who have sustained a lower limb amputation.

The objective of the Norvell et al. (2005) study was "to demonstrate whether amputees have an increased risk of knee pain or symptomatic osteoarthritis (OA) compared with non-amputees" (p. 487). The design was a retrospective cohort study and included male veteran subjects with (N = 62) and without (N = 94) an amputation. Age was limited to those subjects age 40 and older for both groups. Potential participants with a history of a significant knee injury (an injury requiring medical care, surgery, or limited weight bearing for a period of time) were excluded from the study. Additionally, potential participants with certain medical conditions such as rheumatoid arthritis or rheumatic disease were excluded. The amputee group was limited to those individuals who required a unilateral transfemoral or transtibial amputation. Double amputees were excluded from the study. Ambulating using a prosthetic limb for five years was applied to the selection of the amputee group. The mean age at time of amputation was 31.8 years.

The researchers described the purpose of their study, "to estimate the prevalence of knee pain and symptomatic knee osteoarthritis (OA) in male veteran traumatic amputees and to compare this with the prevalence of knee pain and knee OA in male veteran non-amputees" (p.487). The goal was to compare the amputee with the non-amputee groups for signs and symptoms of knee pain or osteoarthritis and to determine if

there was an increased risk to the amputee group.

The tool used to assess the level of knee pain was the Chronic Pain Grade (CPG) questionnaire. This (CPG) tool allows data to be collected via telephone interview. The authors stated that the studies on the use of the tool demonstrated a Cronbach's *alpha* greater than 0.90 and noted that highly significant correlations ($p < .001$) with all dimensions of the medical outcomes study 36-item health survey confirmed the validity of the CPG tool. The item-total correlations were reported as being high (the obtained correlations were not given), which indicated good internal consistency/reliability. The CPG questionnaire was reported as being previously applied to assess pain severity in the amputee population. Additionally, the authors stated that the CPG questionnaire had been used to grade pain in other populations besides amputees: however, they did not provide specifics.

Data analysis included descriptive statistics and negative binomial regression. The reported results of the study showed that the prevalence of knee pain was not statistically greater in amputees (40.3%) than non-amputees (20.2%). The findings also suggested that in the amputee population, stress on the non-amputated knee can cause secondary disability. Specifically, transfemoral amputees were three times as likely to develop pain in the non-amputated knee compared to the non-amputee subjects (prevalence ratio = 3.3, 95% CI, 1.5– 6-3). A current complaint of pain is an important finding to consider when assessing a firefighters role performance or the ability of a firefighter with a lower limb amputation or other lower extremity injury to return to duty as pain in the non-injured limb could hinder the firefighter's ability to perform job duties.

There is a variety of diagnostic tests and assessment techniques provided in the

literature that may be used when evaluating lower extremity function. Many of the testing and assessment modalities included in the literature review were applied to the present study. The DeGowin's Diagnostic Examination text (Leblond, Brown, & DeGowin, 2009) identified the importance for obtaining a medical history. Radomski and Latham (2008) and Donatelli and Wooden (2010) provided a review and explanation of a variety of testing and assessment modalities that may be used to evaluate functional ability. For the present study, healthcare providers were asked to indicate their use of 11 types of diagnostic tests and how often they obtain a history when evaluating firefighters returning to work after a lower extremity injury.

Workplace Accommodation

In this section, empirical and opinion literature on the issue of worker accommodation after an injury will be presented. An article by Koviack (2004) was reviewed for understanding of accommodation of nurses that cannot perform the essential functions of their job. The basis for the article was the need to provide accommodation in accordance with the Americans with Disability Act and to retain nurses in a modified nursing role when role performance was compromised.

The reasonable accommodation program for nurses at Warren G. Magnuson Clinic Center of the National Institutes of Health in Bethesda, Maryland was started in 1999 and has resulted in 147 accommodation requests since inception. The length of time of accommodation ranged from 4 days to twelve months, with 84% of the participating employees able to return to full duty within three months. The program was initiated as a temporary accommodation program and indicated that after the three-year review, there were benefits to the employer for having the nurses remain on duty in an accommodated

position. This article was relevant to this researcher's area of research, as the ability to accommodate employees on a temporary basis is an essential first step in the accommodation process.

Girdhar, Mital, Kephart and Young (2001), using U.S. Bureau of Labor Statistics data, noted that in 1998 there were 10,200 amputations due to occupational injuries in the United States, and of those 53.8% resulted in below the knee amputations. Below the knee was defined as an amputation between the knee and foot. The purpose of the article was to discuss the challenges in accommodating employees with a disability when the employee is returning to duty.

The article, which was based on a review of relevant literature, provided many causes for the amputations and listed some difficulties and limitations experienced by amputees. Of the limitations experienced by amputees, the following were listed for lower extremity amputations: (1) carrying; (2) turning; (3) stamping; (4) driving (forklift or other company vehicle); (5) walking; (6) running; (7) standing; and (8) kicking. This list includes duties similar to those firefighters must perform or are included as essential functions of the job, such as operating from heights, walking or crawling in the dark along narrow and uneven surfaces, and operating fire apparatus or other vehicles in an emergency mode. The article stressed that understanding of the limitations based on the type of amputation is critical; this researcher agrees.

The bulk of the article discussed strategies for accommodating amputees and the need to modify the physical work environment of the employee. Prosthetic devices for lower limb amputees were classified as socket, shank, and the foot-ankle system. Some advantages and disadvantages of each were given. Based on Girdnar and colleagues'

(2001) interpretation of the literature, guidelines were given for dealing with prosthetic devices. Of note were these notations: "unnecessary stresses or strains on prosthetic extremities should always be avoided, obstacle-free access to the work location is necessary to avoid stumbling or falls for those with prosthetic legs or feet, tasks requiring frequent walking, running, lifting, or moving of heavy or difficult items should be modified or reassigned to a healthy and fit employee" (Girdnar et al., p. 116, 2001).

Girdnar and colleagues (2001) pointed out the need to adequately assess the individual with an amputation and properly assess the work place to identify safety hazards and modifications needed for the employee to safely perform the duties of the job. The article provided a fairly comprehensive review of difficulties and adaptations that may occur in the work place for individuals with a lower limb amputation. A firefighter with a lower limb amputation falls into the category of lower extremity injury, which was the emphasis of this study. Just like other lower extremity injuries, a firefighter with a lower limb amputation would need to be evaluated before returning to work to determine if job duties can be safely performed. In the present study, a description of the essential job duties from the firefighter's perspective is provided along with diagnostic testing and assessment modalities currently being used by healthcare providers when evaluating a firefighter's ability to perform the essential job duties. The emphasis of the current study is on those duties that predominately require use of the lower extremities.

Schoppen et al. (2001) performed a cross-sectional study to describe the occupational status of lower limb amputees in the Netherlands. Adult participants were recruited from an orthopedic workshop in the Netherlands. The target participant had a

lower limb amputation for at least 2 years and was asked to complete a self-report questionnaire that contained questions on job characteristics, work adjustments, and work conditions. The RAND-36 (Dutch version) general health assessment questionnaire was used to measure health status perception of the participants. The researchers achieved a 95% response rate with 652 questionnaires received from the orthopedic workshop patients.

A review of the responses showed that 64% were currently employed and working, 31% were not working, and 5% had no work experience. The mean time between amputation and return to work was 2.3 years. The overall health of the individuals who had not returned to work was significantly worse when compared to those that returned to work. Forty-three percent of the employees that worked prior to and after the amputation indicated that they had job modifications that allowed them to continue to work. The modifications were grouped into four categories: (1) change to work hours/times; (2) aids; (3) workload changes; and (4) other tasks or obtaining additional training. Workload changes as a workplace accommodation was desired the most by the workers.

Limitations of the study were the use of self-report data and the convenience sampling method employed at the orthopedic workshops. The study identified that a majority (64%) of the population surveyed was working at the time of the study. This validated that lower limb amputees can return to the workforce when appropriate workplace modifications are enacted. The article did not mention what happened to the other 36% who did not return to work, some of whom may have never been working. Another unanswered question is the actual job classification of the worker surveyed. The

analyses indicated classification groups and list one as servicing. It is unclear what job classifications fell into this category. Servicing or service industry may include firefighters, police, utility workers or security. Clarity of this group composition would be beneficial and may provide additional relevance to this study.

Of the 652 respondents, 216 had a job at the time of amputation and were working at the time of the Schoppen et al. (2001) study. Of the 216, 118 (55%) retained their same type of job post amputation. The job categories ranged from agrarian to administrative. There was no mention if the 118 individuals were able to perform all of their job duties when they returned to work. Nonetheless, it is encouraging for this researcher to note that there was such a high level of job retention. The Schoppen et al. (2001) study provided validation of the need to assess individuals who are returning to work after a lower limb amputation and to provide reasonable accommodation as needed in an attempt to maintain a higher level of overall health.

In summary, these empirical findings suggest that firefighters with a lower limb injury may be able to return to duty but may require some form of reasonable accommodation or modified duty. Limitations were (1) correlation of job classification or job duties with return to work statistics, that is, are there job classifications that are more difficult for injured workers to return to, and (2) the paucity of empirical literature on lower extremity injury and the effect on the ability of a worker to return to work and the effects on the work environment.

Legal Cases

In two recent letters to the editors published in the *Journal of Occupational and Environmental Medicine,* the authors described occupational medical evaluations for

public safety positions, specifically medical evaluations for firefighters with lower extremity amputations (Budnick, Brachman, Foye, & Stitik, 2007; and Ardaiz, 2007). In the Budnick et al. (2007) letter, the National Fire Protection Agency (NFPA) 1582 standard on comprehensive occupational medical program for fire departments was presented and the authors determined that it did not meet the threshold for application to a broad class of individuals. Specifically, a firefighter with an amputation from a city in New Jersey was deemed by a physician, after a medical evaluation and application of the NFPA 1582 standard, to not meet the medical standards for the firefighter position. Upon appeal, the State Department of Personnel Merit System Board (Board) found that the hiring fire department had not fully adopted the use of the NFPA 1582 standards for their firefighter positions. Additionally, the Board concluded that such individuals (firefighter applicants) must be medically evaluated on an individual basis to determine if the medical condition interferes with the individual's ability to perform the essential duties of the firefighter job. The Board indicated that NFPA as an organization should consider re-evaluating their standards and classify amputations as category B conditional exclusions, not category A absolute exclusions. Currently, the NFPA defines category A exclusions as medical conditions that *would* preclude a firefighter from being able to perform the essential duties of the job and category B exclusions as medical conditions that *could* preclude a firefighter from performing the essential duties of the job. Of importance to note is that Budnick et al. (2007) did not provide a recommendation for a substitute method of evaluation or a recommendation against using NFPA 1582.

In the subsequent letter by Ardaiz (2007), the New Jersey case cited above was expanded on to include the challenges occupational physicians are faced with when

evaluating and determining work fitness for firefighters. Ardaiz (2007) asserted that legal challenges exist and will increase when blanket disqualifications are used in lieu of a physical test to determine work fitness. Historically, carte blanche disqualifications under the guise of public safety such as the risk of danger to self or others were accepted as a valid rationale for restricting the firefighter from work duties. Ardaiz (2007) cited several court cases that challenged the application of blanket disqualifications, the medical evaluation process, and the use of NFPA standards. Ardaiz (2007) concluded that the medical community needs to validate public safety medical standards by means of a survey and determine the effects of certain medical conditions on the job duties for public safety positions, such as a firefighter position. As discussed in some detail in the following paragraphs on case law, the number of court cases and challenges to the application of medical standards and disability violations under the American's with Disabilities Act necessitates that the medical community reexamine employment medical evaluation practices.

A review of court cases retrieved from LexisNexis provided support for the need to determine what medical standards exist and how to apply them in a systematic method for firefighter job duty evaluations. In Bombrys v. City of Toledo (City) (1993), it was decided that the City was restricted from applying blanket disqualifications for police officer positions due to a medical condition, in this case insulin dependent diabetes. Specifically, Mr. Bombrys was a police officer candidate for the City of Toledo police department. During the police officer training process, the City noted that Mr. Bombrys was an insulin-dependent diabetic and subsequently disqualified him for the police officer position stating that the nature of his insulin-dependent diabetes posed a threat to

self and others. The City supported their decision by citing an alleged insulin reaction that rendered Mr. Bombrys confused and non-responsive while he was in the police officer training academy. To fight the decision, Mr. Bombrys received medical care and provided a note from his physician showing that his diabetes was well-controlled. The City admitted that they applied a blanket disqualification of not allowing insulin-dependent diabetics to be City police officers. The court stated that before an employer can refuse to hire an individual due to a disability or potential safety threat to self or others, the employer must make an individualized assessment to determine the duration, severity, and probability that the injury will occur. The employer may perform a comprehensive pre-employment medical evaluation to determine if the applicant can perform the essential duties of the job. The court stipulated that blanket disqualifications violated several laws and regulations that include the American's with Disability Act.

In Spurlock v. United Airlines (1972), Mr. Spurlock alleged that United Airlines discriminated against him due to his black race when he applied for the position of flight officer. The two main disqualification areas for Mr. Spurlock were his college degree and the number of recorded flying hours he had completed. Although this case was a race discrimination case, the court evaluated the hiring process for flight officers at United Airlines. In evaluating the evidence, the court found that United Airlines had no intent to discriminate. The court further stated broadly that pre-employment qualifications must shown to be job-related, which United Airlines was successful in proving. The court discussed pre-employment standards and stated that in such jobs where human risks and economic burden are great, such as flight officer, the courts should proceed with caution before requiring an employer to lower the pre-employment job standards.

Mr. Spurlock lost his case for race discrimination; however, in the ruling the court found that the job qualifications and testing procedures were fair and reasonable, job related, and were uniformly applied for the position. The court went on to affirm that the employment practice was discriminatory, but may be deemed valid when a business necessity could be shown.

For a case involving medical evaluations, an argument may be made that using blanket disqualifications, such as the one used in the Bombrys case, during the medical evaluation process may be deemed discriminatory or a violation unless a valid business necessity or great public safety concern is proved. This case brings up the opportunity for employing agencies to use a blanket disqualification and argue that a firefighter with a lower limb injury, such as an amputation would be at great risk of harm to self and others. However, the outcome of Kapche v. City of San Antonio summarized later in this section indicates otherwise. This contradiction in case outcomes on the application of medical standards and use of blanket disqualifications supports the need for this study.

In Sutton & Hinton v. United Airlines (1997) the plaintiffs, pilot applicants, lost their case for disability discrimination citing an Americans with Disability Act (ADA) violation. The claim was that they were discriminated against due to their vision disability and inability to meet the 20/100 or better vision standard requirement for the pilot position. The court found that having a vision impairment that did not limit a major life activity did not constitute a disability, and therefore did not violate the ADA. Specifically, the plaintiff's uncorrected vision was 20/200 in one eye and 20/400 in the other, which failed to meet the uncorrected vision standard of 20/100 or better. Both individual plaintiffs, twin sisters, were pilots for regional airlines other than United

Airlines. In reviewing the evidence, the courts believed that both plaintiffs were able to mitigate their vision deficiencies with glasses or contact lenses; thus, their vision deficiencies did not limit a major life activity, and therefore the applicants could not be considered as having a disability. This case reinforces the requirements set forth in the ADA regulations that to be a violation of the ADA, the individual must be deemed disabled or perceived as being disabled by the employing agency (www.eeoc.gov/policy/ada.html, April 21, 2009). United Airlines was found not to have regarded or perceived either applicant as disabled. In the case of a firefighter applicant or employee, a claim may be made that a medical condition such as a lower extremity injury constitutes a disability and provides protection under the ADA and that failure to be medically cleared to perform the firefighter job further violates the ADA.

In Kapche v. City of San Antonio (City) (2002) the plaintiff, a police officer candidate, was denied employment for being an insulin-dependent diabetic. This was a blanket disqualification applied by the City and argued as a violation of Americans with Disability Act (ADA) by the plaintiff. In reviewing the case, the courts indicated that the City had a burden to perform an individualized assessment of the applicant's ability to perform the essential job functions and the application of a blanket disqualification was an ADA violation. The court acknowledged that an essential job duty relevant to the case was whether the applicant was qualified and could safely drive a car given his diabetic status. Another issue that received a lot of attention was whether the applicant posed a significant risk to self or others due to his insulin-dependent diabetes. Regardless of the central issues raised, the court held that an individualized assessment of the applicant's present ability to perform the essential functions of the police officer job was required

and mandated by the Americans with Disability Act. The City failed to perform such an evaluation and, therefore, violated the ADA. This case, like Bombrys v. City of Toledo, reinforced the courts determination that use of blanket disqualifications based on the rationale that the medical condition poses a great risk to self and others is in violation of ADA law.

In a ruling contrary to the above decision, Davis v. Meese (1988) held that using a blanket disqualification for insulin-dependent diabetes did not violate the rehabilitation act or the Americans with Disability Act for an investigator position with the Federal Bureau of Investigations. Arguments cited by the court note that an individualized assessment of job performance should be done if valid medical testing exists. The court stated that for this medical condition (insulin-dependent diabetes) there was not enough expert medical evidence to prove that an insulin-dependent diabetic would not have a severe hypoglycemic event while on duty. This alleged lack of medical evidence allowed the court to conclude that public safety could be at risk and allowed the use of the categorical (blanket) disqualification. Additionally, the court stated that there is not a reliable method to assess the future risks associated with the medical condition, that having this exclusion was based on valid medical opinion and health and safety concerns, and if a method, such as an evidence-based guideline, was available in the future to make a determination, then the use of a blanket exclusion would not be valid. Although initially contradictory to the other court decision, this case supports the need for research in the area of evidence-based medical practice and the need to have current evidence based evaluation criteria.

In summary, the review of the case law demonstrated inconsistencies in the

practice and application of medical tests on individuals for various job positions including firefighters. In general, the application of blanket medical disqualifications appeared to be unsupported. However, it was believed that with expert medical opinion on public safety risks, the lack of a valid medical test was considered sufficient to allow the use of a blanket medical disqualification. The review also found that in the letters to the editors, there was no mention of a valid medical test for assessing a firefighter with a lower extremity medical condition. In the present study, current medical evaluation practices, use of medical testing protocols and application of the National Fire Protection Association standards on firefighters was assessed. A primary question for the present study is what medical standards and testing modalities are being applied by healthcare providers when medically evaluating firefighters.

Disability Law

The California Fair Employment and Housing Act (1980) states "employees are protected from discrimination due to an actual or perceived physical or mental impairment that is disabling, potentially disabling, or perceived as disabling" (Thomson & West, 2006, p. 148). Additionally, the employment laws define impairment in broad terms and only require the individual to have a limitation of a major life activity that includes any limitation of physical, mental, social activity, or work, whereas the Americans with Disability Act of 1990 defines impairment as having a substantial limitation or a major life activity. This difference between state and federal law is not subtle. California state law covers individuals with any, minimal to substantial, amount of limitation to a major life activity and federal law requires a substantial limitation of activity. These definitions require careful consideration and application when performing

assessments for returning an employee to work. The laws also afford the employee the right to engage in the interactive process (exchange in communication between the employee and the employer on the employee's request for accommodation) with the employer and make it a matter of law that the employer engage in the interactive process with the employee (Thomson & West, 2006).

