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The Influence of Manual and Hydraulic Stretchers on Recruitment, Retention, and Turnover in the Emergency Medical Services Workforce

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THE INFLUENCE OF MANUAL AND HYDRAULIC STRETCHERS ON

RECRUITMENT, RETENTION, AND TURNOVER IN THE

EMERGENCY MEDICAL SERVICES WORKFORCE

by

Gregory Micheal Cole

A Dissertation
Submitted to the Graduate School,
the College of Science and Technology
and the Department of Human Capital Development
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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ABSTRACT

The Department of Labor predicts an increase in demand for Emergency Medical Services (EMS) as the United States' population grows older. The leaders of EMS must confront the difficulties surrounding recruitment, retention, and employment turnover of the EMS workforce to ensure a solvent employment pipeline to meet the predicted service demands. Previous researchers found that hydraulic stretchers reduced the number of occupationally acquired injuries among the EMS workforce. Grounded in human capital development and corporate social responsibility theories, this study extended from the work of Brice et al. (2012), Fredericks, Butt, and Hovenkamp (2009), and Studnek, Crawford, & Fernandez, (2011) who found that hydraulic stretchers have a positive influence on job satisfaction, lost workdays, and absenteeism.

This study examined the relationship between EMS employment turnover, retention, and recruitment and stretcher systems. This study used a causal comparative design, survey solicitation of data, and a multivariate analysis of covariance as the statistical methodology. The researcher concluded that stretcher type does not influence recruitment, retention, and turnover in this study group. This study improves the understanding of workforce outcomes as influenced by the type of stretcher systems used in EMS. Future EMS workforce research should focus on employment attractors and detractors to women in EMS and investigate the relationship among ambulance call volume, service type, EMS employment conditions, recruitment, retention, and turnover.

ACKNOWLEDGMENTS

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DEDICATION

I dedicate this dissertation to the inspirational women in my life and to my son.

My mother, Cletis Cole, was the smartest woman I have ever known yet she never finished elementary school. She was the kindest person I have ever known, but she was treated so unkindly. She owned no earthly wealth, but she was the most resourceful person I have ever known. She was the most optimistic person I have known, yet nothing cheerful ever happened for her. Mother, you are the personification of human capital development. Thank you for your reassurance. You are my hero. I am sure you are being rewarded for your exemplary attitude.

Melissa Cole is the most loyal wife who never complained about the energy, time, or money this process took from the family. She simply said, "You can do it. You must." She is a defender of the helpless and the epitome of a godly woman. She is a fearless bookworm. Simply, she is wonderful. You are the best decision I have ever made. Thank you for having and helping me. I love you.

Abby is the most beautiful daughter; inside and out. Just thinking of her brings a tear of joy to my eyes and plucks at my heart strings. This was for you, darling.

Brien, this is for you, son. I wanted you to have something that others do not. As you are choosing your life path remember this: no agony, no brag-ony. All my love.

And to the others who positively influenced and enriched my life, Thank you: Rodney, Geraldine, Dee Dee, and Joel. I love you. I always will.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CSR	Corporate Social Responsibility
CV	Covariate
DV	Dependent Variable
EMS	Emergency Medical Services
FICEMS	Federal Interagency Committee on Emergency Medical Services
IV	Independent Variable
MANCOVA	Multivariate Analysis of Covariance
NHTSA	National Highway Traffic Safety Administration
NORA	National Occupational Research Agenda
NREMT	National Registry of Emergency Medical Technicians
NRP	Nationally Registered Paramedic
OAI	Occupationally Acquired Injury

CHAPTER I – INTRODUCTION

As the gateway to healthcare for many patients, Emergency Medical Services (EMS) is an essential component of the healthcare system of the United States (Freeman, Slifkin, & Patterson, 2009; Sanders, 2012; Studenk & Crawford, 2007). For many victims of acute and chronic illness and injuries, EMS is the entry point into the United States healthcare system (Patterson, Probst, Leith, Corwin, & Powell, 2005). Operating in the before-the-hospital (prehospital) sector, EMS provides treatment to emergency and non-emergency patients and transport to healthcare facilities (Studenk & Crawford, 2007). EMS is like other professions in that inadequate support of human capital can negatively affect business practices and workforce outcomes (Behm, Veltri, & Kleinsor, 2009; Brice et al., 2012; Fisher & Wintermeyer, 2012; Kluth & Strasser, 2006; National Highway Traffic Safety Administration [NHTSA], 1996). In EMS, 89.9% of occupationally acquired injuries (OAIs) are reported from over-exertion resulting in muscle strain to the back of the EMS professional (Kim, Dropkin, Spaeth, Smith, & Moline, 2011). Human capital measures, such as protecting the health of the EMS workforce, ensure that EMS will be able to meet an aging society's need for emergency services and transportation (NHTSA, 2008; NHTSA, 2011).

The EMS workforce is composed of 826,111 credentialed professionals (NHTSA, 2014). EMS responds to 36 million calls for emergency services annually (Federal Interagency Committee on Emergency Medical Services [FICEMS], 2012) and provides care for approximately 30 million patients resulting in financial expenditures of approximately $6.75 billion per annum (National Registry of Emergency Medical Technicians [NREMT], 2014b). EMS professionals often operate in suboptimal and

dangerous situations (Studenk & Crawford, 2007). The NHTSA predicts an increase in demand for EMS services as baby boomers retire and disease prevalence increases (NHTSA, 2008; NHTSA, 2011). Even though EMS is the frontline of healthcare, it receives little attention from the public on issues that challenge the EMS workforce (Patterson et al., 2005). Human capital empirical best practices that protect the EMS workforce are needed to ensure that EMS is available to provide prehospital emergency and non-emergency treatment and transportation to citizens suffering from acute and chronic illnesses and injuries (NHTSA 2008; NHTSA 2009; NHTSA 2011).

Background of the Study

Borrowing from the concepts that saved the American soldier on the battlefield, the whitepaper *Accidental Death and Disability* in 1966 addressed the trauma death rate in the United States (Committee on Trauma and Committee on Shock, 1966). The whitepaper revealed that more trauma deaths occurred in one year in the United States than the total number of casualties from the entire Korean Conflict (Committee on Trauma and Committee on Shock, 1966). In light of the loss of human life, loss of productive years, and the expenses associated with trauma injuries, the whitepaper declared trauma as a public health crisis (Committee on Trauma and Committee on Shock, 1966). The whitepaper recommended the formation of a comprehensive ambulance service system with several components that included research, development, communications, and transportation (Committee on Trauma and Committee on Shock, 1966). The whitepaper set in motion many legislative actions that would eventually evolve into a modern EMS system (Committee on Trauma and Committee on Shock, 1966).

The EMS Agenda for the Future was the first strategic plan for the improvement of EMS in the United States (NHTSA, 1996). The Agenda was an integral stimulus for a contemporary EMS system (NHTSA, 1996). The Agenda addressed EMS human resource issues such as reciprocity and credentialing (NHTSA, 1996). Other than the call for evidence-based education and critical incident stress debriefing, the Agenda did not address human capital issues such as safety programs or ergonomics (NHTSA, 1996). Auspiciously missing from The Agenda was workforce safety recommendations.