These statutes are relevant to the present study in that employees classified as having a disability are a protected class within state and federal laws as cited above. A firefighter returning to work after a lower extremity injury would need to be evaluated for work limitations or ability/inability to perform the essential duties of the job in a manner that meets regulatory standards. An improper or inadequate evaluation of the employee could result in litigation and sanctions to the employing organization.

The National Fire Protection Association (NFPA) 1582 standard on comprehensive occupational medical program for fire departments that may be used by fire agencies does not mitigate the need for the employer to perform an individualized medical assessment when determining if the firefighter can return to work and perform the job duties. NFPA may dictate that a firefighter with a lower extremity injury cannot perform certain essential job duties; however this is informational and can be used as a guide by the health care professional, but cannot replace a medical assessment of the individual.

Theoretical Framework and Evidence-Based Practice

Theoretical Framework

Role theory provided the theoretical underpinning of this study along with the concepts and methodology for the development of evidence-based practice. In this

section a brief history of role theory will be presented showing the development from Mead and colleagues (as cited in Burr, Leigh, Day, & Constantine, 1979) in sociology through Meleis (1975) in nursing. Appropriate concepts from role theory will then be discussed in relationship to work capacity assessment of firefighters with lower extremity injuries.

Role theory was developed as a sub-theory from symbolic interaction and has continued to evolve as a theory since its origination. Authors such as Mead, Biddle, Linton and Moreno applied the phenomenon of role or variations thereof in their works dating from 1934 – 1979 (Burr, Leigh, Day, & Constantine, 1979). Role was developed as a technical construct in the social science literature. Role theory dealt with role as applied to social norms (behavior based roles), individual positions, or individual statuses. It is the latter use of role where role performance was applied to this research project.

Role performance was selected for application to this research study based on its significance, utility, and application to the occupational health nursing arena, in particular the application of assessing a firefighter's ability to perform essential duties of the job or assigned role. However, role performance applied in the occupational health environment was difficult to find in the literature. There was a lack of literature as a whole on the concept and application of assessing role performance as a functional assessment of tasks.

To assist with the understanding of the concept of role performance, this researcher developed an explanatory framework. The framework, as shown in diagram form in Figure 1, begins when an injury occurs. The injury may be due to a work or non-

work related event. The firefighters job duties or essential functions are influenced by the work environment and policy such as the Americans with Disability Act (www.eeoc.gov/policy/ada.html, April 21, 2009) and the National Fire Protection Association. Role performance is the firefighter's ability to do the job duties or essential functions. The same policies relating to the job duties affect the medical evaluation. If evidence-based guidelines were available, the guideline would influence how the assessment was completed (Melnyk & Fineout-Overholt, 2011). An evidence-based guideline would have nursing and medical practice implications and it would drive public and employment policy in the area of return-to-duty evaluations.

Role performance was delineated by Kopec and Esdaile (1998) in an article with reference to role performance in persons with back pain. The article stated "there is little relative data on the effect of back pain on occupational role functioning" (p. 373). This statement suggested that other professionals have experienced similar difficulty in locating application of role performance (function) in the literature. Additionally, it was implied in the article that there is a paucity of professional or empirical literature on the concept of role performance. The articles reviewed were not complete in their assessment and use of the term role performance. No published concept analysis articles on the concept of role performance were found. The absence of relevant literature underscores the need to further develop and define the concept of role performance. In the occupational health setting, role performance may be defined as the individual's (worker) ability to perform the essential functions of their role or job.

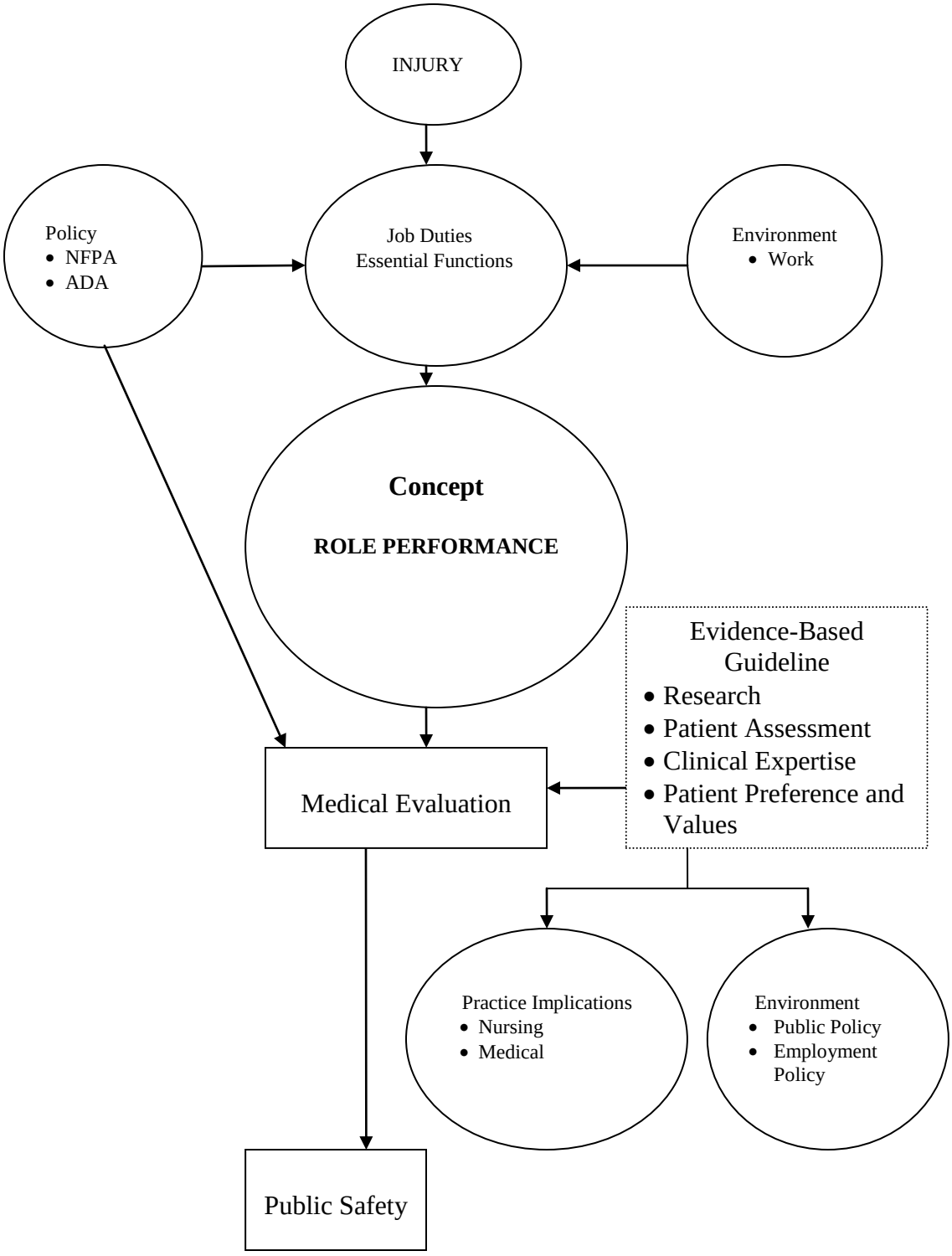

Figure 1. Explanatory Framework

Role is defined in the literature in various ways. The main thrust being that of a pattern of wants, goals, and actions of a position (Robischon & Scott, 1969) or behaviors, expectations, and actions (Hardy & Conway, 1988). Roles are not always clearly defined and may be learned from intentional or incidental interactions (Robischon & Scott, 1969). When the roles of workers, such as firefighters, are delineated and explained to the worker and healthcare provider (nurse), there is an opportunity for clear understanding. Robischon and Scott (1969) further explain that when there is a lack of clarity of the role expectations (essential functions), the confusion over firefighter functions can result in conflict over the firefighter's rights to return to work, and tension between health professionals, workers, and employers over appropriate designation of the firefighters work status.

In an article by Burr (1972) on role transitions, it was implied that role clarity is imperative for a positive outcome to be achieved when assessing role performance. To assess a firefighter's role performance, it is the essential functions of the job that provide that role clarity. When applying this concept to nursing practice, the essential functions are provided to the firefighter and the nurse to accurately assess the individual's role performance.

Burr (1972) provided an in-depth analysis of the process of role transition. Phenomena such as role strain and role conflict were discussed. Specifically, role strain may arise when an individual has difficulty meeting the role expectations. Role conflict may arise when there are inconsistent expectations. To address these issues for the implementation of research on the role performance of a firefighter, the essential functions of the job have been delineated and supported by the National Fire Protection

Association standards promulgated in 2007. Further, the desired outcome for the nurse and the worker is positive goal attainment. Therefore, to do the full firefighter job, the individual must be able to perform the essential functions of the role (role performance). Meleis (1975) used role from the symbolic interactionist perspective and stated that role is a "way of coping with an imputed other role" (p. 264). In this application, role takes into account the individual's situation which helps to define the current role. Meleis (1975) described the phenomena of role insufficiency and role supplementation from a symbolic interactionist point of view. Within the conceptual framework, both role clarification, having the knowledge of the role characteristics, and role transition, incorporating necessary changes in abilities and expectations, occur. Both of these concepts have application to this study and have been applied in the conceptual-theoretical-empirical model. Role clarification is the application and explanation of the job's essential functions to the individual and medical personnel performing the medical evaluation. Role transition is the firefighter's ability to recognize the physical changes that occurred as a result of the injury. The firefighter may or may not be able to adapt and perform the job duties.

According to Meleis (1975), role insufficiency occurs when there is a misunderstanding of the role or when social events affect the behavior of the individual during role changes. In the case of a firefighter, the individual firefighter might experience role insufficiency when the essential functions to be performed are not clearly explained or understood. The use of role insufficiency as a construct in the conceptual model provides an added element of refinement to the research design.

Evidence-Based Practice

The systematic use of evidence-based practice takes into consideration the practitioner's clinical expertise, opinion, and current research (Melnyk & Fineout-Overholt, 2011). Therefore, clinical decision making that is evidence-based may be derived from various sources. Melnyk and Fineout-Overholt (2011) identified four components of evidence-based practice. Although randomized clinical trials have been labeled the strongest type of evidence, there are less stringent methods that constitute a valid process for developing evidence-based guidelines and standards. The four components of evidence-based practice listed by Melnyk and Fineout-Overholt (2011) include (1) evidence from research and expert panels, (2) evidence from patient assessment and healthcare resources, (3) clinical expertise, and (4) patient preference and values. These components are integrated into the theoretical framework applied to this study as outlined in Figure 1.

To pursue the development of evidence-based practice, a person must collect pertinent clinical practice guidelines, integrate clinical expertise, and critically analyze the validity and application of the data. Both quantitative and qualitative research can be used to develop evidence-based guidelines. Because there are several components of evidence-based practice, it is imperative that research be conducted in a manner that gathers data from each of the areas. This study gathered data from medical professionals, firefighters, and fire agencies as the foundation for establishing evidence-based practice.

Summary of Literature Review

In this chapter, a review of expert opinion, legal, theoretical, empirical and interpretive literature has been provided that showed the need to evaluate the functional

abilities of individuals with lower extremity injuries, described the legal regulations behind work place medical assessments, provided a basis for the application of role theory as the theoretical framework for this study, and introduced evidence-based practice. State and federal disability laws and disability case law were described showing areas of discrepancy between the regulations and the lack of application of the regulations in the workplace. The literature review points out the need for greater specificity in firefighter assessments and in policies that cover the injured workers return to work. Additionally the review of the literature revealed some important gaps in our research knowledge. These gaps are the lack of empirical literature on work-related lower extremity assessment criteria and firefighter work fitness evaluations.

Conclusion

This chapter contained a comprehensive review on empirical, policy, and theoretical literature. The topics included criteria for work place accommodation and physical assessment, physical examination and testing methods, study specific legal cases, and disability law. Additionally, evidence-based practice research was reviewed and applied to the study. The summary of the literature review captured the essence of the reviewed literature and identified potentially important knowledge gaps in the area of work-related lower extremity assessment criteria and firefighter work fitness evaluations. This study aims to fill in some of the gaps and contribute to the body of knowledge on firefighter medical evaluations.

CHAPTER THREE

METHODOLOGY

The purpose of this study was to establish the foundation for developing an evidence-based guideline to evaluate a firefighter's ability to return to work after a lower extremity injury. In this chapter, the research design and philosophical perspective that provide support for the methods chosen will be described. Research aims aligned with questions are provided along with a description of sampling, measurement, data collection, and analyses used in the study.

Research Design

A descriptive, comparative, cross-sectional survey was used to achieve the purpose of the study. To meet the aims of the study, two group-specific electronic questionnaires were used. Questionnaire I (Appendix A) surveyed healthcare providers who practice in the State of California and have professional work experience performing return-to-duty and/or work related medical evaluations on employees and/or firefighters; and, questionnaire II (Appendix B) surveyed career firefighters in the State of California.

Philosophical Perspective Supporting Research Design

Within philosophical inquiry, epistemology is how people come to know. Sources for knowledge claims have provided this researcher with a background for the further development of empirical understanding relative to the purpose of this study. Based on the review of research, including legal and case specific literature, gaps in knowledge have been identified. Application of role theory and an evidence-based practice model have further informed the purpose of this study. Finally, a brief overview of the epistemological perspective of realism suggests that although some truths have been

identified, there remains a need for more systematic and scientific information to strengthen the evidence base for work capacity evaluation of firefighters with lower extremity injuries. Findings from this study will provide a stronger basis of knowledge through describing the current application of NFPA standards by firefighters and healthcare providers, essential functions of the firefighter job as described by the firefighter respondents, and current diagnostic testing and assessment modalities used in assessing a firefighter's ability to resume work duties. Understanding current knowledge and practice adds to our understanding of the "truth" and could lead to the development of an evidence-based assessment guideline and policy revisions that are more closely aligned to the "truth" or reality of firefighter role performance following injury.

Hussey (2000) defines realism as scientific theories that are true or false based on their ability to describe the real world, that a definite world structure exists independent of how theories are defined (the world is what it is, regardless of the theories), and that it is possible to obtain a substantial amount of reliable and observed information about the world. Realism, as a philosophy, is based on core principles of truth, objective truth, and the use of objective evidence to support or refute truth (Wilson & McCormack, 2006). It is this author's belief that realism is applicable to science, specifically nursing science. Hussey (2000), in fact, supports this belief, noting that philosophical realism is appropriate to the application to nursing science as an alternative to positivism, interpretivism, hermenutics, and phenomenology.

The phenomenon of role performance applied to the present study involves the health care provider's capacity to assess the firefighter's ability to perform the essential functions of the job. Realism is the lens through which this researcher views reality, thus

empirical methods were used in this study to discover objective and measurable "truths" about assessment of firefighters return to work abilities.

The methods used to collect the evidence (data and results analysis) include the use of two group-specific electronic questionnaires. Additionally, data were analyzed using descriptive and inferential statistics. Realism as a philosophical position is applicable to the study as aims and research questions were established and answered using conventional research methodology.

Assumptions

1. A firefighter's role performance may be compromised; however, the firefighter may be able to perform the essential functions of the job.
2. Firefighters will be able to identify essential job duties.
3. The National Fire Protection Association 1582 standard on the comprehensive occupational medical program for fire departments is not adopted and in use by the majority of fire agencies.
4. Medical tests can determine a firefighter's ability to perform essential functions.
5. Healthcare professionals will use an evidence-based guideline when developed.

Research Aims and Related Questions

Research questions applied to this study to address each aim are:

Aim 1

Determine testing and assessment modalities currently being used by healthcare providers when evaluating a firefighter's ability to return to work after an injury, particularly lower extremity injuries.

1. How frequently would healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use testing and assessment modalities when evaluating a firefighter's ability to return to work after a lower extremity injury?
2. How frequently would healthcare providers without professional work experience performing return to duty or work related medical evaluations on firefighters use testing and assessment modalities when evaluating a firefighter's ability to return to work after a lower extremity injury?

Aim 2

Determine the use and adoption of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments.

3. What percentage of firefighters work in fire departments where the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments has been adopted?
4. What percentage of fire department chiefs believe their fire department has adopted the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments?
5. How frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after an injury?
6. How frequently do healthcare providers with professional work experience

performing return to duty or work related medical evaluations on firefighters use the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after a lower extremity injury?

Aim 3

Determine whether healthcare providers and firefighters differ in familiarity with the National Fire Protection Association standards.

7. Do various types of healthcare providers differ in familiarity with the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments?
8. Do firefighters, non-officers, and officers differ in familiarity of the National Fire Protection Association fire agency standards?
9. Do firefighters, non-officers, and officers differ in familiarity with the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments?
10. Is there a difference in familiarity between healthcare providers (providers combined) and firefighters (ranks combined) with the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments?

Aim 4

Describe essential job functions for a firefighter job from the firefighter's perspective.

11. What percentage of firefighters (non-officers compared to officers) report that a unique task is an essential duty for *their* job as a firefighter?

12. What percentage of firefighter respondents (non-officers and officers combined) report that a unique task is an essential duty for *any* firefighter job?
13. Is there a difference in the essential functions reported by firefighters (non-officers and officers) by the type of fire department where the firefighter is employed?
14. Do firefighters (all ranks combined) and healthcare providers (providers combined) differ on whether healthcare providers should use a list of the firefighter's job duties/essential functions unique to each fire department when determining if a firefighter can do his/her firefighter job safely?
15. Do firefighters (non-officers compared to officers) with and without a history of a workers compensation claim for a lower extremity injury report different essential functions for a firefighter job?

Aim 5

Determine the use of firefighter job duties or essential function lists by healthcare providers.

16. How frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the National Fire Protection Agency 1582 standard on comprehensive occupational medical program for fire departments essential job function list when evaluating a firefighter who is returning to work after an injury?
17. How frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the firefighter's actual fire departments job duties or essential functions list when performing a return to duty evaluation on a firefighter?

Aim 6

Determine the beliefs and use of evidence-based assessment guidelines by healthcare providers.

18. Do healthcare providers believe an evidence-based guideline would be useful when evaluating firefighters returning to work after a lower extremity injury?
19. How frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use evidence-based guidelines when performing return to duty evaluations on firefighters?

Method

To establish the foundation for developing an evidence-based guideline for evaluating a firefighter's ability to return to work after a lower extremity injury, data were collected from a non-probability sample of healthcare providers and firefighters in California. An anonymous on-line survey tool was used to survey the two groups.