The *EMS Workforce Agenda for the Future* identified the vision for the EMS workforce (NHTSA, 2011). The EMS Workforce Agenda for the Future (2011) recommended the establishment of occupational processes that improve workforce safety for EMS. The EMS Workforce Agenda's 2020 goals include workforce wellness, injury/illness prevention, and resources for injury prevention (NHTSA, 2011). This document indicates that occupationally acquired injuries (OAIs) and difficulties in recruitment and retention in EMS might be related (NHTSA, 2011).

Occupationally Acquired Injuries

There are many dangers in the EMS profession including exposure to hazardous materials, violent situations, and motor vehicle collisions (Maguire, Hunting, Guidotti, & Smith, 2004). The workforce injury rate in EMS is higher than any other profession (Kim et al., 2011; Magurie et al., 2005); therefore, OAIs are a major workforce concern for EMS (NHTSA, 2008). Compared to other occupations, the EMS workforce has the most worker's compensation injury claims at 54 injury compensation claims per 100 full-time employment equivalents (Kim et al., 2011). This is four times higher than the average of other industries at 14 workers' compensation claims per 100 full-time

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equivalents (Kim et al., 2011). Maguire et al. (2005) found the injury rate among medics at 34.6 per 100 full-time equivalents per year. This represents an injury rate that is ten times higher than the national rate of 3.4 cases among 100 full-time workers reported in 2012 (BLS, 2013).

The EMS professionals' greatest risk for OAIs occurs during stretcher operation (Crill & Hostler, 2005; Erich, 2013b). Studnek et al. (2011) concur that lifting the occupied, manual stretcher is the primary source of OAI in EMS. Among OAIs in EMS, 72.4% were related to patient handling and 56.6% occurred during a stretcher lift (Kim et al., 2011). Stretcher operations are an essential component of prehospital emergency medical services to facilitate patient management and transportation (Goodloe, Crowder, Arthur, & Thomas, 2012).

Hydraulic Stretchers as an Ergonomic Intervention

In terms of workforce, a poor safety record of an organization can adversely influence employee morale and make recruitment more difficult, especially in industries like EMS (NHTSA, 2011; Rechenthin, 2004). Organizations that have proactive safety programs experience fewer injuries, less OAI expenses, less intent to change jobs, higher job satisfaction, increased productivity, and a more cooperative/collegial workforce (OSHA, 2002). Therefore, safety prevention programs enhance an organization's profitability through human capital protection (ASSE, 2002; Behm, 2009).

The National Occupational Research Agenda (NORA) Public Safety Sector Council's (2013) strategic goal for EMS is to reduce traumatic injuries suffered by the EMS workforce. NORA encourages the development of patient transfer technologies to reduce friction during patient management by implementing patient lift-assist technology,

especially for bariatric patients (NORA Public Safety Sector Council, 2013). In EMS,

safety programs such as hydraulic stretchers are effective in reducing OAIs by modifying

the lifting task by reducing the lifting effort (Studnek et al., 2011; Fisher, 2012).

Hydraulic stretchers, as an ergonomic intervention, lessen the physical exertion required

to lift patients and equipment by the EMS workforce (Brice et al., 2012; Fredericks et al.,

2009; Studnek et al., 2011) as demonstrated in Figures 3 and 4. Hydraulic stretchers

reduce the number of OAIs among medics, the number of lost workdays, and the

associated expenses of OAIs (Brice et al., 2012; Fredericks et al., 2009; Studnek et al.,

2011).

Recruitment, Retention, and Turnover

EMS faces difficulties in recruitment, retention, and the interrelated constructs of

employment turnover: retention prevents turnover and turnover necessitates recruitment

(Franks, Kocher, & Chapman, 2004; Patterson & Yonas, 2007; Patterson et al., 2010).

Recruitment, retention, and turnover represent the most significant issues confronting

EMS (Patterson et al., 2010) especially for the rural EMS agencies (Franks et al., 2004;

McGinnis, 2004). Two national reports, *The EMS Workforce Agenda* (NHTSA, 2011)

and *The EMS Workforce for the 21st Century: A National Assessment* (NHTSA, 2008)

call for a refined understanding of how EMS OAIs influence recruitment, retention, and

turnover by 2020.

Recruitment: Percentage of women employees. Many consider EMS as a young

man's occupation (NHTSA, 2011). This gender branding of EMS may deter women

from considering EMS as a career (NHTSA, 2011). Similar to the workforce shortages

during World War II, Dychtwald, Erickson, and Morison, (2006) suggest that one method

to combat talent shortages is to employ more women in nontraditional occupations. Nationally, only 34% of EMS employees are women (NREMT, 2014). When compared to law enforcement, 26.6% of law enforcement employees are women; but only 11% of women are officers (FBI Uniform Crime Reporting, 2013). In fire services, only 7.3% (1,160,450 total firefighters) are women (Haynes & Stein, 2017).

Women may be deterred from considering EMS as a career because female medics have a much higher risk of injury (Magurie & Smith, 2010). In their seminal research, Hoyga and Ellis (1990) found by percentage, female EMS workers were more likely injured while working in EMS. The occupational injury rate for female medics is 86 cases per 100 workers per year (Hoyga & Ellis, 1990). This is higher than the injury rate for men, which is 50 cases per 100 workers, per year (Hoyga & Ellis, 1990). Kim, Dropkin, Spaeth, Smith, and Moline, (2011) found women, especially those older than 50 years of age, suffered OAIs more frequently than the rest of the EMS workforce.

Hydraulic stretchers modify the lifting procedure and decrease the injury rate in EMS (Brice et al., 2012; Erich, 2005, 2013a, 2013b; Studnek et al., 2011). Ergonomic job redesign expands opportunities (Kluth & Strasser, 2006) for women into occupations that were previously male dominated (Campos-Serna et al., 2013; Habib & Messing, 2012). Employing more women in EMS may resolve some of the recruitment issues as it has in other professions (Campos-Serna et al., 2013; Dychtwald et al., 2006; NHTSA, 2008).

Retention: Age and length of employment tenure. Just like other industries, EMS agencies face the potential loss of human capital as the baby boomers begin to retire and take their knowledge, skills, and experience with them as they leave the workforce

(NHTSA, 2011; Dychtwald et al., 2006). The branding of EMS as a young man's

profession may deter older workers from remaining in the profession or considering it as

an occupation (NHTSA, 2011). Ergonomic job redesigns make it possible for older

employees to have longer employment tenures (Beevis & Slade, 2003). Hydraulic

stretchers modify the lifting technique and lessen the workload for medics during

stretcher operations (Brice et al., 2012; Erich, 2005, 2013a, 2013b; Studnek et al., 2011).

David and Brachet (2009) report the average length of employment tenure for paramedics

as 7.3 years among private EMS agencies. Fire-based EMS agencies have an average

length of employment tenure of 10.8 years (David & Brachet, 2009). The Bureau of

Labor Statistics (2014) reports the 2014 average length of employment tenure for men as

4.7 years and 4.2 years for women (Bureau of Labor Statistics, 2014). The average

tenure for the general service industry, which includes hospitality, healthcare, and

transportation, was 3.3 years (Bureau of Labor Statistics, 2014). Older employees had

longer lengths of employments (Bureau of Labor Statistics, 2014).