Sample

The targeted populations for the study were healthcare providers (nurse practitioners, physicians, physician assistants, and registered nurses) and career firefighters working in the State of California. For the healthcare providers, work experience in occupational medicine/health was highly desired along with professional work experience performing medical evaluations on firefighters. For the firefighter sample, career firefighters from all ranks within the various fire departments were sought.

The sampling plan employed for the study was a non-probability purposive sample. Participation inclusion and exclusion criteria were registered nurses, physicians,

physician assistants and nurse practitioners in California with professional work experience performing work related return to duty or medical evaluations on employees or firefighters and career firefighters (all ranks) in California. Even though the sample included healthcare providers without professional work experience with firefighters, they perform similar medical evaluations on other types of employees. Given the nature of occupational health, it is likely that this group may at some point in time perform medical evaluations on firefighters. The American Association of Occupational Health Nurses reported 466 occupational health nurse members in California (L. Sears, personal communication, May 12, 2010). The American College of Occupational & Environmental Medicine reported 300 physician members and 37 affiliate/associate members in California (M. Hoffman, personal communication, May 12, 2010). Affiliate and associate members include nurse practitioners, physician assistants, and occupational health nurses. The California Professional Firefighters organization reports 30,000 career front-line firefighter and paramedic members in California (http://www.cpf.org, April 10, 2011).

Protection of Human Subjects

The study posed minimal risk and the privacy and confidentially of information was maintained. Instruments used to collect data did not ask for participant name, the name of the healthcare provider's employer, or the name of the fire department where the firefighters worked. Electronic data was password protected in SurveyMonkey. Application for approval of the study was submitted to the Loma Linda University Institutional Review Board. The study was approved and granted exempt status (Appendix C) prior to commencing recruitment or data collection. Healthcare providers

and firefighters were solicited to participate using electronic communication, postal mail, in person communication, and telephone calls.

Participants completed an electronic survey using SurveyMonkey's (SM) web-based service. Participants accessed the SM website via computers. The internet protocol address for computers used by the participants was not provided to the researcher. SM did not link personal identification, name, email address, or IP address to the data collected.

Development of the Questionnaires

To develop the two questionnaires (one for healthcare providers and one for firefighters), literature was reviewed, and applicable information was used as survey content. Demographic questions were asked at the beginning of each survey and contained questions on gender, ethnicity, work experience, age, and work location. For the surveys, job title or firefighter rank was asked, respectively.

For the healthcare provider questionnaire, questions included familiarity and use of the National Fire Protection Association (NFPA) 1582 standard, use of evidence-based guidelines, and use of diagnostic testing and assessment modalities when evaluating a firefighter returning to work after a lower extremity injury. The diagnostic testing and assessment criteria applied to the study were derived from the literature contained in chapter two of this study. For clarity, the testing and assessment modalities are listed in Table 4 along with the referenced sources.

For the firefighter questionnaire, questions included familiarity and use of the National Fire Protection Association (NFPA) 1582 and the NFPA fire agency standards. The NFPA 1582 document was used as the basis for developing the questions on

essential job functions to meet aim four of the study (describe the essential job functions for a firefighter job from the firefighter's perspective).

Table 4

References for the Testing and Assessment Modalities.

Modality	Reference
Obtain a History	LeBlond et al. (2009)
Treadmill	Radomski and Latham (2008)
Flexibility	Radomski and Latham (2008)
Muscle Strength	Radomski and Latham (2008)
Range of Motion	Donatelli and Wooden (2010)
Compare Non-injured Extremity to Injured Extremity	Donatelli and Wooden (2010)
Neurovascular	Donatelli and Wooden (2010)
Postural Stability	Sobeih et al. (2006)
Abduction/Adduction	Donatelli and Wooden (2010)
Gait	Donatelli and Wooden (2010)
Work Simulation	Radomski and Latham (2008)
Dynamometer	Gibson and Strong (2003)

Preliminary pilot testing occurred to evaluate and refine the written survey tool (Appendix D and E) that was used to develop the on-line questionnaires. The pilot testing process consisted of a review, critique, and discussion with two focus groups, occupational medicine physicians and firefighters (different ranks). The purpose of the pilot testing was to determine face validity, ease of use, and applicability of the survey

content.

A firefighter known to the researcher who worked in a local fire department was contacted and asked to participate in the pilot testing process. As a result, a group of four firefighters (different ranks) were brought together in a focus group to discuss, review, and refine the firefighter survey tool. After the tool was revised, a firefighter from another fire department and not part of the initial focus group was contacted and asked to review and complete the survey. The firefighter recorded the time it took to complete the survey so this information could be used to advise future participants on the time estimate. The same process occurred for healthcare providers except there were five occupational medicine physicians who participated in the initial healthcare provider focus group and another occupational medicine physician who reviewed, timed, and completed the pilot survey tool. For their support and participation, food and drink was provided to each focus group participant during pilot testing.

The written questionnaires were used to develop two on-line questionnaires in SurveyMonkey. The healthcare provider on-line survey consisted of 62 questions with 11 specific questions answered by providers with professional work experience performing return to duty or work related medical evaluations on firefighters. The firefighter on-line survey consisted of 60 questions with five specific questions answered by firefighters (all ranks) who had filed a worker's compensation claim for a lower extremity injury they sustained on duty as a firefighter. For the specific questions answered by the select group of participants, system logic was used in SurveyMonkey to force the non-targeted sample to skip these questions (the participant was not advised that they skipped any questions). The on-line questionnaires were designed so that the participants could exit at anytime.

When this occurred, if they wanted to re-start the survey, they would have to start over from question one. In addition, each question was required to be answered; therefore, no questions could be missed or skipped unless the participant exited the survey. All of the study data was collected using the on-line questionnaires in SurveyMonkey.

Participant Recruitment

To solicit healthcare provider participation, potential participants were identified, and the researcher contacted the participants using electronic communication, postal mail, telephone, and in person and to describe the nature of the study. The Loma Linda University Institutional Review Board approved study participation letter was provided to the healthcare provider individually and in some cases for dissemination within their agency (Appendix F). To solicit occupational medicine physician participation, the researcher attended the Western Occupational and Environmental Medical Association conference that occurred during the study period. To heighten registered nurse and nurse practitioner participation, a mailing list was obtained at no-cost from the California State Association of Occupational Health Nurses. The mailing list contained names and email addresses for nurse practitioner and registered nurse members of the professional nursing organization. The nurses and nurse practitioners were contacted via email and asked to participate. To increase physician participation, a mailing list was purchased from the Western Occupational and Environmental Medical Association. The California only mailing list contained labels pre-addressed with physician, physician assistant, nurse practitioner, registered nurse, and other member names and addresses. The labels were screened to remove those with non-healthcare provider credentials. Two mailings, 364 and 350 follow-up to potential participants, respectively, were sent approximately three

weeks apart. Three letters were returned undeliverable from the first mailing, and two were returned from the second mailing.

To solicit participation, the researcher contacted firefighters and fire departments using electronic communication, postal mail, telephone, or in person to describe the nature of the study. A supportive contact within the fire department was identified and assisted the researcher with notifying other firefighters about voluntary participation in the study. The Loma Linda University Institutional Review Board approved study participation letter was provided to the contact at the fire department and for dissemination within their agency (Appendix G). Additionally, a few firefighters contacted other fire agencies via phone and email and advised them of the opportunity to participate in the study. When this was known, the researcher asked the firefighter to provide the invitation letter to the new fire agency as an introduction and provide the researcher with contact information for proper follow-up. Additionally, the researcher attended the Western Occupational and Environmental Medical Association conference that occurred during the research period. As part of the conference, the researcher attended a pre-conference specialty work-site session that was conducted at the Orange County Fire Authority. Attendance at this session provided the researcher access to firefighters and the Orange County Fire Authority (fire department) not previously known to the researcher. A firefighter contact was made within this agency which facilitated firefighter participation in the study. A food basket was sent to the Orange County Fire Authority for their support and participation in the study.

Method of Analysis

Data was complied into an SPSS (version 19) data file directly from SurveyMonkey. To analyze data, the SPSS values (responses) were converted to nominal and ordinal scales so that quantitative and qualitative variables could be evaluated and analyzed. Descriptive and inferential statistics were used to analyze the data and answer the research questions (Table 5). For group comparisons (e.g., healthcare provider responses versus firefighter responses) chi-square tests of independence were used (Dawson & Trapp, 2004). These chi-square tests were used to analyze research questions 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, and 19. Alpha for all tests was 0.05.

When evaluating differences between firefighter ranks, it was assumed that management or officer-level firefighters (captain and above) would have differences in expectations of the firefighter job duties and familiarity with the National Fire Protection Association standards due to their increased knowledge and use of policy and procedures governing firefighter roles and practices.

Table 5

Statistical Tests Used for Research Questions

Research Question	Type of Analysis
1 through 19 (All)	Descriptive statistics (frequencies and percentages)
7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19	Chi-square test of independence

CHAPTER FOUR

RESULTS

Preparation of the Data

The survey data from the two SurveyMonkey (SM) on-line questionnaires were downloaded directly from SM into SPSS (version 19). In the SPSS format, the data were sorted and reviewed for completeness. There were a total of 98 healthcare providers and 443 firefighters who initiated the study. Exclusion criteria established for both groups were applied, and cases were removed as follows: For healthcare providers, two participants were removed as they did not practice in the State of California, three were removed as they did not agree to participate in the study, and five were removed as they did not have professional work experience performing return to duty or work-related medical evaluations on employees or firefighters. Among the firefighter participants, six were removed as they did not work in the State of California, one did not agree to participate in the study, and ten were removed as they were paid-call, seasonal, or volunteer firefighters.

The SPSS data file with the exclusion criteria applied was reviewed to determine incomplete questionnaires and the extent of missing data. The data sets were reviewed and evaluated to determine composition of the samples at various sections of the surveys. After review, a determination was made to remove all of the incomplete cases from both datasets to eliminate missing data from the final analysis. Data were considered missing if the respondent exited without completing the survey. Missing data would not be considered missing at random as respondents were required to answer all questions sequentially to progress through the survey. Therefore, they could not randomly decide to

not answer a question. The attrition count for each sample was 25 for healthcare providers and 114 for firefighters.

To prepare the final dataset for analysis, many of the variables were coded within SPSS: for example, a yes response was coded to a 1 and a no response was coded to a 2. For the Likert scale responses (strongly disagree to strongly agree, or never to always) variables were coded 1 to 4, with 1 representing strongly disagree or never and 4 representing strongly agree or always. Before further analysis, the variable coding was verified and confirmed for all responses.

Sample Demographics

For the two sample groups, healthcare providers and firefighters in California, the total number of participants after the application of exclusion criteria and the removal of cases with incomplete data was 63 healthcare providers and 312 firefighters.

Description of the Healthcare Provider Sample

The healthcare provider sample included 28 registered nurses, 13 nurse practitioners, and 22 physicians (Table 6). Although physician assistants were potential participants, no physician assistants enrolled in the study. Of the 22 physicians, all were nationally boarded in their medical specialty, with 18 boarded in occupational medicine by the American Board of Preventive Medicine. Thirty-four of the 41 nurse practitioners and registered nurses were nationally boarded in their nursing specialty, with 30 boarded by the American Board for Occupational Health Nurses. In total, 59 of the 63 respondents reported occupational medicine/health as their primary specialty, which was the target population for the study.

Table 6

Healthcare Provider Descriptive Statistics, Categorical (N = 63).

Variable	*n*	%
Age		
20-30	1	1.6
31-40	3	4.8
41-50	8	12.7
51-60	26	41.3
60+	25	39.7
Gender		
Male	24	38.1
Female	39	61.9
Ethnicity		
African-American	3	4.6
Asian/Pacific Islander	5	7.9
Caucasian	53	84.1
Hispanic	1	1.6
Native American	1	1.6
Other		
Job Title		
Nurse Practitioner	13	20.6
Physician	22	34.9
Registered Nurse	28	44.4
Years Practicing in Profession		
0-5	8	12.7
6-10	8	12.7
11-15	8	12.7
16-20	6	9.5
21+	33	52.4
Years Performing Work-related Employee Medical Evaluations		
0-5	15	23.8
6-10	11	17.5
11-15	7	11.1
16-20	13	20.6
21+	17	27.0

Table 6 *continued*

Primary Specialty	1	1.6
Family Medicine	59	93.7
Occupational Medicine/Health	3	4.8
Other		
Current Practice Setting		
Group Medical Practice	4	6.3
Occupational Medicine Clinic	17	27.0
Corporate Occupational Medical Clinic	18	28.6
University Medical Clinic	2	3.2
County or City Medical Clinic	6	9.5
Hospital-Based Clinic	8	12.7
Solo Medical Practice	0	0
Other	8	12.7
Average Number of Return to Work Evaluations Performed in a Month		
0-50	56	88.9
51-100	1	1.6
101-200	3	4.8
200+	3	4.8
Work Location		
Alameda County	2	3.2
Kern County	2	3.2
Los Angeles County	14	22.2
Orange County	3	4.8
Riverside County	6	9.5
San Bernardino County	5	7.9
San Diego County	7	11.1
San Francisco County	1	1.6
Ventura County	0	0
Other	23	36.5

Of the 63 healthcare provider respondents, 51 were 51 years of age or older. The majority (52.4%) of the healthcare provider participants had been working in their profession for 21 or more years, and 56 of the 63 (88.9%) estimated they perform zero to 50 return to work evaluations per month. Gender was distributed in the sample as 61.9%

female and 38.1% male. The majority (84.1%) of the healthcare provider sample was Caucasian (n = 53).

Description of the Firefighter Sample

For the firefighter sample (N = 312), 156 were non-officer ranks (firefighter to engineer), 153 were officer ranks (captain to fire chief), and 3 were ranked "other" (Table 7). For the non-officer ranks (firefighter to engineer), there were 44 firefighters, 62 firefighter/paramedics, and 50 engineer respondents. For officer ranks (captain to fire chief), there were 104 captains, 22 battalion chiefs, 11 division chiefs, 8 deputy/assistant chiefs, and 8 fire department chiefs. There were 3 firefighter participants that indicated "other" as their firefighter rank.

Among all participants, 122 (39.4%) were between 41 and 50 years of age, and 163 reported 21 or more years of work experience as a firefighter. The majority (n = 302) of all firefighter respondents were male, and only 10 or 3.2% were female. A review of the ethnicity data showed that 233 (74.7%) were Caucasian, 6 were Asian/Pacific Islander, and 6 were African American. Hispanics accounted for 15.1% (n = 47) of the firefighter sample, and 2.6% (n = 8) were Native American.

Table 7

Firefighter Descriptive Statistics, Categorical (N = 312).

Variable	*n*	%
Age		
20-30	38	12.2
31-40	77	24.7
41-50	122	39.4
51-60	73	23.4
60+	2	0.6
Gender		
Male	302	96.8
Female	10	3.2
Ethnicity		
African-American	6	1.9
Asian/Pacific Islander	6	1.9
Caucasian	233	74.7
Hispanic	47	15.1
Native American	8	2.6
Other	12	3.8
Present Rank		
Firefighter	44	14.1
Firefighter/Paramedic	62	19.9
Engineer	50	16.0
Captain	104	33.3
Battalion Chief	22	7.1
Division Chief	11	3.5
Deputy/Assistant Chief	8	2.6
Fire Department Chief	8	2.6
Other	3	1.0
Years as a Firefighter		
1-5	35	11.2
6-10	52	16.7
11-15	34	10.9
16-20	28	9.0
21-30	123	39.4
31-40	40	12.8

Table 7 *continued*

Type of Fire Department		
County Fire Department	170	54.8
Rural Fire Department	1	0.3
State Fire Department	0	0
Federal Fire Agency	0	0
Urban or City Fire Department	138	44.2
Other	3	1.0
Work Status		
Career	312	100
Work Location		
Los Angeles County	45	14.4
Orange County	96	30.8
Riverside County	30	9.6
San Bernardino County	130	41.7
San Diego County	7	2.2
Other	4	1.3

Results in Relation to Each Research Question

Aims and Research Questions

The aim for research questions one and two was to determine testing and assessment modalities currently being used by healthcare providers when evaluating a firefighter's ability to return to work after an injury, particularly lower extremity injuries. Research question one asked, how frequently would healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use testing and assessment modalities when evaluating a firefighter's ability to return to work after a lower extremity injury? It was important to assess the current testing and assessment practices among the healthcare providers with firefighter assessment experience. Variation in practices could mean that a standard methodology is not being used when evaluating a firefighter's ability to return to work

after an injury. Almost all, 29 out of 30, of the healthcare providers with professional work experience performing return to duty or work-related medical evaluations on firefighters would always obtain a history of how the injury occurred. Of the 30 healthcare provider respondents, 14 would sometimes use some type of diagnostic testing modalities, 12 would often use some type of diagnostic testing modalities, and 4 would always use some type of diagnostic modalities when evaluating a firefighter returning to work after a lower extremity injury (Table 8). Moreover, all of the healthcare providers would test flexibility, muscle strength, range of motion, compare the non-injured extremity to the injured extremity, evaluate abduction and adduction, and perform a gait assessment. How often they would use these modalities ranged from sometimes to always. A treadmill test would be used sometimes to always, as part of the evaluation by only 17 of the 30 respondents. Twenty-one of the healthcare providers would always perform a neurovascular assessment, and 22 would always assess postural stability. A work simulation test based on a specific job duty would be used sometimes, often, or always by 26 of the respondents, but not by 4. The use of a dynamometer to assess muscular strength would not be used by 16 of the healthcare providers.

Research question two asked, how frequently would healthcare providers without professional work experience performing return to duty or work related medical evaluations on firefighters use testing and assessment modalities when evaluating a firefighter's ability to return to work after a lower extremity injury? This question was asked and analyzed to determine whether there was variation in the use of testing and assessment modalities among healthcare providers with and without professional work experience when performing return to duty or work related medical evaluations on

Table 8

Healthcare Providers with Firefighter Evaluation Work Experience Reported Use of Testing and Assessment Modalities (n = 30).

Modality	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Obtain a History	0	0	0	0	1	3.3	29	96.7
Diagnostic Testing Modalities	0	0	14	46.7	12	40.0	4	13.3
Types of Diagnostic Tests								
Treadmill	13	43.3	12	40.0	4	13.3	1	3.3
Flexibility	0	0	3	10.0	6	20.0	21	70.0
Muscle Strength	0	0	2	6.7	6	20.0	22	73.3
Range of Motion	0	0	2	6.7	4	13.3	24	80.0
Compare Non-injured to Injured	0	0	1	3.3	4	13.3	25	83.3
Neurovascular	1	3.3	6	20.0	2	6.7	21	70.0
Postural Stability	2	6.7	2	6.7	4	13.3	22	73.3
Abduction/Adduction	0	0	5	16.7	4	13,3	21	70.0
Gait	0	0	2	6.7	2	6.7	26	86.7
Work Simulation	4	13.3	22	73.3	2	6.7	2	6.7
Dynamometer	16	53.3	11	36.7	2	6.7	1	3.3

firefighters. A total of 24 of the 33 healthcare providers without professional work experience with firefighters indicated they would always obtain a history of how the injury occurred (Table 9). Six of the providers would never use diagnostic testing modalities, whereas, 81.9% (*n* = 27) would use diagnostic testing modalities, sometimes

(*n* = 15), often (*n* = 3) or always (*n* = 9) when evaluating a firefighter returning to work after a lower extremity injury. A treadmill test would be used, sometimes to always, as part of the evaluation process by 21 of the 33 respondents. The majority of these healthcare providers would always use the following modalities: 1) test flexibility (*n* = 23); 2) test muscle strength (*n* = 24); 3) evaluate range of motion (*n* = 24); 4) compare the non-injured extremity to the injured extremity (*n* = 24); 5) perform a neurovascular assessment (*n* = 18); 6) assess postural stability (*n* = 22); 7) evaluate abduction and adduction (*n* = 21); and 8) perform a gait assessment (*n* = 23). A work simulation test based on a specific job duty would be used sometimes, often, or always by 72.7% but not used by 9 of the 33 healthcare providers. The use of a dynamometer to assess muscular strength would not be used by 11 of the 33 healthcare providers without firefighter evaluation work experience.

An analysis of the data for healthcare providers with and without professional work experience performing return to duty or work related medical evaluations on firefighters showed that 100% of healthcare providers with the work experience would, sometimes to always, use diagnostic testing modalities when evaluating a firefighter returning to duty after an injury, whereas 81.8% of healthcare providers without such experience would use diagnostic testing modalities, sometimes to always (Tables 8 and 9). Moreover, 100% (*n* = 30) of healthcare providers with this work experience would, sometimes to always, test flexibility, muscle strength, and range of motion and compare the non-injured extremity to the injured extremity. Only 88.6% (*n* = 27) of healthcare providers without this work experience would, sometimes to always, use these same testing modalities. In general, healthcare providers with work experience on firefighters would use testing

modalities more often than the other healthcare providers. All of the healthcare providers would obtain a history of how the injury occurred, sometimes, often or always.

Table 9

Healthcare Providers Without Firefighter Evaluation Work Experience Reported Use of Testing and Assessment Modalities (n = 33).

Modality	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Obtain a History	0	0	1	3.0	8	24.2	24	72.7
Diagnostic Testing Modalities	6	18.2	15	45.5	3	9.1	9	27.3
Types of Diagnostic Tests								
Treadmill	12	36.4	15	45.5	3	9.1	3	9.1
Flexibility	3	9.1	2	6.1	5	15.2	23	69.7
Muscle Strength	4	12.1	1	3.0	4	12.1	24	72.7
Range of Motion	4	12.1	1	3.0	4	12.1	24	72.7
Compare Non-injured to Injured	4	12.1	1	3.0	4	12.1	24	72.7
Neurovascular	4	12.1	3	9.1	8	24.2	18	54.5
Postural Stability	3	9.1	3	9.1	5	15.2	22	66.7
Abduction/Adduction	3	9.1	2	6.1	7	21.2	21	63.6
Gait	3	9.1	1	3.0	6	18.2	23	69.7
Work Simulation	9	27.3	11	33.3	4	12.1	9	27.3
Dynamometer	11	33.3	10	30.3	4	12.1	8	24.2

The aim for research questions three, four, five, and six was to determine the use

and adoption of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments. Question three asked, what percentage of firefighters work in fire departments where the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments has been adopted? The majority (57.4%) of all firefighter respondents (ranks combined) reported that they did not know if the National Fire Protection Association (NFPA) 1582 standard on comprehensive occupational medical program was adopted in their fire agency (Table 10). A total of 71 (22.8%) of the 312 firefighter respondents (ranks combined) indicated their fire departments have adopted the standard and 62 (19.8%) indicated no. Not surprisingly, of the non-officer ranks, firefighter to engineer, 99 of the 156 respondents (63.5%) did not know if the standard was adopted. Among the officer ranks, 66 of the 104 captains (first level of management within the fire department) indicated that they did not know if the standard was adopted, and 14 (13.5%) of the 104 captains indicated that the standard was adopted in their agency. Within the other four officer ranks, 32.7% (n = 16) indicated that the standard has been adopted, 42.9% (n = 21) indicated the standard has not been adopted, and 12 of the 49 (24.5%) indicated that they did not know if the standard was adopted. Among all officer ranks, 30 of the 153 indicated that the standard was adopted, 45 indicated that the standard was not adopted, and 78 (51.0%) reported they did not know if the standard was adopted in their fire agency. Overall, the higher level officer ranks had more knowledge on the adoption of the standard.

Table 10

Adoption of the National Fire Protection Association 1582 Standard Within Fire Agencies (N = 312).

Rank	Yes		No		Don't Know	
	n	%	*n*	%	*n*	%
Non-Officer						
Firefighter	7	15.9	4	9.1	33	75.0
Firefighter/Paramedic	21	33.9	5	8.1	36	58.1
Engineer	12	24.0	8	16.0	30	63.5
Officer						
Captain	14	13.5	24	23.1	66	63.5
Battalion Chief	6	27.3	7	31.8	9	40.9
Division Chief	3	27.3	6	54.5	2	18.2
Deputy/Assistant Chief	3	37.5	4	50.0	1	12.5
Fire Department Chief	4	50.0	4	50.0	0	0
"Other"[a]	1	33.3	0	0	2	66.7

[a] Note. Table includes all firefighter respondents (*N* = 312) including the "other" rank category.

Question four asked, what percentage of fire department chiefs believe their fire department has adopted the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments? Among the eight Fire Department Chiefs, 50.0% indicated the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments was adopted by their agency, and 50.0% indicated that it was not adopted (Table 10).

Therefore, four fire departments (each fire department has one Fire Chief) residing in the counties surveyed in this study have adopted the NFPA 1582 standard.

Question five asked, how frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after an injury? Most, 20 out of 30 (66.7%), healthcare providers use the NFPA 1582 standard (answers ranging from sometimes to always) when performing medical evaluations on firefighters returning to duty after an injury (Table 11). In total, 10 of the 30 healthcare providers (33.3%) never use the NFPA 1582 standard when evaluating a firefighter returning to duty after an injury. Of the physicians, 7 of the 20 indicated they always use the standard, and 6 never use it. For nurse practitioner and registered nurse respondents, 6 of the 10 indicated they use the standard as a guide when evaluating a firefighter returning to duty after an injury (answers ranging from sometimes to always).

Table 11

Use of the National Fire Protection Association 1582 Standard as a Guide When Evaluating Firefighters Returning to Duty After an Injury (n = 30).

	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	4	50.0	1	12.5	3	37.5	0	0
Physician	6	30.0	4	20.0	3	15.0	7	35.0
Registered Nurse	0	0	0	0	1	50.0	1	50.0

Question six asked, how frequently do healthcare providers with professional work experience performing return to duty or work-related medical evaluations on firefighters use the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after a *lower* extremity injury? When evaluating a firefighter returning to duty after a lower extremity injury, 19 of the 30 (63.3%) healthcare providers used the NFPA 1582 standard (answers ranging from sometimes to always (Table 11). This frequency represents a decrease (3.4%) in use when compared to use of the standard when evaluating a firefighter returning to duty after any injury (Tables 11 and 12). In total, 11 of the 30 healthcare providers (36.7%) do not use the standard when evaluating a firefighter returning to work after a lower extremity injury. Twenty percent (n = 4) of the physicians indicated they always use the standard, and 35% never use the standard. Physicians indicated they would use the standard less often when evaluating a firefighter returning to work after a lower extremity injury than when evaluating a firefighter retuning to work after any injury. Six of the 10 nurse practitioner and registered nurse respondents indicated they use the standard as a guide when evaluating a firefighter returning to duty after a lower extremity injury (answers ranging from sometimes to always). The nurse practitioners and registered nurses indicated the same frequency of use of the NFPA 1582 standard when evaluating a firefighter returning to work with any injury and when evaluating a firefighter returning to duty after a lower extremity injury.

Table 12

Use of the National Fire Protection Association 1582 Standard as a Guide When Evaluating Firefighters Returning to Duty After a Lower Extremity Injury (n = 30).

	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	4	50.0	1	12.5	3	37.5	0	0
Physician	7	35.0	4	20.0	5	25.0	4	20.0
Registered Nurse	0	0	0	0	1	50.0	1	50.0

The aim for questions seven through ten was to determine whether healthcare providers and firefighters differ in their familiarity with the National Fire Protection Association standards. Question seven asked, do various types of healthcare providers differ in familiarity with the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments? Based on the results of a 3 x 5 chi-square test of independence, familiarity was dependent on provider type (Table 13). Physicians were very much more familiar with this standard (e.g., 36.4% knew it well) than were either nurse practitioners or registered nurses (only 7.7% of the former and 3.5% of the latter knew it well). Moreover, relatively high percentages of nurse practitioner (61.5%) and registered nurse (71.4%) respondents had not even heard of this standard.

Table 13

Healthcare Provider Familiarity of the National Fire Protection Association 1582 Standard.

Provider Type	No, Never Heard of It		Yes, Heard of It		Yes, Know a Little		Yes, Know A Lot		Yes, Know it Well	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	8	61.5	2	15.4	0	0	2	15.4	1	7.7
Physician	4	18.2	2	9.1	5	22.7	3	13.6	8	36.4
Registered Nurse	20	71.4	4	14.3	3	10.7	0	0	1	3.6

χ^2 [8, N = 63] = 24.2, p < .002

Question eight asked, do firefighters, non-officers and officers, differ in familiarity of the National Fire Protection Association fire agency standards? Based on the results of a 2 x 5 chi-square test of independence, familiarity was dependent on firefighter classification, non-officers and officers (Table 14). Non-officer firefighter respondents were more familiar with this standard (e.g., 21.6% knew it well, and 39.2% knew it a lot) than officers (11.5% knew it well, and 34.0% knew it a lot). A very low percentage of respondents (1.0%) had not heard of this standard.

Table 14

Firefighter Reported Familiarity of the National Fire Protection Association Fire Agency Standard.

	No, Never Heard of It		Yes, Heard of It		Yes, Know a Little		Yes, Know A Lot		Yes, Know it Well	
Rank[a]	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Non-Officer	2	1.3	6	3.9	52	40.0	60	39.2	33	21.6
Officer	1	0.6	12	7.7	72	46.2	53	34.0	18	11.5

χ^2 [4, N = 309] = 10.38, p < .035
[a] Note. Does not include the "other" rank category respondents (*n* = 3).

Question nine asked, do firefighters, non-officer and officer, differ in familiarity of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments? Like the previous standard, non-officer firefighter respondents were more familiar with this standard (e.g., 45.8% knew it well) than officers (2.6% knew it well) (Table 15). A relatively high percentage of respondents (25.0%) had not heard of this standard. Surprisingly, officers as a group were less likely (94.2% had never heard of it, heard of it, or knew it a little) to be familiar with this resource. The 2 x 5 chi-square test for independence, however, was not statistically significant.

Table 15

Firefighter Reported Familiarity of the National Fire Protection Association 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments (n = 309).

	No, Never Heard of It		Yes, Heard of It		Yes, Know a Little		Yes, Know A Lot		Yes, Know it Well	
Rank[a]	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Non-Officer	32	21.0	48	31.4	50	32.7	16	10.5	7	45.8
Officer	45	28.8	54	34.6	48	30.8	5	3.2	4	2.6

[a] Note. Does not include the "other" rank category respondents (*n* = 3).

Question ten asked, is there a difference in familiarity between healthcare providers (providers combined) and firefighters (ranks combined) with the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments? Based on the results of a 2 x 5 chi-square test of independence, familiarity was dependent on whether the respondent was a healthcare provider or firefighter (Table 16). Healthcare providers were less familiar with the standard (51.0% never heard of it) than were firefighters (25.0% never heard of it). A fairly high percentage of firefighter respondents had heard of the standard (33.0%) or knew it a little (32.0%). Not surprisingly, 25.4% of the healthcare provider respondents had only heard of the standard or knew it a little. Combined, less than one percent of the respondents indicated that they knew the standard well.

Table 16

Difference in Familiarity Between Healthcare Provider and Firefighters With the National Fire Protection Association 1582 Standard.

	No, Never Heard of It		Yes, Heard of It		Yes, Know a Little		Yes, Know A Lot		Yes, Know it Well	
Group	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Healthcare Providers	32	51.0	8	0.1	8	0.1	5	0.8	10	0.2
Firefighters	78	25.0	103	33.0	99	32.0	11	0.04	21	0.1

χ^2 [4, N = 375] = 40.2, p < .000

The aim for questions eleven through fifteen was to describe essential job functions for a firefighter job from the firefighter's perspective. Question eleven asked, what percentage of firefighters (non-officers compared to officers) report that a unique task is an essential duty for *their* job as a firefighter? Based on the results of the twelve 2 x 2 chi-square tests of independence, essential job duties were dependent on firefighter classification, non-officer or officer (Table 17). Non-officers were more likely (frequency ranged from 92.9% to 100%) than officers (frequency ranged from 82.4% to 97.4%) to report job duties as essential to their firefighter job. More often, non-officers agreed that a job duty was essential to their job as six job duties were reported as essential by all of the non-officer respondents. The six job duties that were reported by all non-officers as essential were: a) performing rescue operations; b) wearing a self-contained breathing apparatus; c) climbing flights of stairs; d) climbing flights of stairs wearing fire protective equipment; e) climbing a ladder; and f) walking on uneven surfaces. There was no such agreement by the officers that a single job duty was essential to their job.

Table 17

Firefighter Reported Essential Job Duties for Their Job.

Essential Job Duty	Non-Officer (*n* = 156)		Officer (*n* = 153)		Total (*n*= 309)		χ^2	
	n	%	*n*	%	*n*	%	Value	*p*
Rescue Operations	156	100	142	92.8	298	96.4	1.63	.001
Wearing SCBA	156	100	144	94.1	300	97.1	9.45	.002
Climbing flights of stairs	156	100	147	96.1	303	98.1	6.24	.012
Climbing flights of stairs wearing fire protective equipment	156	100	144	94.1	300	97.1	9.45	.002
Rescue dragging victims – up to 200 pounds	153	98.1	137	89.5	290	93.9	9.75	.002
Rescue Dragging Victims – Over 200 Pounds	151	96.8	131	85.6	282	91.3	2.09	.001
Dragging A Dry Hose Up To 2.5 Inches In Diameter 150 Feet	155	99.4	135	88.2	290	93.9	6.56	.000
Moving a charged hose up to 2.5 inches in diameter	154	98.7	132	86.3	286	92.6	7.36	.000
Moving a charged hose up to 2.5 inches in diameter 150 feet	145	92.9	126	82.4	271	87.7	8.04	.005
Climbing a ladder	156	100	143	93.5	299	98.7	0.54	.001
Walking on uneven surfaces	156	100	149	97.4	305	98.7	4.13	.042
Working for prolonged periods of physical exertion	155	99.4	146	95.4	301	97.4	4.74	.029

Question twelve asked, what percentage of firefighter respondents (non-officers and officers combined) report that a unique task is an essential job duty for *any* firefighter job? As a group, walking on uneven surfaces (99.4%), performing rescue operations (99.0%), climbing a ladder (98.7%), and working for prolonged periods of physical exertion (98.7%) were the most frequently reported essential job duties for a firefighter job (Table 18). Interestingly, only two duties, wearing a self-contained breathing apparatus (SCBA) and climbing a ladder, rated at the same frequency for being essential for any firefighter job and the respondent's actual firefighter job (Table 17 and 18). Clearly, variation in the perception of job duties for a firefighter job exists among the firefighter respondents.

Question thirteen asked, is there a difference in the essential functions reported by firefighters (non-officers and officers) by the type of fire department where the firefighter worked? Although 100% of respondents from a rural fire department and "other" type of fire department agreed that all of the job duties are essential to their job, the sample size is too small to make an additional analysis of the data (Table 19). Firefighter respondents that work in County fire departments, and urban/city fire departments reported a range of agreement that a job duty was essential to their job. Frequencies for County firefighters ranged from 87.5% to 99.4%, and urban/city firefighter frequencies ranged from 87.6% to 97.1%. There were no job duties where 100% of the firefighters in either group agreed that a job duty was essential to their job. The twelve 2 x 4 chi-square tests of independence, however, were not statistically significant.

Table 18

Firefighter Reported Essential Job Duties for any Firefighter Job.

Essential Job Duty	Total (*n* =309)	
	n	%
Rescue Operations	306	99.0
Wearing SCBA	300	97.1
Climbing flights of stairs	301	97.4
Climbing flights of stairs wearing fire protective equipment	299	96.8
Rescue dragging victims – up to 200 pounds	301	97.4
Rescue Dragging Victims – Over 200 Pounds	289	93.5
Dragging A Dry Hose Up To 2.5 Inches In Diameter 150 Feet	296	95.8
Moving a charged hose up to 2.5 inches in diameter	294	95.1
Moving a charged hose up to 2.5 inches in diameter 150 feet	279	90.3
Climbing a ladder	305	98.7
Walking on uneven surfaces	307	99.4
Working for prolonged periods of physical exertion	305	98.7

Table 19

Firefighter Reported Essential Job Duties Based on the Type of Fire Department.