Dychtwald et al. (2006) postulate that one method to combat talent shortages is to

keep older people employed for longer tenures. However, older medics in EMS suffer

more OAIs (Kim et al., 2011). Hydraulic stretchers are EMS-specific, ergonomic job

redesign that modifies stretcher operations (Brice et al., 2012; Erich, 2005, 2013a, 2013b;

Kluth & Strasser, 2006; Studnek et al., 2011) which may afford older employees longer

tenures in EMS. In light of the previous discussion regarding the difficulty of retention in

EMS, conserving the accumulated human capital by retaining the older medics longer

may be beneficial in resolving retention difficulties.

Turnover in EMS. Patterson et al. (2010) found that the turnover cost per agency totals $71,613.75 with a 10.7% turnover annually. Based on anecdotal evidence and reports on turnover from other researchers such as Franks, Kocher, and Chapman (2004), Patterson et al. (2010) expected to find a higher employment turnover rate. More than half (25 out of 40) of the ambulance services in the Patterson et al. (2010) study suffered from incomplete staffing. The turnover findings from Patterson et al. (2010) were across a variety of compensation patterns such as paid EMS workers, volunteer workers, and a combination of the two. According to Compensation Force, an online news outlet managed by compensation consultant Ann Barnes, a 10% turnover rate is acceptable (2013 Turnover rates by industry, 2015). The EMS turnover rate is higher than the Bureau of Labor Statistics report of total employment separations in February 2015 of 3.4% among all non-farm industries (2013 Turnover rates by industry, 2015). David and Bachet (2009) reported the average annual turnover rate for private EMS agencies as 18%. For comparison, the Bureau of Labor Statistic reported the employment separation rate as 3.2% among all industries and 2.4% in education/healthcare category at the time of the Patterson et al. (2010) research (BLS, 2010). Based on the reports of different agencies concerning employment turnover rates, it is unclear if the EMS turnover rate is too high, close to the average, or below the average. However, among EMS directors, 37% cited recruitment as a continual problem and 55% reported difficulty with retention (Patterson et al., 2010). Freeman, Slifkin, and Patterson (2009) cite recruitment and retention as a persistent operational difficulty for EMS agencies, especially the rural services; the NHTSA 's (2008) report on EMS workforce concurs with Freeman, Slifkin, and Patterson's conclusions.

According to David and Brachet (2009), a high turnover rate diminishes the human capital accumulation gained from the medics' work experience. The more frequently employment disruptions occur, the less experience accumulation occurs (David & Bachet, 2009). Clinical experience is essential for prehospital performance (David & Bachet, 2009). Baxter (2006) and Colford (2005) found that ergonomics reduces employee turnover.

Problem Statement

The NHTSA (2008) and The NHTSA (2011) predict an increased demand for EMS services as the baby boomers retire and disease prevalence increases. The need to fortify the EMS employment pipeline frames the background for this study. In the forefront, state EMS directors report that difficulties in recruitment, retention, and turnover are continual, troublesome issues challenging EMS (McGinnis, 2004; Patterson & Yonas, 2007; Patterson et al., 2010). There is an empirical knowledge gap concerning how different types of stretcher systems affect the composition of the EMS workforce in terms of employee recruitment, retention, and turnover rates. Hydraulic stretchers may expand employment opportunities to people previously inhibited from employment because of the physicality of the job (Kluth & Strasser, 2006), women, or the older worker (Beevis & Slade, 2003). Without mitigation of recruitment and retention issues, EMS will not be prepared to meet the predicted public's demand for EMS services (NHTSA, 2008).

Purpose Statement

The purpose of this research is to determine if the type of stretcher system influences recruitment (percentage of women employees), retention (age and length of

employment tenure), and turnover (employment disruption) of the EMS workforce. This study builds on previous research findings that hydraulic stretchers were associated with reductions in the frequency of OAIs, workers' compensation claims, lost workdays, and the associated injury expenses in the EMS workforce (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). This research will determine if hydraulic stretchers go beyond a reduction of injuries and the associated expenses to address the continual difficulties of EMS recruitment, retention, and turnover (McGinnis, 2004; Patterson & Yonas, 2007; Patterson et al., 2010).

Research Objectives

The literature review, previous theory and research, and the problem statement lead to the formulation of the following research question: Do differences exist in recruitment, retention, and turnover rates among EMS agencies that use manual stretchers, hydraulic stretchers, or a combination of the two stretcher systems. To investigate the research question and explore the relationships between the constructs of this study, the following research objectives were developed. The objectives of this study focus on the influence that stretcher systems have on the workforce of EMS agencies. The objectives are as follows:

RO1:   Describe the demographic characteristics of the EMS agencies in this study.

RO2:   After controlling for the influence of the annual ambulance call volume, compare recruitment (percentage of women employees), retention (age and length of employment tenure), and turnover (employment disruption)

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among EMS agencies that use hydraulic stretchers, manual lift stretchers, or a combination of stretcher systems.

Conceptual Framework

The theoretical foundation for the conceptual framework for this study is the human capital development theory (Akinyemi & Abiddin, 2013; Becker, 1993; Cohen & Soto, 2007; Schultz, 1981; Shaffer, 1961; Sweetland, 1996; Wang & Swanson, 2008) and corporate social responsibility (CSR; Carroll & Shabana, 2010; Lichtenstein, Drumwright, & Braig, 2004; Lindgreen & Swaen, 2010; McWilliams & Siegel, 2001; Renaud-Coulon, 2008; Watts & Holme, 1999). Both theories hypothesize the benefits that the organizations realize from investing in the workforce.

Human capital development theory postulates that investments in a workforce will yield positive financial returns for the organization and individual (Becker, 1993). Although the typical human capital investments are education and health (Akinyemi & Abiddin, 2013), safety and ergonomic interventions are protective of the workforce and, therefore, constitute a human capital investment (Deshkar, 2010). Such investments will yield a financial return (Becker, 1993).

CSR is the application of social and ethical standards to business conduct (Lichtenstein, Drumwright, & Braig, 2004). CSR characterizes the merger of economic and social goals to organizational management (Lindgreen & Swaen, 2010) for the improvement of the lives of employees and society (Watts & Holme, 1999). The organization that embraces CSR will demonstrate benevolent behavior toward its constituency (Lindgreen & Swaen, 2010; McWilliams & Siegel, 2001; Rechenthin, 2004;

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Renaud-Coulon, 2008) which can improve the business prospects for the organization (Carroll & Shabana, 2010).

The study population is separated into groups by the type of stretcher systems used in EMS. The various stretcher systems are manual, hydraulic, or a combination of the first two types used in one EMS agency. This approach is similar to Studnek et al. (2011), Fredericks et al. (2009), and Goodloe et al. (2012) when they investigated OAIs and associated expenses. Studnek et al. (2011) investigation of how stretcher systems influenced OAIs of the EMS workforce (Studnek et al., 2011). The previous studies mentioned, reveal that hydraulic stretchers protected the health and ability of the workforce by reducing OAIs which constitutes a human capital intervention (Studnek et al., 2011; Fredericks et al., 2009, Goodloe et al., 2012). The stretcher system that is associated with better recruitment and retention and a reduced turnover rate is the stretcher system that improves human capital outcomes in addition to the previous findings of reduced OAIs. Aside from the stretcher system, the constructs of interest in this study are EMS recruitment, retention, and turnover. These constructs are studied by examining the differences in the workforce indicators of employment turnover, average age, length of employment tenure, and the percentage of women employees in the EMS workforce. Indicators are examined by different stretcher systems.