	County (*n* = 168)		Rural (*n* = 1)		Urban or City (*n* = 137)		Other (*n* = 3)		Total (*n* = 309)
Essential Job Duty	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Rescue Operations	163	97.0	1	100	131	95.6	3	100	298
Wearing SCBA	164	97.6	1	100	132	96.4	3	100	300
Climbing flights of stairs	166	98.8	1	100	133	97.1	3	100	303
Climbing flights of stairs wearing fire protective equipment	166	98.8	1	100	130	94.9	3	100	300
Rescue dragging victims – up to 200 pounds	161	95.8	1	100	125	91.2	3	100	290
Rescue Dragging Victims – Over 200 Pounds	155	92.3	1	100	123	89.8	3	100	282
Dragging A Dry Hose Up To 2.5 Inches In Diameter 150 Feet	159	94.6	1	100	127	92.7	3	100	290
Moving a charged hose up to 2.5 inches in diameter	156	92.9	1	100	126	92.0	3	100	286
Moving a charged hose up to 2.5 inches in diameter 150 feet	147	87.5	1	100	120	87.6	3	100	271
Climbing a ladder	163	97.0	1	100	132	96.4	3	100	299

Table 19 *continued*

Walking on uneven surfaces	167	99.4	1	100	134	97.8	3	100	305
Working for prolonged periods of physical exertion	165	98.2	1	100	132	96.4	3	100	301

Question fourteen asked, do firefighters (all ranks combined) and healthcare providers (providers combined) differ on whether healthcare providers should use a list of the firefighter's job duties/essential functions unique to each fire department when determining if a firefighter can do his/her firefighter job safely? Based on the results of a 2 x 4 chi-square test, opinion on whether healthcare providers should use the firefighter's job duties/essential functions unique to that fire fighter's fire department when determining if the firefighter can safely do their job was dependent on the respondents group, firefighter or healthcare provider (Table 20). Most of the healthcare providers reported that essential job functions should be used when determining if a firefighter can safely do their job. Of the 63 healthcare provider respondents, 51 (81.0%) indicated they strongly agreed, and 11 (17.5%) agreed that the unique job duty/essential function list should be used when evaluating if a firefighter can safely do their job. Only one healthcare provider disagreed, and no providers strongly disagreed. Moreover, relatively a high percentage of firefighter respondents strongly agreed (61.9%) and agreed (32.7%) that the unique job duty/essential function list should be used by healthcare providers when evaluating if a firefighter can safely do their job. Of the 312 firefighter respondents, only 17 strongly disagreed or disagreed with the use of the firefighter's unique essential job duty list.

Table 20

Healthcare Providers Should use a List of the Firefighter's Job Duties/Essential Functions Unique to Each Fire Department When Determining if a Firefighter can do Their Job Safely.

	Strongly Disagree		Disagree		Agree		Strongly Agree	
Group	*n*	%	*n*	%	*n*	%	*n*	%
Healthcare Providers	0	0	1	1.6	11	17.5	51	81.0
Firefighters	8	2.6	9	2.9	102	32.7	193	61.9

χ^2 [4, N = 375] = 8.92, $p < .030$

Question fifteen asked, do firefighters (non-officers compared to officers) with or without a history of a workers compensation claim for a lower extremity injury report different essential functions for a firefighter job? Interestingly, all of the non-officers and officers with a history of a workers compensation claim for a lower extremity indicated that climbing a ladder and walking on uneven surfaces were essential job duties for a firefighter (Table 21). Non-officer firefighters without a claim were in agreement that performing rescue operations (100%), walking on uneven surfaces (100%), and working for prolonged periods of time (100%) were essential job duties. Officers with a history of a workers compensation claim indicated "yes", that the job duty was essential for a firefighter job, more frequently to 8 of the 12 essential job duties than officers without a lower extremity workers compensation claim history. In contrast, among the non-officer firefighter respondents, those without a history of a workers compensation claim had higher percentages for 8 of the 12 essential job duties. The twelve 2 x 4 chi-square tests of independence were not statistically significant.

Table 21

Reported as an Essential Job Function for a Firefighter Job by Firefighters With and Without a History of a Worker's Compensation Claim for a Lower Extremity Injury.

Essential Job Duty	Non-Officers				Officers			
	With a Claim (*n* = 69)		Without a Claim (*n* = 84)		With a Claim (*n* = 64)		Without a Claim (*n* = 92)	
	n	%	*n*	%	*n*	%	*n*	%
Rescue Operations	68	98.6	84	100	63	98.4	91	98.9
Wearing SCBA	66	95.6	83	98.8	62	96.9	89	96.8
Climbing flights of stairs	68	98.6	84	98.8	62	96.9	87	94.6
Climbing flights of stairs wearing fire protective equipment	67	97.1	83	98.8	62	96.9	87	94.6
Rescue dragging victims – up to 200 pounds	68	98.6	82	97.6	61	95.3	90	97.8
Rescue Dragging Victims – Over 200 Pounds	65	94.2	77	91.7	59	92.2	88	95.6
Dragging A Dry Hose Up To 2.5 Inches In Diameter 150 Feet	67	97.1	82	97.6	60	93.8	87	94.6
Moving a charged hose up to 2.5 inches in diameter	67	97.1	82	97.6	60	93.8	85	92.4
Moving a charged hose up to 2.5 inches in diameter 150 feet	62	89.9	80	95.2	57	89.1	80	87.0
Climbing a ladder	69	100	83	98.8	64	100	90	97.8
Walking on uneven surfaces	69	100	84	100	64	100	90	97.8
Working for prolonged periods of physical exertion	68	98.6	84	100	63	98.4	90	97.8

The aim for questions sixteen and seventeen were to determine the use of firefighter job duties or essential function lists by healthcare providers. Question sixteen asked, how frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the National Fire Protection Agency 1582 standard on comprehensive occupational medical program for fire departments essential job function list when evaluating a firefighter who is returning to work after an injury? Physicians more frequently used the NFPA 1582 standard (e.g., 25.0% used the standard often, and 25.0% used the standard always) than nurse practitioners (12.5% used the standard often and 12.5% used the standard always) (Table 22). For the two registered nurse respondents, both of them used the standard often. The 3 x 4 chi-square test of independence was not statistically significant.

Table 22

Healthcare Provider Reported use of the NFPA 1582 Essential Job Function List (n = 30).

Group	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	5	62.3	1	12.5	1	12.5	1	12.5
Physician	9	45.0	1	0.05	5	25.0	5	25.0
Registered Nurse	0	0	0	0	2	100	0	0

Question seventeen asked, how frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use the firefighter's actual fire departments job duties or essential functions list when performing a return to duty evaluation on a firefighter? Nurse practitioners more frequently used the firefighter's actual fire departments job duties or essential functions list when performing a return-to-duty evaluation on a firefighter (e.g., 25.0% used the standard often and 75.0% used the standard always) than physicians (35.0% used the standard often, and 45.0% used the standard always) (Table 23). In addition, there were higher percentages (for often and always) reported by both of these groups for use of the firefighter actual fire department job duty or essential function list than for question sixteen, use of the National Fire Protection Association 1582 essential job functions list (Tables 22 and 23). For the two registered nurse respondents, they used the firefighter's actual job duty list often or always. The 3 x 4 chi-square test of independence was not statistically significant.

Table 23

Healthcare Provider Reported Use of the Firefighter's Actual Fire Department Job Duties or Essential Functions List (n = 30).

Group	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	0	0	0	0	2	25.0	6	75.0
Physician	1	5.0	3	15.0	7	35.0	9	45.0
Registered Nurse	0	0	0	0	1	50.0	1	50.0

The aim for questions eighteen and nineteen was to determine the beliefs and use of evidence-based assessment guidelines by healthcare providers. Question eighteen asked, do healthcare providers believe an evidence-based guideline would be useful when evaluating firefighters returning to work after a lower extremity injury? Overall, 33 of the 63 healthcare provider respondents indicated that an evidence-based guideline would always be useful when evaluating a firefighter returning to work after a lower extremity injury (Table 24). Due to their professional level, it is not surprising that registered nurses had higher percentages (39.3% often and 53.6% always) of usefulness for an evidence-based guideline. Physicians and nurse practitioners also had relatively high percentages of usefulness, respectively, 45.5% often and 40.9% always, and 23.1% often and 69.2% always. Of the total sample (N = 63), only two physicians indicated that an evidence-based guideline would never be useful. The 3 x 4 chi-square test of independence was not statistically significant.

Table 24

Healthcare Provider Reported Usefulness of Evidence-Based Guidelines (N = 63).

Group	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	0	0	1	7.7	3	23.1	9	69.2
Physician	2	9.1	1	4.5	10	45.5	9	40.9
Registered Nurse	0	0	2	7.1	11	39.3	15	53.6

Question nineteen asked, how frequently do healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters use evidence-based guidelines when performing return to duty evaluations on firefighters? The specific type (protocol, policy, etc.) of evidence-based guideline that was used by the healthcare providers was not asked in the present study. Among the three provider groups, nurse practitioners, physicians, and registered nurses, seven of the 30 respondents indicated they never use an evidence-based guideline when performing return to duty evaluations on firefighters (Table 25). Eight of the 20 physicians reported they used evidence-based guidelines (it is unknown as to what type of guideline was used) often or always (40.0%), and nurse practitioners reported somewhat higher percentages of use with 5 of the 8 indicating they used guidelines often and always (62.5%). For the two registered nurse respondents, one never used a guideline and one used a guideline always. The 3 x 4 chi-square test of independence was not statistically significant.

Table 25

Healthcare Providers With Professional Work Experience Performing Return to Duty or Work Related Medical Evaluations on Firefighters Reported Use of Evidence-Based Guidelines (n = 30).

Group	Never		Sometimes		Often		Always	
	n	%	*n*	%	*n*	%	*n*	%
Nurse Practitioner	1	12.5	2	25.0	3	37.5	2	25.0
Physician	5	25.0	7	35.0	4	20.0	4	20.0
Registered Nurse	1	50.0	0	0	0	0	1	50.0

Summary of Results

The healthcare provider and firefighter samples were experienced in their professions with the majority of both groups having 21 or more years of work experience, 52.4% for healthcare providers and 52.2% for firefighters. Healthcare provider respondents were from Los Angeles (22.2%), San Diego (11.1%), Riverside (9.5%) San Bernardino (7.9%), Orange (4.8%), Kern (3.2%), Alameda (3.2%), and San Francisco (1.6%) counties. Twenty three providers (36.5%) selected the "other" county category therefore their work location in California was unknown. Out of the 63 healthcare providers in the sample, 30 reported professional work experience performing return to duty or work related medical evaluations on firefighters. Among the firefighter sample (N = 312), there were eight fire department chiefs and eight deputy/assistant chiefs who completed the survey. The firefighter respondents were from San Bernardino (41.7%), Orange (30.8%), Los Angeles (14.4%), Riverside (9.6%), and San Diego (2.2%) counties. Four firefighters (1.3%) selected the "other" county category.

Of the 30 healthcare providers with professional work experience performing return to duty or work related medical evaluations on firefighters, there was variation in the reported use of diagnostic testing modalities when evaluating a firefighter returning to work after a lower extremity injury. Most of the healthcare providers (66.7%) use the National Fire Protection Association 1582 standard when performing medical evaluations on firefighters returning to work after an injury. Physicians reported more familiarity of the NFPA 1582 standard (36.4% knew it well) than nurse practitioners (7.7% knew it well). Eight of the 13 nurse practitioners in the sample reported they had never heard of the NFPA 1582 standard.

For the firefighter respondents, 19.8% reported their fire department has not adopted the NFPA 1582 standard, and 57.4% reported that they did not know if the standard was adopted in their fire agency. Of the eight fire department chief respondents, four reported that their agency had adopted the NFPA 1582 standard, and four reported that the standard was not adopted in their agency. Interestingly, non-officer firefighters were more familiar (45.8% knew it well) with the NFPA 1582 standard than officers (2.6% knew it well). The essential job duties reported for a firefighter job varied among the respondents. There were six job duties reported as essential by all of the non-officers in the sample (n = 156): a) performing rescue operations; b) wearing a self-contained breathing apparatus; c) climbing flights of stairs; d) climbing flights of stairs wearing fire protective equipment; e) climbing a ladder; and f) walking on uneven surfaces. Among the officers in the sample (n = 153), there was not 100% agreement on any of the essential job duties.

CHAPTER FIVE

DISCUSSION

The findings from the present study establish the foundation for developing an evidence-based assessment guideline that may be used by healthcare providers when evaluating a firefighter's ability to return to work after a lower extremity injury. The philosophical foundation was based on a realist perspective, which suggests that one can assess objective truth. The six stated aims of the study were met. The analysis of the survey data described the current testing and assessment modalities being used by healthcare providers when evaluating a firefighter's ability to return to work after an injury, particularly lower extremity injuries. The findings describe the use and adoption of the National Fire Protection Association 1582 standard on comprehensive occupational medical program for fire departments and provided a comparison of the differences in familiarity by healthcare providers and firefighters of the National Fire Protection Association standards. Firefighters endorsed various essential job functions for a firefighter job. The use of firefighter job duties or essential function lists by healthcare providers was determined, and the beliefs and use of evidence-based assessment guidelines by healthcare providers was described.

Two new on-line survey tools were used to measure healthcare provider and firefighter opinions and beliefs. Both survey tools were developed for use in this study by the researcher after a thorough review of the literature and pilot testing with the two targeted focus groups, healthcare providers and firefighters.

Summary of the Findings

Evaluation of Lower Extremity Function

In the literature (Donatelli & Wooden, 2010, Gibson & Strong, 2003, LeBlond et al., 2009, Radomski & Latham, 2008, Sobeih et al., 2006), a variety of diagnostic and assessment modalities were reported. To determine what modalities are currently being used by healthcare providers, the healthcare provider survey (Appendix A) developed for the present study contained a list of 12 diagnostic testing and assessment modalities and asked the providers to indicate the frequency of use when evaluating a firefighter returning to work after a lower extremity injury. According to the survey results, healthcare providers frequently ask about the mechanism of injury. In total, 96.7% (29 out of 30) of the healthcare providers would always obtain a history of how the injury occurred, and the remaining one provider would often obtain a history. According to LeBlond et al. (2009) obtaining a medical history is a standard assessment tool used during a medical examination.

For the other 11 testing and assessment modalities, there were wide variations in the responses by the healthcare providers. The responses for testing flexibility, muscle strength, range of motion, comparing the non-injured extremity to the injured extremity, evaluating abduction and adduction, and performing a gait assessment ranged from sometimes to often to always. The three diagnostic tests that received the highest reported use were performing a gait assessment (86.7% always), comparing the non-injured lower extremity to the injured lower extremity (83.3% always), and evaluating range of motion (80.0% always). According to Donatelli and Wooden (2010), the complete medical evaluation should include a gait assessment and visual assessment of both the injured and

non-injured lower extremity. Results of the study indicate that in practice not all of the healthcare providers always use these assessment techniques.

Radomski and Latham (2008) introduced the concept of having the firefighter perform a work simulation test to assess the firefighter's ability to perform the job duties. Although having the equipment and necessary space in a medical office to perform work-simulation testing of firefighters may limit this option, 26 of the 30 healthcare provider respondents with professional work experience with firefighters reported they use a work simulation test sometimes (n = 22), often (n = 2), or always (n = 2). Four of the 30 healthcare providers never used this modality. To assess impairment after an injury, muscle strength can be evaluated with the use of a dynamometer (Gibson & Strong, 2003). However, over half (n = 16) of the 30 healthcare providers with professional work experience on firefighters in the study would never use a dynamometer to assess muscular strength of the affected extremity, and only one provider would always use this modality.

Donatelli and Wooden (2010), Gibson and Strong, (2003), LeBlond et al. (2009), Radomski and Latham (2008), and Sobeih et al. (2006) support the use of diagnostic testing and assessment modalities when evaluating physical function. As a group, the healthcare providers in the present study did not report consistent use of diagnostic testing modalities. The rationale for the use or lack of use by the healthcare providers were not captured during the study; however, it would be interesting to know the degree of knowledge among the providers of the various testing practices and if they are aware of the equipment needed to perform each of the testing and assessment methods.

Limitations of the Sample

To maintain confidentiality, healthcare providers and firefighters were not asked to report the name of the agency where they were employed. They were asked the type of organization (e.g., corporate, urban, or city) and to identify the location, the County where they worked was solicited. This lack of specificity in the demographic characteristics limited the researcher's ability to describe practices by specific organizations; nevertheless, generalizations could be drawn from the data.

For the healthcare provider sample ($N = 63$), participation was limited to members of two professional organizations, the California State Association of Occupational Health Nurses and the Western Occupational and Environmental Medical Association, and local provider groups known to the researcher. Use of the state-wide mailing lists allowed greater access to providers in the targeted specialty of occupational medicine/health and for representation in many counties and work agencies. Within the sample, there were 28 registered nurses with two reporting work experience with firefighters, 13 nurse practitioners with eight reporting professional work experience with firefighters, and 28 physicians with 20 reporting professional work experience with firefighters.

The limited number of providers ($N = 63$) and the small number ($n = 30$) with professional work experience with firefighters restrict the ability to generalize the findings to occupational healthcare provider practices as a whole. Additionally, for their work location, the healthcare providers identified with nine of the 10 counties listed in the survey (23 reported "other"). Although there appears to be broad representation

throughout the State of California, the small number of participants may limit the ability to generalize the findings.

For the firefighter sample (N = 312), the age range with the highest percentage of participation was age 41 to 50 (39.4%), followed by the 31 to 40 year age range at 24.7%. According to Karter and Stein (2010), of the 1,148,100 firefighters in the United States, the largest percentage of firefighters are between the ages of 30 and 39 (27.6%) with 25.6% in the 40 to 49 age range. Although the age ranges varied by a year or two, the firefighter sample percentages for this study closely resembled those reported by Karter and Stein (2010). Unlike the national statistics (50 to 59, 16.1%), the firefighter sample in this study had 73 or 23.4% in the age range of 51 to 60.

Unlike the healthcare provider sample, the firefighter respondents identified working in only five (all in southern California) of the 10 counties listed in the survey (along with four reporting their county as "other"). Among the firefighter respondents, 170 (54.8%) worked in county fire departments and 138 (44.2%) worked in urban or city fire departments. There was no representation for State or Federal fire departments in the study. With the lack of broad representation across more counties in the State of California and across more department types, the findings may not have the ability to be generalized to the broader firefighter population.

Limitations of the Survey Tool

The on-line survey tool (SurveyMonkey) although easy to access and use, posed some technical limitations for the study. A limitation with the design of the on-line survey was that participants could exit the survey at any time. SurveyMonkey had the capability to provide each participant with their own password via their individual email

address that would have allowed each participant to start, stop, and restart without causing a duplication of data. However, to maintain confidentiality of the participants, this function was not used for this study. By limiting this function, the internet protocol or email addresses of participants were not provided to the researcher, which met the requirement for the study's exempt status approved by the Loma Linda University Institutional Review Board. However, it also meant that participants who exited, and then restarted the survey, could not restart from where they previously ended.

If participants wanted to complete the survey after they exited, they would have to restart from the very beginning. When this occurred, duplicate cases were created but would be unknown to the researcher. To address the duplicated case dilemma, incomplete cases were removed from both of the datasets as follows, 25 removed from the healthcare provider dataset and 114 removed from the firefighter dataset. The high number of firefighter case removals is not surprising given the nature of the firefighter job. Because the firefighters may have opted to take the survey while on duty, and if they were required to respond to an emergency call, they would have had to exit the survey. This could have been a factor for the number of incomplete cases observed in the dataset.

Another limitation of the survey tool design was that healthcare providers were not asked to provide specific information on what they considered to be evidence-based guidelines. For research question 19, healthcare providers were asked to indicate the frequency of use of evidence-based guidelines when performing return to work medical evaluations on firefighters. Other than use of the National Fire Protection Association 1582 Comprehensive Occupational Medical Program for Fire Departments (2007) document that was developed by an expert technical committee, any other type (e.g.,

protocol or policy) of an evidence-based guideline that was used by the healthcare providers was not asked.

Implications for Role Theory

Role theory was the basis of inquiry for the present study and provided a framework for developing the survey tools and conducting the research. In addition to role theory, concepts were described in the literature such as role transition, incorporating necessary changes in abilities and expectations and role clarification, having the knowledge of the role characteristics (Meleis, 1975). The concept, role performance, was defined by this researcher and applied to the present study. To assess a firefighter's role performance, essential job duties need to be identified or clarified for the healthcare provider that is medically evaluating a firefighter returning to work after an injury. Role clarification is the application and explanation of the job's essential functions to the individual and medical personnel performing the medical evaluation. Role transition is the firefighter's ability to recognize the physical changes that occurred as a result of the injury. The firefighter may or may not be able to adapt and perform the job duties.

Although the National Fire Protection Association (NFPA) promulgates a document titled NFPA 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments (2007) that contain essential functions for a firefighter job, the essential functions must be validated and adopted by each fire agency. The results of the present study clearly point out that there is a wide-range of disagreement among firefighters on their essential job duties and that the perception of their duties were dependent on firefighter classification, when comparing non-officer ranks to officer ranks.

The primary concept for the present study was role performance (Figure 1) and was operationally defined as the firefighter's ability to perform the essential functions of the job. The findings from the present study show there is variation in the firefighter's perception of roles (essential functions) for the firefighter job, and the reported essential job duties varied by the type of fire department worked (work environment). State and Federal workplace policies affect the way healthcare providers perform medical evaluations on firefighters to assess role performance. Having a clear understanding of the essential duties for a firefighter is a requirement of these policies. Additionally, as outlined in Figure 1, evidence-based practice may guide the way in which role performance is evaluated. Future research could be performed to develop role performance as a theoretical concept.

When the firefighters reported the essential job functions, only six of the 11 job duties contained in the survey tool were reported as essential by the non-officer firefighter ranks. The six job duties were: a) performing rescue operations; b) wearing a self-contained breathing apparatus; c) climbing flights of stairs; d) climbing flights of stairs wearing fire protective equipment; e) climbing a ladder; and f) walking on uneven surfaces. The officer ranked firefighters did not have full agreement on any of the essential functions. These results do not support the broad use of the essential functions in the 2007 NFPA 1582 standard on comprehensive occupational medical program for fire departments document. Although it might be desirable to have a standard used across multiple fire agencies, firefighters in this study reported a range of essential functions for the firefighter job. Given this disparity, it seems that each fire agency needs to determine the essential functions for their firefighters by rank and maybe even job assignment by

conducting a job analysis, as discussed in Radomski and Latham (2008). To comply with the Americans with Disability Act, medical evaluations of employees or firefighters must be conducted using job specific essential functions (Radomski & Latham, 2008). The NFPA supports these assertions and states in the 1582 document that each fire agency shall evaluate the essential job tasks (firefighter role) listed in the standard for applicability to their department, and take into account the type of fire fighting work performed, structures, occupancies, etc. by their agency. This implies that the essential job tasks listed on the NFPA 1582 document is only a guide and not a "standard."

The explanatory framework (Figure 1) applied to the present study was developed from the underpinnings of role theory and contains the concept of role performance. Having an understanding of the firefighter's essential job functions is important when evaluating a firefighter retuning to work after a lower extremity injury. The NFPA 1582 (2007) standard on comprehensive occupational medical program for fire departments is available for use as a guide by healthcare providers and contains guidance on medical evaluations of firefighters and performance requirements for firefighters.

To evaluate the use of the NFPA 1582 document, healthcare providers (n = 30) who perform medical evaluations with firefighters were asked if they use the document as a guide when evaluating firefighters returning to duty after an injury and after a lower extremity injury. The results of the present study show that the standard is not used as a guide on a regular basis in either case. At least one-third of the providers, 10 (any injury) and 11 (lower extremity injury), reported they never used the standard. The NFPA 1582 standard was first promulgated in 1992 and has been updated and revised over the years. It seems to this researcher that healthcare providers that perform medical evaluations on

firefighters should always use the standard as a guide when evaluating firefighters. The fact that a third of the providers answering this question reported no use of the standard is startling and it is unknown if the providers in the study are aware the standard exists.

Implications for Evidence-Based Practice

Melnyk and Fineout-Overholt (2011) identified a seven-level rating system for the use of evaluating evidence. The lowest level of evidence in their design is evidence from expert opinion. This study set out to determine the beliefs and use of evidence-based guidelines by healthcare providers (experts). Of the 63 healthcare provider respondents, only a little more than half (n = 33) indicated that an evidence-based guideline would always be useful when evaluating a firefighter returning to work after a lower extremity injury. Of the 33 who indicated an evidence-based guideline would always be useful, registered nurses were the majority group with 15 reporting always, along with 9 nurse practitioners and 9 physicians. Additionally, among the sub-group of healthcare providers (n = 30) with professional work experience on firefighters, only six always used evidence-based guidelines, seven used them often, and seven never used evidence-based guidelines at all. Given the high level of physical fitness required of firefighters, and the need for healthcare providers to accurately evaluate the firefighter's ability to perform the job tasks, this researcher recommends that healthcare providers always use evidence-based guidelines to ensure that public safety is not compromised.

After an extensive review of the available literature, there is no known evidence-based guideline on the evaluation of lower extremity function for firefighters, except for the National Fire Protection Association (NFPA, 2007) 1582 document. The NFPA 1582 document was developed by a technical committee comprised of various professionals,

medical, firefighters, and others. Findings from the present study showed that 23.3% of the healthcare provider respondents with professional work experience on firefighters always use an evidence-based guideline and the same number of providers never used an evidence-based guideline (Table 25). In contrast, when all healthcare providers in the group (N = 63) were asked if an evidence-based guideline would be useful when evaluating firefighters returning to work after a lower extremity injury, 52.4% reported always and only 2 (0.03%) reported never (Table 24).

Several findings from this study provided a framework for developing an evidence-based guideline that may be used when evaluating firefighters returning to work after a lower extremity injury. Specifically, the results of this study show that healthcare providers will use an evidence-based guideline, that essential functions for a firefighter job is dependent on the role (rank) of each firefighter and the type of fire department where the firefighter works, and that diagnostic testing modalities can assess physical function. These findings provide the foundation for the development of an evidence-based guideline (see Figure 2). As shown in Figure 2, when evaluating a firefighter returning to work after a lower extremity injury, the first step for the healthcare provider would be to obtain the firefighter's essential job duty list from the employing fire department. The job specific essential duties list will provide the specifics of the firefighter job, for example, how much weight the firefighter must lift and carry. The next step would be to conduct the job specific return to duty evaluation to determine the firefighter's role performance. The medical provider would perform diagnostic testing and assessment modalities to determine the firefighter's functional ability. Future research needs to be conducted to complete the evidence-based guideline.

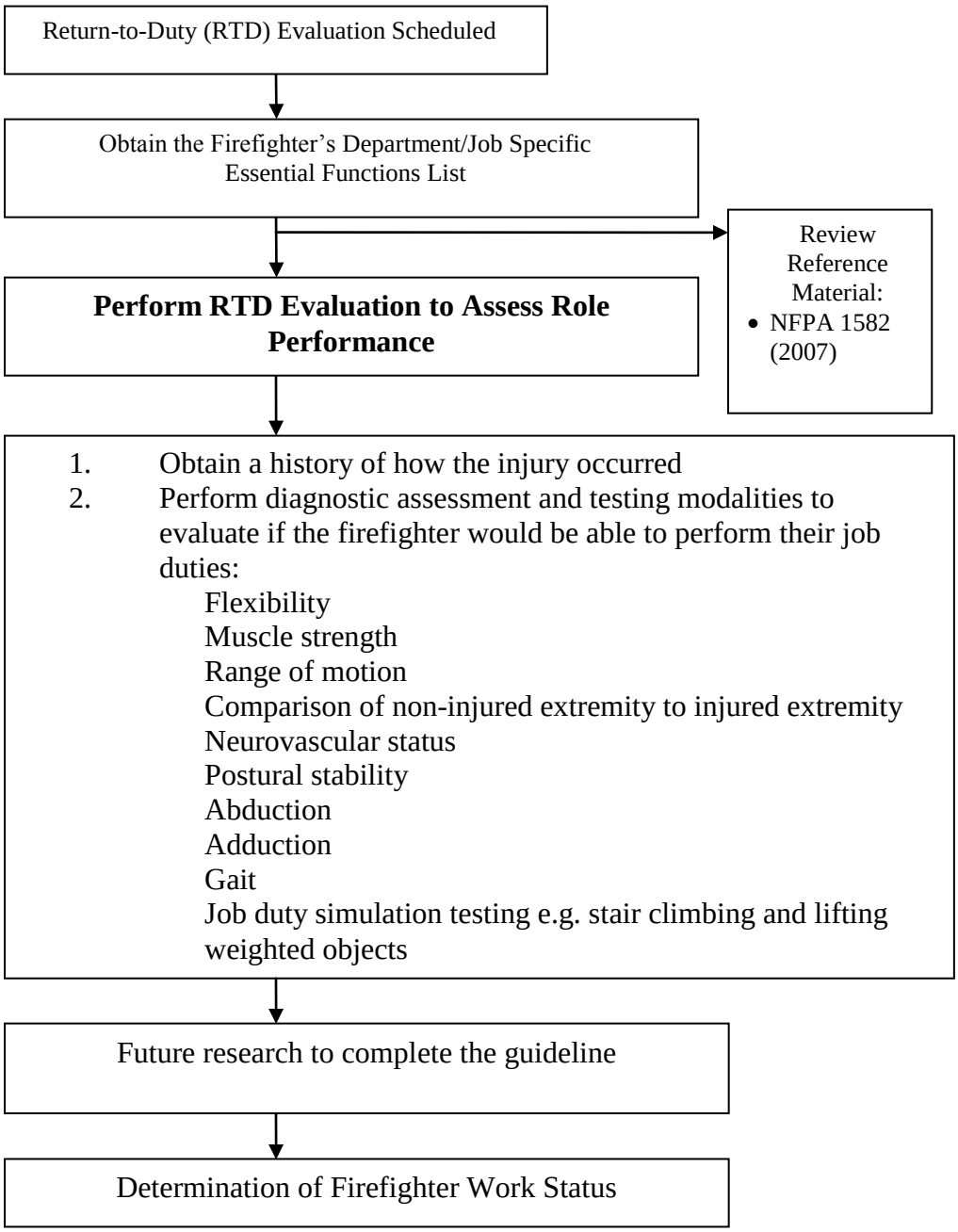

Figure 2. Evidence-Based Guideline for Evaluating Firefighters Returning to Work After a Lower Extremity Injury.

Implications for Policy

The development and use of evidence-based guidelines may be placed into medical and nursing practice protocols within healthcare agencies and provider groups that perform medical evaluations on firefighters. Based on the findings in the present study that 52.4% of the healthcare provider respondents indicated that an evidence-based guideline would always be useful when evaluating a firefighter returning to work after a lower extremity injury, it is recommended that such guidelines be developed and adopted by state workers' compensation boards and included in their regulations. Specifically, State Representatives (Senators and Assemblymen) locally could be contacted to discuss evidence-based practice and the recommendation for adopting this practice by the worker's compensation board. Facts and figures could be provided to show the benefits of evidence-based practice and the need for adoption for these public safety employees. Representatives have access to the Governor, who assigns or appoints committee members; therefore, their support is critical for access to and influence of the members of the workers compensation board, on which they may be a member.

Fire departments, as a matter of policy, could demand that healthcare providers use evidence-based guidelines when evaluating firefighters. Fire departments can be contacted and shown the benefits of evidence-based practice and assisted with the adoption among their contracted medical providers. Professional organizations in the field of occupational medicine and occupational health could adopt policies to support research for the development and refinement of evidence-based guidelines. This may be accomplished by presenting the findings of the present study at conference meetings and by publishing the data.

Another policy recommendation is for fire departments to consider mandating their firefighters perform a valid physical ability test (PAT) annually to demonstrate their ability to perform their job duties. As reported in the Harley and James (2006) qualitative study, firefighters indicated that the current PAT they performed did not measure their ability to perform the job duties, and as a result they did not have confidence in the abilities of their co-workers. The participants recommended that the PAT be revised to reflect their actual job duties, be required to be performed on an annual basis, and performed with and without donned protective equipment. The present study described the essential job duties from the firefighter's perspective. Using the firefighter's reported job functions, along with on-the-job observation, is a valid method for determining essential job duties.

Implications for Future Research

Because 52.4% (33 out of the 63) of the healthcare providers reported that an evidence-based guideline would always be useful when evaluating a firefighter returning to work after a lower extremity injury, future research should be done to complete the development of the evidence-based guideline. The essential job functions for the firefighter job should be indicated at the beginning of the guideline, as outlined in Figure 2, as a required element prior to the healthcare provider evaluation and determination of the firefighter's work status. This would ensure that the medical evaluation is being done to determine if the firefighter can do their specific job. Therefore, fire departments need to determine the essential duties for firefighters within their own agency. Research will need to be done in those agencies that have not yet developed the agency specific criteria.

The findings from the present study along with data collected by convening an expert panel (research team) of healthcare providers with firefighter work experience could be used to complete the development of the evidence-based guideline. The expert panel could be asked to provide copies of applicable research studies, policies, protocols, or other evidence-based guidelines that are currently used in their practice. Additionally, diagnostic testing and assessment modalities beyond what was discovered in the present study may be explored. The healthcare providers could be asked to describe their concerns with performing return to duty evaluations and provide an opportunity for discussion and problem solving. To address concerns raised, additional valid research may need to be found.

The development of an evidence-based guideline requires many steps. According to Titler et al. (2001), the first step in developing evidence-based practice is to form a research team. A research team may include stakeholders from occupational healthcare practices, fire departments, and healthcare, and firefighter professional organizations. The next step in the process is to gather and critique relevant research and record pertinent findings. If there is adequate research available, an evidence-based guideline can be drafted. If not, more research may need to be done in the specific area where there is a void. The information provided in the present study and the NFPA 1582 standard on comprehensive occupational medical program for fire departments (2007) may be used along with other sources for completing the guideline.

Once the guideline is developed, the guideline may be implemented via pilot testing by healthcare providers and fire departments. The use of the guideline could be monitored and evaluated for applicability, completeness, and cost. Evidence-based

guidelines are a dynamic state and require constant review and updating to ensure current practice standards are being employed, which is dictated by reviewing the research.

Additional research may be done to determine why healthcare providers do not use evidence-based guidelines and to determine, for the healthcare providers that perform medical evaluations on firefighters, their awareness of the NFPA 1582 standard. A lack of awareness of available guidelines would support the underreported use and could lead to inadequate medical assessments by healthcare providers. If a firefighter is on the job and is unable to perform the job duties, firefighters and public safety would be compromised. The NFPA could conduct more research to enhance the appropriateness of their standard. Using research such as that presented in the current study as a model for gathering current practice and firefighter perceptions may be a starting place.

Conclusions

The present study has provided information on the adoption of the National Fire Protection Association 1582 (2007) standard on comprehensive occupational medical program document for fire departments and the essential functions for a fighter job from the firefighter's perspective, with a comparison based on the rank of the firefighter and type of fire agency where the firefighter worked. There were only 71 (22.8%) firefighter respondents out of the 312 that reported the NFPA 1582 standard on comprehensive occupational medical program for fire departments was adopted in their fire agency. Additionally, only 164 (53.1%) of the 309 firefighters among the officer and non-officer ranks reported they knew a lot about the standard or knew it well. Firefighters from agencies throughout southern California provided their opinion on the essential job

functions for a firefighter job and mutual agreement on the essential job duties was not found.

The findings provided insight into the practices of healthcare providers with and without professional work experience with firefighters. The study was unique in that it provided frequencies on the use and usefulness of evidence-based guidelines by healthcare providers in occupational medicine/health and showed that 11 of the 30 healthcare providers with work experience on firefighters never use the NFPA 1582 document as a guide when evaluating a firefighter returning to work after a lower extremity injury. Limitations of the present study have been identified and implications for future research have been addressed. Career firefighter perceptions on their essential duties of the job have been identified and assessment and testing modalities used by healthcare providers were identified, and found to be inconsistently applied. The future development and use of an evidence-based guideline that complies with State and Federal regulations could mitigate discrepancies in practice, allow medical providers to perform medical evaluations using research based guidelines that recognize the need to determine and use job specific essential functions, and protect the public from undue harm. With an estimated 78,150 on-duty firefighter injuries in 2009 (Karter & Molis, 2010), use of the information from the present study and the development of an evidence-based guideline will result in increased firefighter work performance and increased public safety.

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APPENDIX A

SURVEYMONKEY HEALTHCARE PROVIDER SURVEY

1. Informed Consent

Loma Linda University School of Nursing
Graduate School

You are being invited to participate in a research study conducted by Deanna Stover, R.N., Ph.D.(c) as part of her Ph.D. program at Loma Linda University School of Nursing. The study focuses on firefighter medical standards and the purpose of the study is to establish the foundation for developing an assessment guideline that may be used by nursing and medical personnel when evaluating a firefighter's ability to return to work after a lower extremity injury.

You are invited to participate in this research because you are a healthcare provider that performs evaluations on employees and/or firefighters returning to work after an injury within the State of California. Your participation is voluntary and includes the completion of this on-line survey that takes approximately 10-20 minutes to complete. You may withdraw at any time without any negative consequence. Your participation is not required and will not effect your work status or be disclosed to your employer.

Risks and Benefits of Being in the Study
The study potentially contributes to a better understanding of the essential job duties of a firefighter and how medical evaluations are performed for firefighters returning to work after a lower extremity injury. In addition to fostering the professional knowledge base, your participation may increase your knowledge of the firefighter role and firefighter medical evaluations.

Confidentiality
Results of the study will be reported across all participants and none of the information will/can be traced back to the participants completing the on-line survey.

Contacts and Questions
You may ask any questions about the study by contacting the study researcher, Deanna Stover, R.N., Ph.D.(c), at dstover03n@llu.edu or the sponsoring professor, Dr. Betty Winslow, at bwinslow@llu.edu.

1. Do you currently practice in the State of California?

◯ Yes
◯ No

2. Consent to Participate

2. Do you agree to participate in the study?

- ◯ Yes - Start Survey
- ◯ No Thank you - Exit Survey

3. Demographic information.

Please provide the following demographic information. Your participation is voluntary, and the information collected on this questionnaire is anonymous.

3. Do you have professional work experience performing return to duty and/or work-related medical evaluations on employees and/or firefighters?