This study seeks to improve the understanding of how stretcher systems influence EMS recruitment by examining the percentage of women employees in the EMS workforce. More representation of women in the EMS workforce is a possible solution for recruitment difficulties in EMS (NHTSA, 2008) as in other professions (Campos-Serna et al., 2013; Dychtwald et al., 2006; NHTSA, 2008). Hydraulic stretchers

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represent an ergonomic job redesign in EMS (Brice et al., 2012; Erich, 2005, 2013b; Kluth & Strasser, 2006; Studnek et al., 2011). This redesign could expand opportunities for women (Campos-Serna et al., 2013; Habib & Messing, 2012; Kluth & Strasser, 2006) and reduce recruitment issues in EMS.

This study seeks to improve the understanding of how stretcher systems influence employment retention by examining the average age of ambulance employees and the average length of employment tenure. Failure to retain older employees results in a loss of knowledge, skills, and ability accumulated by experience, which is a loss of human capital (Dychtwald et al., 2006; NHTSA, 2011). Studying the average length of employment tenure will aid in understanding retention. Longer employment tenures represent conservation of financial and human capital resources (Dychtwald et al., 2006; NHTSA, 2008; NHTSA, 2011; Patterson et al., 2005; Patterson et al., 2010). This study seeks to improve the understanding of how stretcher systems influence employment turnover. Employment turnover is a drain of financial and human capital for EMS agencies. This conceptual model proposes an investigation of the turnover rates among EMS agencies based on the type of stretcher used by the EMS agency. The empirical basis for the study of turnover derives from the findings of Patterson et al. (2010) concerning employment difficulties in EMS. Figure 1 is a graphic of the conceptual framework for this study.
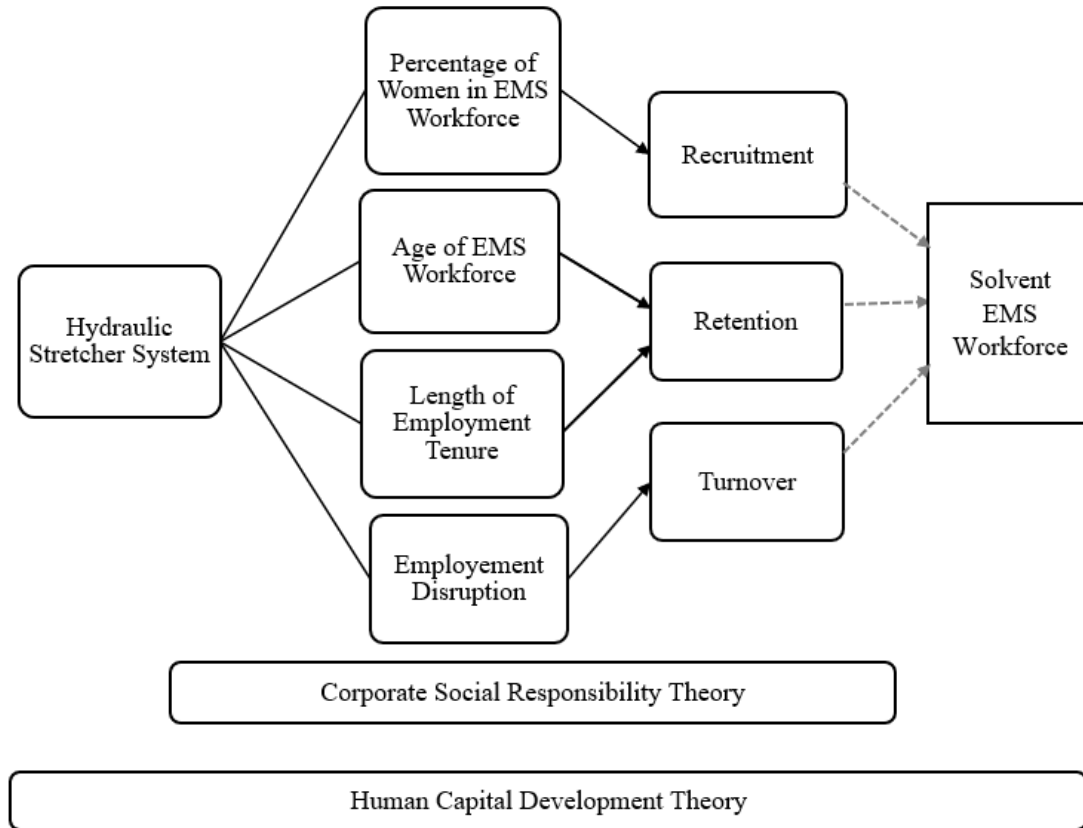
Figure 1. Conceptual Framework

Significance of the Study

This research is relevant to understand the elements, influences, and remediation of difficulties of EMS recruitment, retention, and turnover (McGinnis, 2004; Patterson & Yonas, 2007; Patterson et al., 2010). National reports sponsored by the NHTSA calls for a better understanding of recruitment, retention, and turnover in EMS by 2020 (NHTSA, 2008; NHTSA, 2011). Specifically, the EMS Workforce Agenda calls for a refined understanding of how EMS OAIs influence recruitment, retention, and turnover (NHTSA, 2011). Previous research reveals a connection between hydraulic stretchers and the reduction in OAIs, injury expenses, and the improvement of some workforce

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metrics such as lost workdays (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). If hydraulic stretchers address the continual difficulties of recruitment, retention, and turnover in EMS (McGinnis, 2004; Patterson & Yonas, 2007; Patterson et al., 2010), EMS policy makers, owners/operators, and managers can make better decisions regarding workforce planning (NHTSA, 2011). It is necessary to fortify the EMS employment pipeline to meet the current and predicted future demands for EMS services (NHTSA, 2008). It is incumbent on the organization to purchase equipment (Lichtenstein, Drumwright, & Braig, 2004), such as stretchers, that improve work productivity, protect the workforce from injury (Beevis & Slade, 2003; Brice et al., 2012; Lahiri, Gold, & Levenstein, 2005; Reichelt & Conrad, 1995; Shuford, 2013), and enable people to work in a chosen occupation (Campos-Serna, Ronda-Perez, Artazcoz, Moen, & Benavides, 2013; Dychtwald et al., 2006).

<div align="center">Delimitations</div>

The quality of this study depends on the measures the researcher takes to ensure the validity and reliability of the instruments and practices of the study by addressing potential limitations (Shadish et al., 2002) and imposing delimitations (Roberts, 2010). The researcher imposed several literature-supported delimitations to improve the focus of the study.

The delimitations of this study improve the clarity of the constructs, limit extraneous variables, streamline the research procedures, and improve the alignment of the study between methodology, instrumentation, research questions, and objectives

(Roberts, 2010). The following is a discussion of the delimitation parameters instituted by the researcher to improve the study results.