- ◯ Yes
- ◯ No

4. Demographic Information

4. On average, how many return to work evaluations do you estimate you perform in a month?

- ◯ 0-50 return to work evaluations per month
- ◯ 51-100 return to work evaluations per month
- ◯ 101-200 return to work evaluations per month
- ◯ 201 + return to work evaluations per month

5. How many years have you been performing work-related employee medical evaluations?

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21+ years

6. My primary specialty is:

- ◯ Family Medicine
- ◯ Occupational Medicine (Occupational Health)
- ◯ Orthopedics
- ◯ Other

7. My current practice setting is:

- ◯ Group medical practice
- ◯ Occupational Medicine Clinic
- ◯ Corporate Occupational Medical Clinic
- ◯ University Medical Clinic
- ◯ County or City Medical Clinic
- ◯ Hospital-based Clinic
- ◯ Solo Medical Practice
- ◯ Other

8. I am a:

- ◯ Male
- ◯ Female

9. My age is years is:

- ◯ 20-30 years
- ◯ 31-40 years
- ◯ 42-50 years
- ◯ 51-60 years
- ◯ 60+ years

10. I presently work in:

- ◯ Alameda County
- ◯ Inyo County
- ◯ Kern County
- ◯ Los Angeles County
- ◯ Orange County
- ◯ Riverside County
- ◯ San Bernardino County
- ◯ San Diego County
- ◯ San Francisco County
- ◯ Ventura County
- ◯ Other

11. How many years have you been practicing in your present profession?

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21+ years

12. My Ethnicity is:

- ◯ African-American
- ◯ Asian/Pacific Islander
- ◯ Caucasian
- ◯ Hispanic
- ◯ Native American
- ◯ Other

13. I am presently a/n:

- ◯ Exercise Physiologist
- ◯ Nurse Practitioner
- ◯ Occupational Therapist
- ◯ Physical Therapist
- ◯ Physician
- ◯ Physician Assistant
- ◯ Registered Nurse

5. Demographic Information

14. Are you nationally boarded in your medical specialty?

- ◯ Yes
- ◯ No

15. Are you presently boarded by the American Board of Preventive Medicine in occupational medicine?

- ◯ Yes
- ◯ No

6. Demographic Information

Please provide the following demographic information. Your participation is voluntary, and the information collected on this questionnaire is anonymous.

16. Are you nationally boarded in your Nursing specialty?

- ◯ Yes
- ◯ No

17. Are you presently boarded by the American Board for Occupational Health Nurses?

- ◯ Yes
- ◯ No

7. National Fire Protection Association (NFPA) Standards

18. The following questions ask your familiarity and use of the National Fire Protection Association (NFPA) standards. Use the scale to rate each statement.

	No, Never Heard of It	Yes, Heard of It	Yes, Know a Little	Yes. Know a Lot	Yes, Know it Well
I am familiar with the National Fire Protection Association (NFPA) fire agency standards.	◯	◯	◯	◯	◯
I am familiar with NFPAs 1582 standard on the comprehensive occupational medical program for fire departments	◯	◯	◯	◯	◯

19. I am familiar with the Americans with Disability Act regulations for performing return to duty medical evaluations on employees.

	No, Never Heard of It	Yes, Heard of It	Yes, Know a Little	Yes. Know a Lot	Yes, Know it Well
.	◯	◯	◯	◯	◯

8. Evidence-Based Guidelines

20. The following questions ask your use of evidence-based guidelines and lists of essential job functions when performing return to duty evaluations of employees. Use the scale to respond to each statement.

	Never	Sometimes	Often	Always
An evidence-based guideline would be useful when evaluating firefighters returning to work after an injury.	◯	◯	◯	◯
An evidence-based guideline would be useful when evaluating firefighters returning to work after a LOWER extremity injury.	◯	◯	◯	◯
I use evidence-based guidelines in my practice setting.	◯	◯	◯	◯
I use evidence-based guidelines when performing return to duty evaluations on firefighters.	◯	◯	◯	◯
I WOULD use an evidence-based guideline when performing return to duty evaluations on firefighters.	◯	◯	◯	◯
I know the employee's job duties or essential functions before I render a decision about their ability to return to work.	◯	◯	◯	◯

21. Do you have professional work experience performing return to duty and/or work-related medical evaluations on FIREFIGHTERS?

◯ Yes

◯ No

9. Evidence-Based Guidelines

The following questions ask your use of evidence-based guidelines and lists of essential job functions when performing return to duty evaluations of employees. Use the scale to respond to each statement.

22. On average, how many FIREFIGHTER evaluations do you perform in a month?

- ◯ 0-50 firefighter medical evaluations per month
- ◯ 51-100 firefighter medical evaluations per month
- ◯ 101-200 firefighter medical evaluations per month
- ◯ 201 + firefighter medical evaluation per month

23. How many years have you been performing FIREFIGHTER medical evaluations?

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21+ years

24. Use the scale to respond to each statement

	Never	Sometimes	Often	Always
I use NFPA 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after an injury.	◯	◯	◯	◯
I use NFPA 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after a LOWER EXTREMITY injury.	◯	◯	◯	◯
I know the actual firefighter's job duties or essential functions before I render a decision about the firefighters ability to return to work.	◯	◯	◯	◯
I use the NFPA 1582 standard on comprehensive occupational medical program for fire departments essential job function list when evaluating a firefighter who is returning to work after an injury.	◯	◯	◯	◯
I use the firefighter's actual fire departments job duties or essential functions list when performing a return to duty evaluation on a firefighter.	◯	◯	◯	◯
I use the workers compensation carriers' firefighter job duty list/job analysis when performing a return to duty evaluation on a firefighter returning to work after a work related injury.	◯	◯	◯	◯
I use NFPA 1582 standard on comprehensive occupational medical program for fire departments when determining the work status of a firefighter returning to work after a lower extremity injury.	◯	◯	◯	◯
I use NFPA 1582 standard on comprehensive occupational medical program for fire departments, category A and category B criteria, when determining the work status of a firefighter.	◯	◯	◯	◯
I use diagnostic testing modalities when evaluating a firefighter returning to work after an injury.	◯	◯	◯	◯

10. Examinaton and Testing Methods

25. The following questions ask you about examination and testing methods when performing return to duty evaluations. Use the scale to respond to each statement.

	Never	Sometimes	Often	Always
I obtain a history of how the injury occurred when evaluating an individual's ability to return to work after an injury.	◯	◯	◯	◯
I would use diagnostic testing modalities when evaluating a firefighter returning to work after an injury.	◯	◯	◯	◯

26. If you were to evaluate a firefighter returning to work after a lower extremity injury would you:

	Never	Sometimes	Often	Always
Use a treadmill test as part of your evaluation of functional ability	◯	◯	◯	◯
Test for lower extremity flexibility	◯	◯	◯	◯
Test for lower extremity muscle strength	◯	◯	◯	◯
Evaluate lower extremity range of motion	◯	◯	◯	◯
Assess the non-injured lower extremity comparing it to the assessment of the injured lower extremity	◯	◯	◯	◯
Perform a neurovascular assessment of the injured lower extremity	◯	◯	◯	◯
Assess postural stability	◯	◯	◯	◯
Evaluate abduction and adduction of the extremity	◯	◯	◯	◯
Perform a gait assessment	◯	◯	◯	◯
Use a work simulation test based on a specific job duty to determine if the firefighter is able to do the job duties.	◯	◯	◯	◯
Use a dynamometer to assess muscular strength of the affected lower extremity	◯	◯	◯	◯

11. Medical evaluations and work restrictions.

27. The following are general questions about your beliefs on medical evaluations and work restrictions for firefighters. Use the scale to respond.

	Strongly Disagree	Disagree	Agree	Strongly Agree
A firefighter should not be assigned to full-duty if he/she cannot perform all job duties or essential functions.	◯	◯	◯	◯
A firefighter with a lower leg (below the knee) amputation wearing a prosthetic device can perform all of the firefighter job duties or essential functions.	◯	◯	◯	◯
I would trust a firefighter with a lower leg (below the knee) amputation wearing a prosthetic device for a leg to perform firefighter job duties or essential functions.	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to full-duty as a firefighter.	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a TEMPORARY basis with work restrictions.	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a PERMANENT basis with work restrictions.	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be medically evaluated to determine if he/she can perform the essential duties of the firefighter job before returning to work.	◯	◯	◯	◯
Medical providers should be knowledgeable of the job duties of a firefighter when determining whether a firefighter can return to duty.	◯	◯	◯	◯
The medical provider, when evaluating a firefighter returning to work after a lower extremity injury, should perform testing such as stair climbing and range of motion to determine the firefighter's ability to perform the job duties.	◯	◯	◯	◯
A list of the firefighter job duties/essential job functions unique to each fire department should be used by medical providers when determining if a firefighter can do his/her firefighter job safely.	◯	◯	◯	◯
I would want to know the actual firefighter's job duties or essential functions before I render a decision about a firefighters ability to return to work.	◯	◯	◯	◯

12. Thank-you

Thank-you for your interest and/or voluntary participation in this study. The survey is limited to providers currently practicing in California with professional work experience performing medical evaluations on employees and/or firefighters.

Once you select the DONE button you will not be able to return to the survey. Thank you for completing the survey.

APPENDIX B

SURVEYMONKEY FIREFIGHTER SURVEY

1. Informed Consent

Loma Linda University School of Nursing
Graduate School

You are being invited to participate in a research study conducted by Deanna Stover, R.N., Ph.D.(c) as part of her Ph.D. program at Loma Linda University School of Nursing. The study focuses on firefighter medical standards and the purpose of the study is to establish the foundation for developing an assessment guideline that may be used by nursing and medical personnel when evaluating a firefighter's ability to return to work after a lower extremity injury.

You are invited to participate in this research because you are a fire fighter in California. Your participation is voluntary and includes the completion of this on-line survey that takes approximately 10-20 minutes to complete. You may withdraw at any time without any negative consequence. Your participation is not required and will not effect your work status or be disclosed to your employer.

Risks and Benefits of Being in the Study
The study potentially contributes to a better understanding of the essential job duties of a firefighter and how medical evaluations are performed for firefighters returning to work after a lower extremity injury. In addition to fostering the professional knowledge base, your participation may increase your knowledge of the firefighter role and firefighter medical evaluations.

Confidentiality
Results of the study will be reported across all participants and none of the information will/can be traced back to the participants completing the on-line survey.

Contacts and Questions
You may ask any questions about the study by contacting the study researcher, Deanna Stover, R.N., Ph.D.(c), at dstover03n@llu.edu or the sponsoring professor, Dr. Betty Winslow, at bwinslow@llu.edu.

1. Are you a Firefighter in the State of California?

◯ Yes

◯ No

2. Consent to Participate

2. Do you agree to participate in the Firefighter study?

- ◯ Yes - Start Survey
- ◯ No Thank you - Exit Survey

3. Demograhic Information

Please provide the following demographic information. Your participation is voluntary, and the information collected on this questionnaire is anonymous.

3. I am currently a _____ firefighter

- ◯ Career
- ◯ Paid-Call
- ◯ Volunteer
- ◯ Reserve
- ◯ Seasonal
- ◯ Other

4. I am a:

- ◯ Male
- ◯ Female

5. My Ethnicity is:

- ◯ African-American
- ◯ Asian/Pacific Islander
- ◯ Caucasian
- ◯ Hispanic
- ◯ Native American
- ◯ Other

6. How many total years have you been a fire fighter?

- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21-30 years
- ◯ 31-40 years
- ◯ 41+ years

7. For my primary fire fighter job, I work for a:

- ◯ County Fire Department
- ◯ Rural Fire Department
- ◯ State Fire Department
- ◯ Federal Fire Agency
- ◯ Urban or City Fire Department
- ◯ Other

8. My age in years is:

- ◯ 20-30 years
- ◯ 31-40 years
- ◯ 41-50 years
- ◯ 51-60 years
- ◯ 60+ years

9. My work as a firefighter is in:

- ◯ Alameda County
- ◯ Inyo County
- ◯ Kern County
- ◯ Los Angeles County
- ◯ Orange County
- ◯ Riverside County
- ◯ San Bernardino County
- ◯ San Diego County
- ◯ San Francisco County
- ◯ Ventura County
- ◯ Other

10. My present rank is:

- ◯ Firefighter
- ◯ Firefighter / Paramedic
- ◯ Engineer
- ◯ Captain
- ◯ Battalion Chief
- ◯ Division Chief
- ◯ Deputy / Assistant Chief
- ◯ Fire Department Chief
- ◯ Other

4. National Fire Protection Association (NFPA) standards

The following questions ask your familiarity and use of the National Fire Protection Association (NFPA) standards within your fire agency. Use the scale to rate each statement.

11. Use the scale to rate each question

	No, Never Heard of It	Yes, Heard of It	Yes, Know a Little	Yes. Know a Lot	Yes, Know it Well
I am familiar with the National Fire Protection Association (NFPA) fire agency standards.	◯	◯	◯	◯	◯
I am familiar with NFPAs 1582 standard on the comprehensive occupational medical program for fire departments.	◯	◯	◯	◯	◯

12. My fire department has adopted (put into practice and/or policy) the NFPA 1582 standard on comprehensive occupational medical program for fire departments

◯ Yes

◯ No

◯ Don't Know

5. Return-to-duty medical evaluations

The following questions are about return-to-duty medical evaluations and your fire department's use of the National Fire Protection Association (NFPA) 1582 medical standards. Use the scale to respond to each statement.

13. Return-to-duty Evaluations

	Never	Sometimes	Often	Always	Don't Know
My fire department performs or contracts with external medical providers to perform return to duty medical evaluations on firefighters returning to duty after an injury.	◯	◯	◯	◯	◯
My fire department uses the NFPA 1582 standard on comprehensive occupational medical program for fire departments when evaluating firefighter returning to duty (after a lower extremity injury).	◯	◯	◯	◯	◯
My fire department has used NFPA 1582 standard on comprehensive occupational medical program for fire departments to defend its position on a firefighters return to duty work status.	◯	◯	◯	◯	◯
When a firefighter has sustained a minor lower extremity injury, my fire department sends the firefighter for a medical evaluation before the firefighter can return to duty.	◯	◯	◯	◯	◯
When a firefighter has sustained a major lower extremity injury, my fire department sends the firefighter for a medical evaluation before the firefighter can return to duty.	◯	◯	◯	◯	◯

14. Has your fire department, using NFPA 1582 standard on comprehensive occupational medical program, discovered that a firefighter was returned to duty after a lower extremity injury and was unable to perform the job duties?

	Never	Sometimes	Often	Always	Don't Know
.	◯	◯	◯	◯	◯

15. My fire department has been challenged in court on a firefighter's return to duty work status.

	Never	Sometimes	Often	Always	Don't Know
.	◯	◯	◯	◯	◯

6. Firefighter job duties

The following questions ask your beliefs about YOUR firefighter job duties. Use the scale for your yes-no answers

16. Are rescue operations under stressful conditions an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

17. Is wearing a self-contained breathing apparatus an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

18. Is climbing flights of stairs an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

19. Is climbing flights of stairs while wearing fire protective equipment an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

20. Is rescue dragging or carrying victims up to 200 pounds an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

21. Is rescue dragging or carrying victims over 200 pounds an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

22. Is dragging a dry hose up to 2.5 inches in diameter 150 feet in distance an essential job duty for YOUR job as a firefighter?

- ◯ Yes
- ◯ No

23. Is moving a charged hose up to 2.5 inches in diameter an essential job duty for YOUR job as a firefighter?

◯ Yes

◯ No

24. Is moving a charged hose up to 2.5 inches in diameter 150 feet in distance an essential job duty for YOUR job as a firefighter?

◯ Yes

◯ No

25. Is climbing a ladder an essential job duty for YOUR job as a firefighter?

◯ Yes

◯ No

26. Is walking on uneven surfaces an essential job duty for YOUR job as a firefighter?

◯ Yes

◯ No

27. Is working for prolonged periods of physical exertion an essential job duty for YOUR job as a firefighter?

◯ Yes

◯ No

7. Medical evaluations and work restrictions.

The following are general questions about medical evaluations and work restrictions. Use the scale to respond.

28. Use the scale to respond to each question

	Strongly Disagree	Disagree	Agree	Strongly Agree
A firefighter should not be assigned to full-duty if he/she cannot perform all job duties or essential functions.	◯	◯	◯	◯
A firefighter with a lower leg (below the knee) amputation wearing a prosthetic device can perform all of the firefighter job duties or essential functions.	◯	◯	◯	◯
I would trust a firefighter with a lower leg (below the knee) amputation wearing a prosthetic device for a leg to perform the firefighter job duties or essential functions.	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to full duty as a firefighter.	◯	◯	◯	◯
A firefighter returning to work after a MAJOR lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a TEMPORARY basis with work restrictions.	◯	◯	◯	◯
A firefighter returning to work after a MAJOR lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a PERMANENT basis with work restrictions	◯	◯	◯	◯
A firefighter returning to work after a major lower extremity injury such as a total or partial knee replacement surgery should be medically evaluated to determine if he/she can perform the essential duties of the firefighter job before returning to work.	◯	◯	◯	◯

29. Use the scale to respond to each question

	Strongly Disagree	Disagree	Agree	Strongly Agree
Medical providers should be knowledgeable of the job duties of a firefighter when determining whether a firefighter can return to duty.	◯	◯	◯	◯
The medical provider, when evaluating a firefighter returning to work after a lower extremity injury, should perform testing such as stair climbing and range of motion to determine the firefighter's ability to perform the job duties.	◯	◯	◯	◯
A list of the firefighter job duties/essential job functions unique to each fire department should be used by medical providers when determining if a firefighter can do his/her firefighter job safely.	◯	◯	◯	◯

8. Job duties for any firefighter

The following general questions ask what you believe are the job duties for ANY firefighter, not just for your fire agency. Use the scale for your yes-no answers

30. Are tasks such as rescue operations under stressful conditions an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

31. Is wearing a self-contained breathing apparatus an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

32. Is climbing flights of stairs an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

33. Is climbing flights of stairs while wearing fire protective equipment an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

34. Is rescue, dragging, or carrying victims up to 200 pounds an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

35. Is rescue, dragging, or carrying victims over 200 pounds an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

36. Is dragging a dry hose up to 2.5 inches in diameter 150 feet in distance an essential job duty for any firefighter?

- ◯ Yes
- ◯ No

37. Is moving a charged hose up to 2.5 inches in diameter an essential job duty for any firefighter?

◯ Yes

◯ No

38. Is moving a charged hose up to 2.5 inches in diameter 150 feet in distance an essential job duty for any firefighter?

◯ Yes

◯ No

39. Is climbing a ladder an essential job duty for any firefighter?

◯ Yes

◯ No

40. Is walking on uneven surfaces an essential job duty for any firefighter?

◯ Yes

◯ No

41. Is working for prolonged periods of physical exertion an essential job duty for any firefighter?

◯ Yes

◯ No

9. Workers compensation

The following questions are related to YOUR experience with workers compensation and your job as a firefighter. Use the scale for your yes-no answers.