The survey specifies the requested information pertains to the previous twelve months as opposed to the last year. Last year is ambiguous and can be subjective. This study follows the example of Patterson et al. (2010) and uses the phase *the previous twelve months* instead of *in the last year.*

This study concerns ground transportation EMS agencies only. Helicopter services are not included in the study populations. EMS agencies that are a division of industrial companies are not included in the solicitation. When calculating the employment turnover rate, only employees directly involved in treating and transporting patients are part of the denominator. Administrative personnel, education personnel, service technicians, etc., are not included in the denominator. This provides a clearer picture of the effects that stretchers have upon the EMS workforce.

If an Arkansas, Louisiana, or Mississippi EMS agency had a multi-state license in any other state, the information from those states were not included in this study. This exclusion prevents contamination of data from sources that the researcher cannot control for factors such as health disparities, rurality, obesity rates, health rankings, EMS certification levels, call volume, or injury rates of EMS agencies in adjacent states. The survey instructions have explicit directions to provide information about EMS activities in Arkansas, Louisiana, or Mississippi only.

To ensure independent observations in the survey, EMS agencies that have multiple locations, listed with different addresses, and with a different manager for each location, were issued a survey for each location. Ambulance services with multiple

locations but listed by one mailing address and one manager, were given one survey for the entire company.

<center>Definitions of Terms</center>

The following definitions will contextualize and clarify the study for the reader. Although this study is from the human capital scholar/practitioner perspective, the constructs and background are from prehospital emergency medicine practice. The definitions are below:

1. *Hydraulic stretchers* - patient transport devices that raise and lower the patient with minimal efforts from the EMS personnel (Studnek et al., 2011). The lift mechanism functions by hydraulics powered by a battery. This device reduces the tensile strain placed on the medic's body during patient handling (Lavender et al., 2000).

2. *Emergency Medical Service (EMS)* - the systems organization of a workforce, facilities, and specialized equipment for the distribution of prehospital healthcare services and transportation (Patterson et al., 2005).

3. *EMS workforce* - a systematic network of credentialed individuals employed by ambulance services, fire departments, hospitals, or government offices, coordinated to provide prehospital emergency medical care and transportation of ill and injured patients (Patterson et al., 2005).

4. *National Highway Traffic Safety Administration* (NHTSA) - a department within the U.S. Department of Transportation (NHTSA, 2008; NHTSA 2009; NHTSA, 2011). The NHTSA has the governmental oversight of EMS operations and development (NHTSA, 2008; NHTSA 2009; NHTSA, 2011).

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5. The *percentage of women employees* - the percentage women that compose the EMS agency workforce.

6. The *average age* - the average age of the ambulance employees of each EMS agency (NREMT, 2014).

7. The *average length of employment tenure* - the average number of months that the employees have worked at the current EMS employer.

8. *Turnover rate* - the ratio of employment disruptions that occur at EMS agencies, such as terminations, resignations, disabilities, deaths, and retirements (NHTSA, 2008; NHTSA, 2011).

9. *Medic* - the collective term that captures all credentialed personnel that render out-of-hospital emergency care services, such as basic or advanced treatment and transportation (Patterson et al., 2005). Ascending by level of responsibility, education, and professional certification, listed below are the different levels of medics:

   a. A *first responder* - a person trained in a 40-hour course that results in a national certification. These professionals provide elementary assessment and stabilizing treatment. They are frequently part of voluntary fire departments. First responders serve a valuable role in the community; however, these individuals are not included in this study (NREMT, 2014a).

   b. An *ambulance driver* - a person who has successfully accomplished an eight-hour training program and has received a state certification to operate an ambulance (Mississippi Bureau of EMS, 2014). EMS agencies

rarely employ an individual with only an ambulance driver certification. This certification is usually required in conjunction with other higher certifications (Mississippi Bureau of EMS, 2014).

c. *Emergency Medical Technicians* (EMTs) - nationally registered professionals that have completed a training program followed by the successful completion of the National Registry examination for EMTs. These professionals represent the fundamental step in the EMS employment. Their skill set includes patient assessment, basic treatment, and transportation (NREMT, 2014a).

d. *Advanced EMTs* - medic that provides an intermediate level of emergency care. The training consists of the previous level discussed (EMT) and components of the next level—paramedic. These professionals are nationally registered and state certified following the completion of a training program and the successful completion of the National Registry of EMT examination. The skill set of the Advanced EMTs incorporates all the skills of the previous levels plus some intermediate skills such as invasive airway control, cardiac arrest and diabetic medications, basic electrical modalities, vascular access, and advanced assessment (NREMT, 2014a).

e. *National Registry Paramedic (NRP), Paramedic* - the highest level of certification of prehospital personnel. These professionals are nationally registered and state certified following the successful completion of a training program and the successful completion of the National Registry of

EMT examination. The skill set of the paramedic incorporates all the skills of the previous levels plus advanced skills such as invasive airway control, medications, electrical modalities, vascular access, and advanced assessment (NREMT, 2014a).

10. *Occupationally Acquired Injuries (OAIs)* - disorders/disabilities contracted because of performing job duties for an employer (Bureau of Labor Statistics, 2010). OAIs impair the professionals' ability to work.

11. *Ergonomics, Safety, Safety Program, or Job Redesign* - organizational safety endeavors intended to lessen the probability of injury on the job (Beevis & Slade, 2003)

12. *EMS Agencies* - private companies or businesses, ambulance services, hospitals, municipal services, fire departments, tribal, or military institutions that provide prehospital, non-emergency and emergency, treatment and transportation services (NREMT, 2014b).

13. *Ambulance calls* or ambulance runs - service requests for emergency or non-emergency treatment or transportation (David & Brachet, 2009).

14. *Type of EMS agency or Ambulance Service* - This refers to the organizational or funding structure of the EMS company, i.e., volunteer, hospital based, fire department based, municipal, or private.

<div align="center">Chapter Summary</div>

As the gateway to healthcare for many patients, EMS is an essential component of the healthcare system of the United States (Studenk & Crawford, 2007; Freeman et al., 2009). OAIs are rampant in EMS and may deter people from considering EMS as a

profession (Rechenthin, 2004). Difficulties in recruitment and retention (McGinnis, 2004; Patterson et al., 2010; Patterson et al., 2005) affect the composition of the EMS workforce (Dychtwald et al., 2006; NHTSA, 2011). By decreasing turnover (Patterson et al., 2010; Patterson et al., 2005; McGinnis, 2004) and increasing underrepresented persons (Dychtwald et al., 2006) in the composition of the workforce, recruitment and retention problems in EMS may be reduced. Hydraulic stretchers modify the lifting task in EMS (Brice et al., 2012; Studnek et al., 2011). Hydraulic stretchers represent ergonomic solutions that reduce the physicality of EMS (McGinnis, 2004; Patterson et al., 2010; Patterson et al., 2005). The purpose of this study is to compare the recruitment, retention, and turnover rates among ambulance services that use manual and hydraulic stretchers. For EMS policy makers, owners, and operators, this study seeks to improve the understanding of how ergonomic capital equipment investments affect the composition of the EMS workforce by studying stretcher systems' influence on recruitment, retention, and turnover in EMS. There is an empirical knowledge gap concerning how different stretcher systems affect the EMS workforce in terms of recruitment, retention, and the employment turnover rate.