42. Have you EVER filed a workers compensation claim for a LOWER EXTREMITY INJURY that you sustained on-duty as a firefighter?

- ◯ Yes
- ◯ No

10. Workers Compensation

The following questions are related to YOUR experience with workers compensation and your job as a firefighter. Use the scale for your yes-no answers.

43. In years, how long has it been since your last LOWER EXTREMITY injury?

- ◯ 0-1 years
- ◯ 2-3 years
- ◯ 4-5 years
- ◯ 6-7 years
- ◯ 8-9 years
- ◯ 10+ years

44. When you sustained your last LOWER EXTREMITY INJURY, were you required to have a medical evaluation before you were returned to work?

- ◯ Yes
- ◯ No

45. After your LOWER EXTREMITY INJURY, how were you initially returned to work as a firefighter?

- ◯ With temporary work restrictons
- ◯ With permanent work restrictions
- ◯ Full-duty (no work restrictons)
- ◯ I was not initially retuned-to-work
- ◯ I was not ever returned to work as a firefighter

11. Workers Compensatiion

The following questions are related to YOUR experience with workers compensation and your job as a firefighter. Use the scale for your yes-no answers.

46. Have you EVER filed a workers compensation claim for ANY other work injury that you sustained as a firefighter?

- ◯ Yes
- ◯ No

12. Workers Compensation

47. In years, how long has it been since your most recent work-related injury?

- ◯ 0-1 years
- ◯ 2-3 years
- ◯ 4-5 years
- ◯ 6-7 years
- ◯ 8-9 years
- ◯ 10+ years

13. Thank-you

Thank-you for your interest and/or voluntary participation in this study. The survey is limited to fire fighters in California.

Once you select the DONE button you will not be able to return to the survey. Thank you for completing the survey.

APPENDIX C

LOMA LINDA UNIVERSITY IRB APPROVAL LETTER

INSTITUTIONAL REVIEW BOARD
Exempt Notice

OFFICE OF SPONSORED RESEARCH • 11168 Anderson Street • Loma Linda, CA 92350
(909) 558-4531 (voice) • (909) 558-0131 (fax)

IRB# 5100212

To: **Winslow, Betty W**
Department: **School of Nursing**
Protocol: *Establishing the foundation for developing an evidence based guideline for evaluating a firefighter's ability to return to work after a lower extremity injury*

Your application for the research protocol indicated above was reviewed administratively on behalf of the IRB. This protocol is determined to be exempt from IRB approval as outlined in federal regulations for protection of human subjects, 45 CFR Part 46.101(b)(2).

Stipulations:

Please note the PI's name and the IRB number assigned to this IRB protocol (as indicated above) on any future communications with the IRB. Direct all communications to the IRB c/o the Office of Sponsored Research.

Although this protocol is exempt from further IRB review as submitted, it is understood that all research conducted under the auspices of Loma Linda University will be guided by the highest standards of ethical conduct.

Signature of IRB Chair/Designee: R L Rigsby MD Date: 12/2/10

IRB Chair:
Rhodes L. Rigsby, M.D.
Department of Medicine
(909) 558-2341, rrigsby@llu.edu

IRB Administrator:
Linda G. Halstead, M.A., Director
Office of Sponsored Research
Ext 43570, Fax 80131, lhalstead@llu.edu

IRB Specialist:
Mark Testerman
Office of Sponsored Research
Ext 43042, Fax 80131, mtesterman@llu.edu

APPENDIX D

HEALTHCARE PROVIDER QUESTIONNAIRE

Please provide the following demographic information. The information collected in this questionnaire is voluntary and anonymous. Please do not provide your name.

		Yes	No
1	Do you have professional work experience performing return to duty/work evaluations on *employees?*		
2	On average, how many return to work medical evaluations do you estimate you perform in a month?	Number/Month _____	
3	How many years have you been performing work-related employee medical evaluations?	Years	
4	Do you have professional work experience performing return to duty/work evaluations on *firefighters?*		
5	On average, how many firefighter medical evaluations do you estimate you perform in a month?	Number/Month _____	
6	How many years have you been performing firefighter medical evaluations?	Years	

		√			√
7	I am a …		**11**	I am located in	
	Exercise Physiologist			San Bernardino County	
	Nurse Practitioner (RN)			Riverside County	
	Occupational Therapist			Los Angeles County	
	Physical Therapist			Orange County	
	Physician			San Diego County	
	Physician Assistant			Other	
	Registered Nurse		**12**	How many years have you been practicing in your current profession?	Years _____
8	My specialty is …		**13**	My ethnicity is…	
	Family Medicine			African American	
	Occupational Medicine (Health)			Asian	
	Other			Caucasian	
9	I am a …			Hispanic	
	Female			Native American	
	Male			Pacific Islander	
				Other	
10	My age in years is	Years _____			

		Yes	No
14	Are you nationally boarded in your specialty		
15	Are you currently boarded by ACOEM in occupational medicine		

The following questions ask *your* familiarity and use of the National Fire Protection Association (NFPA) standards. Use the scale to indicate your agreement/disagreement with each statement

		Strongly Disagree	Disagree	Agree	Strongly Agree
16	I am familiar with National Fire Protection Association (NFPA) fire department standards				
17	I am familiar with NFPAs 1582 standard on comprehensive occupational medical program for fire departments				
18	I am familiar with the Americans with Disability Act regulations for performing return to duty medical evaluations on employees				

The following questions ask *your* use of evidence-based guidelines and lists of essential job functions when performing return to duty evaluations of employees. Use the scale to indicate your response to each statement.

		Never	Sometimes	Often	Always
19	An evidence-based guideline would be useful when evaluating firefighters returning to work after an injury?				
20	An evidence-based guideline would be useful when evaluating firefighters returning to work after a *lower extremity injury*?				
21	I use/would use evidence-based guidelines in my practice setting				
22	I use/would use evidence-based guidelines when performing return to duty evaluations on firefighters				
23	I use/would use NFPA 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after an injury				
24	I use/would use NFPA 1582 standard on comprehensive occupational medical program for fire departments as a guide when evaluating firefighters returning to duty after a *lower extremity injury*?				
25	When evaluating a firefighter returning to work after an injury, I use/would use the list of essential job duties contained in the NFPA 1582 standard on comprehensive medical program document?				

26	I use/would use the firefighters actual fire departments job duties or essential function list when performing a return to duty evaluation on a firefighter				
27	I use/would use the workers compensation carriers firefighters job duty list/job analysis when performing a return to duty evaluation on a firefighter				
28	Do you know what the actual firefighter's job duties or essential functions are before you perform or render a decision about the firefighters ability return to work?				
29	I use NFPA 1582 standard on comprehensive occupational medical program for fire departments *essential job function* list when evaluating a firefighter who is returning to work after an injury				
30	I use NFPA 1582 standard on comprehensive occupational medical program for fire departments when determining the work status of a firefighter returning to work after a lower extremity injury				
31	I use NFPA 1582 standard on comprehensive occupational medical program for fire departments, category A and category B criteria, when determining the work status of a firefighter				
32	Medical providers should be knowledgeable on the job duties of a firefighter when determining if a firefighter can return to duty				
33	A list of the firefighter job duties/essential job functions unique to each fire department should be used by medical providers when determining if a firefighter can do his/her firefighter job safely				

The following questions ask you about examination and testing methods when performing return to duty evaluations. Use the scale to indicate your response to each statement.

		Never	**Sometimes**	**Often**	**Always**
34	I obtain a history of how the injury occurred when evaluating an individual's ability to return to work after an injury				
35	I use diagnostic testing modalities when evaluating a firefighter returning to work after an injury				
	If you were to evaluate a firefighter returning to work after a lower extremity injury would you …				
36	Use a treadmill test as part of my evaluation of functional ability				
37	Test for lower extremity flexibility				
38	Test for lower extremity muscle strength				

39	Evaluate lower extremity range of motion				
40	Assess the non-injured lower extremity comparing it to the assessment of the injured lower extremity				
41	Perform a neurovascular assessment of the injured lower extremity				
42	Assess postural stability				
43	Evaluate abduction and adduction of the extremity				
44	Perform a gait assessment				
45	Use a work simulation test based on a specific job duty to determine if the firefighter is able to do the job duties				
46	Use a dynamometer to assess muscular strength of the affected lower extremity				

The following are general questions about your beliefs on medical evaluations and work restrictions for firefighters. Use the scale to indicate your best response to each statement.

		Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
47	A firefighter should *not* be assigned to full-duty if he/she cannot perform *all* job duties or essential functions.				
48	Would you trust a firefighter with a lower leg (below the knee) amputation wearing a prosthetic device for a leg to perform firefighter job duties or essential functions				
49	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to full duty as a firefighter				
50	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a *temporary* basis with work restrictions				
51	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be medically evaluated to determine if he/she can perform the essential duties of the firefighter job before returning to work				
52	The medical provider, when evaluating a firefighter returning to work after a lower extremity injury, should perform testing such as stair climbing and range of motion to determine the firefighter's ability to perform the job duties				

APPENDIX E

FIREFIGHTER QUESTIONNAIRE

Please provide the following demographic information. The information collected in this questionnaire is voluntary and anonymous. Please do not provide your name.

Demographic Information:

		√			√
1	I am a..... firefighter		**5**	For my primary firefighter job I work for a …	
	Career			County fire department	
	Paid-call			Rural fire department	
	Volunteer			State fire department	
	Reserve			Federal Fire Agency	
2	I am a …			Urban or City fire department	
	Male		**6**	My age in years is	Years _____
	Female				
3	My ethnicity is…		**7**	I am located in	
	African American			San Bernardino County	
	Asian			Riverside County	
	Caucasian			Los Angeles County	
	Hispanic			Orange County	
	Native American			San Diego County	
	Pacific Islander			Other	
	Other		**8**	My current rank is……	
4	How many years have you been a firefighter?	Years _____		Firefighter	
				Firefighter / Paramedic	
				Engineer	
				Captain	
				Battalion Chief	
				Division Chief	
				Deputy / Assistant Chief	
				Fire Department Chief	

The following questions ask your familiarity and use of the National Fire Protection Association (NFPA) standards within **your** fire agency. Use the scale to indicate your agreement/disagreement with each statement

		Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
9	I am familiar with National Fire Protection Association (NFPA) fire agency standards				
10	My fire department has adopted (put into practice and/or policy) NFPA fire standards for use in my organization				
11	I am familiar with NFPAs 1582 standard on comprehensive occupational medical program for fire departments				

		Yes	**No**	**Don't Know**
12	My fire department has adopted (put into practice and/or policy) the NFPA 1582 standard on comprehensive occupational medical program for fire departments			

The following questions are about return-to-duty medical evaluations and your fire departments use of the National Fire Protection Association (NFPA) 1582 medical standards. Use the scale to indicate your best response to each statement.

		Never	**Sometimes**	**Often**	**Always**	**Don't Know**
13	My fire department performs or contracts with external medical providers to perform return to duty medical evaluations on firefighters returning to duty after an injury					
14	My fire department uses the NFPA 1582 standard on comprehensive occupational medical program for fire departments when evaluating firefighter returning to duty (after a lower extremity injury)					
15	My fire department has used NFPA 1582 standard on comprehensive occupational medical program for fire departments to defend its position on a firefighters return to duty work status					
16	When a firefighter has sustained a *minor* lower extremity injury my fire department sends the firefighter for a medical evaluation before the firefighter can return to duty					
17	When a firefighter has sustained a *major* lower extremity injury my fire department sends the firefighter for a medical evaluation before the firefighter can return to duty					
18	Has your fire department, using NFPA 1582 standard on comprehensive occupational medical program, discovered that a firefighter was returned to duty after a lower extremity injury and was unable to perform the job duties?					
19	My fire department has been challenged in court on a firefighter's return to duty work status					

The following questions ask your beliefs about ***your*** firefighter job duties. Use the scale to indicate your agreement/disagreement with each statement

		Yes	**No**
20	Are rescue operations under stressful conditions an essential job duty for **your** job as a firefighter?		
21	Is wearing a self-contained breathing apparatus an essential job duty for **your** job as a firefighter?		
22	Is climbing flights of stairs an essential job duty for **your** job as a firefighter		
23	Is climbing flights of stairs while wearing fire protective equipment an essential job duty for **your** job as a firefighter		
24	Is rescue dragging or carrying victims up to 200 pounds an essential job duty for **your** job as a firefighter		
25	Is rescue dragging or carrying victims over 200 pounds an essential job duty for **your** job as a firefighter		
26	Is advancing a water filled hose up to 2.5 inches in diameter up to 150 feet in distance an essential job duty for **your** job as a firefighter		
27	Is advancing a water filled hose up to 2.5 inches in diameter up to 200 feet in distance an essential job duty for **your** job as a firefighter		
28	Is climbing a ladder an essential job duty for **your** job as a firefighter		
29	Is walking on uneven surfaces an essential job duty for **your** job as a firefighter		
30	Working for prolonged periods of physical exertion is an essential job duty for **your** job as a firefighter		

The following are general questions about on medical evaluations and work restrictions. Use the scale to indicate your best response to each statement.

		Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
31	A firefighter should *not* be assigned to full-duty if he/she cannot perform *all* job duties or essential functions.				
32	A firefighter with a lower leg (below the knee) amputation wearing a prosthetic device *can* perform *all* of the firefighter job duties or essential functions				
33	Would you trust a firefighter with a lower leg (below the knee) amputation wearing a prosthetic device for a leg to perform the firefighter job duties or essential functions				
34	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to full duty as a firefighter				
35	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a *temporary* basis with work restrictions				
36	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be allowed to return to restricted duty on a *permanent* basis with work restrictions				
37	A firefighter returning to work after a *major* lower extremity injury such as a total or partial knee replacement surgery should be medically evaluated to determine if he/she can perform the essential duties of the firefighter job before returning to work				
38	The medical provider, when evaluating a firefighter returning to work after a lower extremity injury, should perform testing such as stair climbing and range of motion to determine the firefighter's ability to perform the job duties				
39	Medical providers should be knowledgeable on the job duties of a firefighter when determining if a firefighter can return to duty				
40	A list of the firefighter job duties/essential job functions unique to each fire department should be used by medical providers when determining if a firefighter can do his/her firefighter job safely				

The following general questions ask what you believe are the job duties for any firefighter job, not just for your fire agency. Use the scale to indicate your agreement/disagreement with each statement

		Yes	No
41	Are tasks such as rescue operations under stressful conditions an essential job duty for a firefighter		
42	Is wearing a self-contained breathing apparatus an essential job duty for a firefighter		
43	Is climbing flights of stairs an essential job duty for a firefighter		
44	Is climbing flights of stairs while wearing fire protective equipment an essential job duty for a firefighter		
45	Is rescue dragging or carrying victims up to 200 pounds an essential job duty for a firefighter		
46	Is rescue dragging or carrying victims over 200 pounds an essential job duty for a firefighter		
47	Is advancing a water filled hose up to 2.5 inches in diameter up to 150 feet in distance an essential job duty for a firefighter		
48	Is advancing a water filled hose up to 2.5 inches in diameter up to 200 feet in distance an essential job duty for a firefighter		
49	Is climbing a ladder an essential job duty for a firefighter		
50	Is walking on uneven surfaces an essential job duty for a firefighter		
51	Working for prolonged periods of physical exertion is an essential job duty for a firefighter		

The following questions are related to your experience with workers compensation and your job as a firefighter. Use the scale to indicate your agreement/disagreement with each statement

		Yes	No
52	Have you ever filed a workers compensation claim for a lower extremity injury that you sustained as a firefighter?		
53	In years, how long has it been since your last lower extremity injury?	Years _____	
54	After the injury, were you returned to work as a firefighter with work restrictions?		
55	After the injury, were you returned to full duty as a firefighter ?		
56	Were you required to have a medical evaluation before you returned to work?		
57	Have you ever filed a workers compensation claim for any other work injury that you sustained as a firefighter?		
58	In years, how long has it been since your most recent work injury	Years _____	

APPENDIX F

HEALTHCARE PARTICIPATION SCRIPT

Dear Healthcare Provider:

My name is Deanna Stover, R.N., Ph.D.(c) and I am a Ph.D. student at Loma Linda University, School of Nursing. I am conducting a survey of knowledge of standards and methods used in assessing readiness for return to work of firefighters with lower extremity injuries. I am recruiting healthcare providers in California to participate in my research.

The purpose of the study is to establish the foundation for developing an evidence-based assessment guideline that can be used by healthcare providers when evaluating a firefighter's ability to return to work after a lower extremity injury.

You are invited to participate in this research study because you are a healthcare provider that performs evaluations on employees and/or firefighters returning to work after an injury. Your participation is voluntary and includes the completion of an online survey that takes no more than 20 minutes to complete. You may withdraw at any time without any negative consequence. Your participation in the survey will be anonymous.

This is a personal invitation for your participation. You may access the online survey at https://www.surveymonkey.com/s/providerstudy2010.

Should you experience technical difficulties with the SurveyMonkey website, or the computer is not allowing you to access the survey, or you have other questions please contact me at dstover03n@llu.edu or my sponsoring professor, Dr. Betty Winslow at bwinslow@llu.edu.

Your time is appreciated and I thank you in advance for participating in the study.

Respectfully,

Deanna Stover, RN-BC, FNP-BC, CNS, COHN-S, Ph.D. (c)
Loma Linda University School of Nursing
Loma Linda, California, 92350
Email: dstover03n@llu.edu

APPENDIX G

FIREFIGHTER PARTICIPATION SCRIPT

Dear Firefighter:

My name is Deanna Stover, R.N., Ph.D.(c) and I am a Ph.D. student at Loma Linda University, School of Nursing. I am conducting a survey of knowledge of standards and methods used in assessing readiness for return to work of firefighters with lower extremity injuries. I am recruiting firefighters in California to participate in my research.

The purpose of the study is to establish the foundation for developing an evidence-based assessment guideline that can be used by healthcare providers when evaluating a firefighter's ability to return to work after a lower extremity injury.

You are invited to participate in this research study because you are a California firefighter. Your participation is voluntary and includes the completion of an online survey that takes no more than 20 minutes to complete. You may withdraw at any time without any negative consequence. Your participation in the survey will be anonymous.

This is a personal invitation for your participation. You may access the online survey at https://www.surveymonkey.com/s/firefighter2010.

Should you experience technical difficulties with the SurveyMonkey website, or the computer is not allowing you to access the survey, or you have other questions please contact me at dstover03n@llu.edu or my sponsoring professor, Dr. Betty Winslow at bwinslow@llu.edu.

Your time is appreciated and I thank you in advance for participating in the study.

Respectfully,

Deanna Stover, RN-BC, FNP-BC, CNS, COHN-S, Ph.D. (c)
Loma Linda University School of Nursing
Loma Linda, California, 92350
Email: dstover03n@llu.edu