The organization of this dissertation is as follows. Chapter one provides an overview of the study that includes the background information, statement of the problem, the research question, purpose of the study, significances of the study, conceptual/theoretical framework, research objectives, limitations, delimitations, and definitions. Chapter two provides an in-depth literature review of the human capital consequences of stretcher systems used by EMS agencies. In addition, chapter two provides an empirical framework for the development and directions of this study. The

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research question and objectives for this study evolved from the literature review.

Chapter three is the research plan. Chapter three describes the data collection plan, research methodology, and statistical instruments used in this study. Chapter four presents the results of the survey aggregated by demographic characteristics and statistical testing. Chapters five contains the study's findings, conclusions, and recommendations.

CHAPTER II – REVIEW OF RELATED LITERATURE

This chapter provides a literature review that establishes the foundation of the conceptual framework for this research. The literature review discusses the occurrence of the financial and workforce expenses related to OAIs EMS. The discussion concerning OAIs is lengthy because of the gravity of injuries and the influence that injuries have on EMS and its workforce. The literature review examines the mitigation interventions of OAIs and the barriers to the implementation of those interventions. Then, the literature review goes on to explore the workforce metrics related to OAIs and interventions for employment turnover. This study includes the anticipated benefits and challenges related to the implementation of ergonomic interventions. This study extends the work of previous researchers to understand how hydraulic stretchers (an ergonomic intervention) affect the EMS workforce concerning recruitment, retention, and employment turnover.

Emergency Medical Services

EMS is the practice of prehospital medicine for the care of patients with trauma and medical diseases (NORA Public Safety Sector Council, 2013). The prehospital setting is unique and provides many challenges to deliver excellent medical care during emergencies (Brice et al., 2012). As a vital part of the continuum of healthcare in the United States (Patterson et al., 2005; Studnek et al., 2007), the EMS workforce is tasked to provide prehospital healthcare services (Patterson et al., 2005). In 2013, EMS rendered care to 30,000,000 patients (NREMT, 2014). The core function of EMS is the transportation of patients to facilities capable of rendering the appropriate healthcare services for the patient (Cooper & Ghassemieh, 2007). A very small fragment of the EMS workforce is employed by emergency departments, pediatric critical care units, or

specialty units in a licensed hospital instead of the traditional EMS agency (Patterson et al., 2005). Of the EMS personnel registered with NREMT, 40% of the EMS workforce practices in fire departments (NREMT, 2014b). Sixty percent of the EMS workforce practices in hospital-based, municipal, or private ambulances services (NREMT, 2014b).

History of EMS

The battlefields of previous wars and conflicts laid the foundation for modern EMS (Sanders, 2012). There are Roman paintings that depict a soldier obligated for the care of the fallen (Sanders, 2012). The Napoleonic wars introduced ambulances for the removal of the wounded from the battlefields; the first ambulances were two-wheeled carts (1861: Ambulance-Early Transport, 2014; Sanders, 2012). The introduction of rapid treatment during prolonged transport to hospital occurred during a cholera outbreak in London in 1832 (1861: Ambulance-Early Transport, 2014). The American Civil War introduced a dedicated vehicle for each regiment to remove the wounded from the battlefield to a remote hospital (1861: Ambulance-Early Transport, 2014; Sanders, 2012). During World War I, on-the-site medical stabilization by a battlefield medic prior to transportation evolved (Sanders, 2012). World War II and the Korean Conflict's contribution to EMS evolution was helicopter evacuation of the wounded (Sanders, 2012). Extensive and systematic training for the prevention of death, disease, and dismemberment occurred during the Vietnam Conflict (Sanders, 2012).

EMS Workforce

The individuals who constitute the frontline of prehospital emergency healthcare are Paramedics, Emergency Medical Technicians (EMTs), and ambulance drivers (Patterson et al., 2005). In the United States, there are 900,000 workers that compose the

EMS workforce (Maguire & Walz, 2004; Studnek et al., 2007). The NREMT reports the number of registered medics with that organization as 700,000 in 2013 (2014). The first number cited (900,000) stems from an estimate of all medics while the NREMT number (700,000) reports only those registered with that agency. The Office of Emergency Medical Service's EMS Assessment of 2011 reported the number of credentialed EMS professionals as 826,111 EMS (NHTSA, 2014).

The EMS workforce is educated, registered, and certified to provide emergency medical care (Patterson et al., 2005). EMS responds to 36 million calls for emergency services annually (Field, 2009) resulting in financial expenditures of approximately $6.75 billion per annum (NREMT, 2014b). However, the EMS workforce goes unnoticed until required to provide emergency care (Patterson et al., 2005). The public is largely unaware of the issues that confront the EMS workforce (Patterson et al., 2005). Multiple problems barrage the EMS workforce and threaten its continual viability (Reichard & Jackson, 2010). The EMS workforce encounters an array of occupational hazards (Reichard & Jackson, 2010) such as ambulance crashes, assaults, extreme physical challenges, perilous environments, extremes in weather elements, hazardous materials, infectious diseases, long and erratic shifts, stress (Reichard & Jackson, 2010), hearing loss, lower back injury (Maquire, Hunting, Smith, & Levick, 2002), and an increase risk of cancers because of occupational exposure to carcinogens (Guidotti, 1993). As a result, EMS is a treacherous occupation (Erich, 2013a). Often the health and safety of the EMS workforce are compromised while providing care in emergencies (Reichard & Jackson, 2010).

The National EMS Strategic Plan

The *EMS Agenda for the Future* (the Agenda) is the cumulative effort of a

multidisciplinary steering committee made up of 500 different representatives from EMS

organizations (NHTSA, 1996). The intent of the committee was to provide strategies to

improve EMS (NHTSA, 1996). In addition to identifying the processes of EMS that are

dysfunctional, the document also provided direction for the improvement of EMS in the

future (NHTSA, 1996). The 14 distinctive systems-level components depict the most

important aspects of the delivery of prehospital care. The following list contains the

components of EMS in the Agenda.

1. Integration of health services

2. EMS research

3. Legislation and regulation

4. System finance

5. Human resources

6. Medical direction

7. Education systems

8. Public education

9. Prevention

10. Public access

11. Communication systems

12. Clinical care

13. Information systems

14. Evaluation (NHTSA, 1996, p. 64)

The Agenda recommended that empirical evidence must drive the development of

the processes and functions that compose EMS (NHTSA, 1996). The barriers to

empirical EMS research are inadequate financial support, deficiency of data collection systems that track industry outcomes, insufficiency of imperial research, lack of research institutions committed to EMS systems, inadequate education in EMS research, and an absence of appreciation of the significance of research (NHTSA, 1996). Perpetual issues for the EMS workforce are inadequate occupational health and safety provision, limited career mobility, and inadequate monetary compensation (NHTSA, 1996).

Injury of the EMS worker. The Agenda identified that the EMS workforce as compared to the public, is two times as likely to suffer from post-traumatic stress disorders (NHTSA, 1996). While the medic is providing services to the emergent patient, he/she routinely incurs occupational hazards that produce long-term detrimental effects. Those events evolve from hostilities inflicted on the EMS crew from bystanders and patients, rescue expectations that are beyond the physical abilities of the medics, the continual threat of bodily injury during service production, and the fear of ambulance collisions while in transit (NHTSA, 1996). The value of supporting the wellbeing of the EMS workforce seems obvious (NHTSA, 1996) because stress has a significant negative effect on the workforce's safety and health aptitude (Topf, 2008).

EMS workforce pipeline strategy. Evolving from the Agenda, in 2011 *The Emergency Medical Services Workforce Agenda for the Future* (Workforce Agenda) articulated the vision for the EMS workforce. For EMS to deliver high-quality patient care, the EMS workforce must be able to meet the demands of EMS employment (NHTSA, 2011). Aside from the required education and certification, little attention has been devoted to the improvement of the EMS workforce (NHTSA, 2011). The Workforce Agenda acknowledged the need for an appropriately educated, credentialed,

appreciated, remunerated, and well EMS workforce (NHTSA, 2011). The Workforce

Agenda called for action to fortify the EMS employment pipeline (NHTSA, 2011). This

action ensures that there is a sufficient EMS workforce capable of fulfilling the public's

demand for EMS services (NHTSA, 2011). This is of importance when considering the

national trends that will increase the demand for ambulance services such as an aging

population, diverse populace, worker shortages, and the potential for disasters and

pandemic diseases (NHTSA, 2011). A viable EMS workforce requires professional and

occupational development (NHTSA, 2011). The deficiencies within the EMS systems

that require improvement include staffing levels, recruitment efforts, employee retention,

monetary compensation, employee benefits, and provisions for EMS workers' health and

safety (NHTSA, 2011).

　　　Developing the EMS workforce. The Workforce Agenda identified that the

following four constructs are paramount to fortifying the EMS workforce and pipeline:

(a) education and credentialing, (b) empirical research, (c) workforce planning and

development, and (d) activities that improve the health and safety of the workforce

(NHTSA, 2011). Next in this literature review is a discussion of two of the four

components: Workforce planning and development and health, safety, and wellness of

the workforce.

　　　Workforce planning and development. EMS needs workforce planning and

development to meet the current and future service demands (NHTSA, 2011). With the

growing older population, increased demand for EMS services is expected (Institute of

Medicine, 2006). EMS policy-makers should start workforce planning to ensure that

there will be enough future workers (NHTSA, 2011). Currently, there are not any

workforce planning or best practice models to address the specific needs of EMS

(NHTSA, 2011). According to Workforce Agenda, the planning and development of the

workforce should be empirical, forecast the pipeline supply of EMS workers, and what

the geographic demands for services will be (NHTSA, 2011). The workforce model

should address the current data on the workforce supply, current workforce compensation

rates, environmental factors that affect EMS such as regulations, types of providers, the

number of providers, population demographics, and geographic factors that affect service

delivery (NHTSA, 2011). An assessment of the EMS pipelines is necessary to

understand the EMS workforce, turnover rates, and the resources needed by the

workforce to deliver emergency and non-emergency services (NHTSA, 2011).

Salary in EMS. A frequently occurring problem with the EMS workforce

planning and development is poor compensation rates (NHTSA, 2011). The median

hourly income for EMTs and paramedics is $12.54 per hour (NHTSA, 2008). This figure

represents the median salary of all EMS workers at all various levels of education and

certification. The wage is probably lower for ambulance drivers and Emergency Medical

Technicians (EMTs) and perhaps higher for paramedics. When compared to other public

emergency workers such as firefighters at $26.82 per hour and police officers at $22.25

per hour (NHTSA, 2008), EMS fares poorly in salary comparison. Besides the

inadequate wage, other problems include a lack of benefits, lack of career promotion, and

lack of employee development (NHTSA, 2011).

Safety in EMS. The EMS workforce must be healthy and safe (NHTSA, 2011).

The Workforce Agenda calls for the collection of workforce illness and injury data (

(NHTSA, 2011)). This is the foundation for a systematic, evidence-based, operational

practice to prevent OAIs in EMS (NHTSA, 2011). There is a lack of evidence-based

EMS workplace safety practices as well as inconsistent reporting of accidents and injuries

(NHTSA, 2011). Both are necessary because EMS experiences an OAI rate greater than

other industries (Maguire, Hunting, Guidotti, & Smith, 2005). The Workforce Agenda

identifies the 2020 goals for EMS and suggests a focus on workforce wellness (NHTSA,

2011). This requires the identification of the best practices for illness/injury prevention

and the provision of the material resources (NHTSA, 2011).

<center>Occupationally Acquired Injuries</center>

OAIs produce human suffering and financial strain (Stubbs, Buckle, Hudson,

Rivers, & Worringham, 1983). OAIs are serious concerns for not only the injured

employee (Fisher, Brodzinski-Andreae, & Zook, 2009) but also the company, the

economy, and the entire society (Lahiri, Gold, & Levenstein, 2005). OAI claims are

common among healthcare workers in the United States (Bureau of Labor Statistics,

2010). Among all professions, there are 4.4 reports of nonfatal OAIs for every 100 full-

time-equivalent workers in the U.S. (Huang et al., 2009).

EMS Injury Data

EMS is a hazardous career (Erich, 2013a) with the highest rate of OAIs when

compared to all occupations (Maguire et al., 2005). Accepted as the first industry

standard, Maguire, Hunting, Guidotti, & Smith (2005) found that EMS' injury rate was

34.6 injuries per 100 full-time equivalents. There are a wide ranges and varieties of

methods used for reporting injury rates about EMS. Gershon (1990) reported 1.2 injuries

per EMS worker per year and Morneau (1999) reported a similar finding at 115 injuries

per 100 full-time equivalent workers. An *EMS World* reader poll, conducted on

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December 21, 2012, asked EMS personnel about the number of injuries suffered while providing prehospital healthcare and transportation. Of the respondents, 78% indicated that they had, at least, one OAI while providing services. Fisher and Wintermeyer (2012) reported that out of 115 participants in their EMS study, 59.1%, or 68 people suffered an OAI. Kim et al. (2011) reported that EMS workers sustained 54 injury claims per 100 fulltime equivalents. The National Association of EMTs (2013) predicts that one out of four EMS professionals will suffer a career-altering injury within the first four years of EMS practice. Schwartz (1993) reported 24.8 back injuries per 100 full-time equivalents. O'Toole (2011) reported a more conservative EMS incident rate at 16.6 injuries per 100 full-time equivalents. Weaver, Wang, Fairbanks, and Patterson (2012) found that 16% of their study group experienced an OAI in the three months prior to the study. Gagne (2011) reported the most conservative rate at 4.6 injuries per 100 employees. Weaver et al. (2012) approximated that as many as 11-32% of EMS OAIs are not reported. While there is a wide range of injury rates, what is clear is that the EMS injury rate is higher than the national average of seven injuries per 100 full-time equivalents (O'Toole, 2011). The Bureau of Labor Statistics (2007) identified the EMS workforce as seven times more likely to suffer an OAI compared to the general workforce.

The Common EMS Injury

Occupationally acquired musculoskeletal injuries affect 7% of the general workforce (NIOSH, 1997). The most prevalent injury among EMS personnel was sprains and strains involving the back (Heick et al., 2009; Hogya & Ellis, 1990; Morneau,1999; Reichard & Jackson, 2010). Half of all EMS workers suffer back pain annually (National Association of EMTs, 2013). Kim et al. (2011) attributed 65.6% of OAIs to back

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injuries. Schwartz (1993) found that the back-injury rate for EMS at 25.4% of the workforce. The Centers for Disease Control and Prevention (2011) reports that there were 27,800 EMS workforce injuries in 2011. The majority of the injuries were to male employees.In regard to gender diveristy and recruitment, Hoyga and Ellis (1990) found that by percentage, female EMS workers were more likely injured. Kim et al. (2011) found that women, especially older than 50 years of age, suffered OAIs more frequently than the rest of the EMS workforce.

Occupationally acquired back injuries are a public health issue that represents an economic burden for employees and employers (Hughes & Nelson, 2009). The EMS workforce is especially susceptible to back injuries because of the compression forces generated on the rescuers' body during patient management (Rodgers, 1998). The Bureau of Labor Statistics (2008) identified 13,900 nonfatal OAIs for ambulance personnel in 2007. Of these 13,900 OAIs, 6,400 incidences resulted in lost workdays, job transfers, or job restrictions. Twenty-two hundred of the injuries were musculoskeletal disorders: 61% of the injuries were sprains or strains and 34% affected the back of the employee. Back injuries are often the result of cumulative wear and tear acquired over one's career (National Association of EMTs, 2013). The injuries resulted in an average of six lost workdays (BLS, 2008). Fisher and Wintermeyer (2012) cited Dailey's (2006) estimate that 47% of EMS workforce has suffered a back injury while carrying out of their duties. Kim et al. (2011) found that 62% healthcare workers' compensation claims were the result of back injuries that occurred during patient handling tasks, such as operating the stretcher. Goodloe et al. (2012) found that stretcher operations occur in three phases. Each phase represents an opportunity for injuries to occur:

1. Unloading the stretcher from the ambulance
2. Loading the stretcher into the ambulance
3. Moving the stretcher

Different stretchers require varying degrees of physical exertion on the part of the medics (Brice et al., 2012; Crill & Hostler, 2005; Fredericks, Butt, & Hovenkamp, 2009; Studnek et al., 2011). With manual stretchers, the occupied stretcher (patient, equipment, and stretcher) has to be lifted by the medics into a raised position so the stretcher can be used for transporting the patient across terrain or loading into the patient compartment of the ambulance (Lavender, Conrad, Reichelt, Johnson, & Meyers, 2000) as demonstrated in Figure 2. Once the stretcher is lifted into the raised position, the front wheels are placed on the floor of the patient compartment. The medic at the foot of the stretcher lifts and supports the weight of the occupied stretcher while the other medic bends over and lifts the stretcher's undercarriage (Lavender et al., 2000). Then the stretcher is fastened into the harness that is mounted on the floor in the rear section of the ambulance. Figure 3 shows the medics loading a stretcher into the back of an ambulance after the undercarriage has been lifted. The stretcher can be harnessed and secured into the ambulance (Studnek, Crawford, & Fernandez, 2011).

Figure 2. Two medics beginning the manual lift process of the occupied stretcher (2016).

Figure 3. Two medics loading an occupied, manual stretcher (2016).

Ergonomic interventions, such as a hydraulic stretcher, reduce workforce and financial losses associated with OAIs (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). Studnek et al. (2011) and Fredericks et al. (2009) demonstrate that hydraulic stretchers decrease the number of OAIs and associated expenses. Hydraulic stretchers modify the lifting technique and lessen the workload for medics during stretcher operations (Brice et al., 2012; Erich, 2005, 2013a, 2013b; Studnek et al., 2011). The hydraulic stretcher can be raised into position by one medic as shown in Figures 4 and 5, by activating the hydraulic lift mechanism (Brice et al., 2012; Studnek et al., 2011).

Figure 4. One medic raising a hydraulic stretcher (2016).

Figure 5. Battery powered hydraulic lift mechanisms are activated by pushing a button (2016).

Risk Factors for OAIs

Each worker has risk factors for OAIs that they bring to the workplace (Brophy, Achimore, & Moore-Dawson, 2001). Risk factors for future occupationally acquired back injuries are past injuries, negative affect, and hereditarily factors (Brophy, Achimore, & Moore-Dawson, 2001). The most reliable predictor of a back injury is the history of previous back injury (Troup, 1984). Dissatisfaction with the job is an important risk factor associated with back injury (Brophy, Achimore, & Moore-Dawson,

2001). EMS research identified that overall lack of physical fitness, certification as a

paramedic, employment in a patient transport service (Studnek et al., 2011), and

employees aged 30 and older are characteristics that predict future back injuries (Studenk

& Crawford, 2007). Overexertion while lifting is the most commonly occurring risk

factor (Brophy, Achimore, & Moore-Dawson, 2001). Overexertion injuries occur when

the physical effort required of a worker to lift, pull, push, hold, carry, wield, or throw

exceeds the tensile capability of the medic's body (Shuford, 2013; Webster, 1999).

According to the Bureau of Labor (2008), 49% of OAIs for EMS personnel involved

overexertion. Liberty Mutual's Workplace Safety Index (2011) identified overexertion as

the leading cause of disabling workplace injuries in 2009. Overexertion accounted for

more than 25% of all claims.

OAIs Caused by Patient Handling

Moving patients result in high injury rates to EMS professionals (Crill & Hostler,

2005). The EMS workforce is predisposed to OAIs because of the repetitive bending,

lifting, and carrying associated with the physicality of the job (Erich, 2013a). Most EMS

injuries, 46%-50%, were acquired while interacting with patients (Bureau of Labor

Statistics, 2010; Centers for Disease Control and Prevention, 2011). Many of the tasks in

EMS strain the backs of medics while performing occupational duties (Lavender, Conrad,

Reichelt, Meyer, & Johnson, 2000). Physical manipulation of the patient is the leading

cause of OAIs (Fisher & Wintermeyer, 2012; Guo et al., 1995; Lahiri et al., 2013; Tullar

et al., 2010) especially lifting patients, carrying patients down stairs, or lateral transfers

(Conrad, 2000). To accomplish patient transfers, EMS personnel physically lift and

move patients and equipment (Fisher & Wintermeyer, 2012). These activities predispose

EMS personnel to OAIs, especially to the back (Fisher & Wintermeyer, 2012). Kim et al. (2011) report that 87.2% of OAIs occurred during a patient lift and 70% of injury claims were lifting-related. Fisher and Wintermeyer (2012) report that the majority of EMS back injuries (76.5%) occurred while lifting a patient. Kim et al. (2011) found patient handling tasks as the only common risk factor in their multivariable regression model of back injuries. Studenk and Crawford (2007) cite Szubert and Sobala's (2002) findings that overexertion while lifting a patient is an example of the physical hazards that the EMS workforce repeatedly encounters. Garg and Kapellusch (2012) concur that patient handling is a major cause of OAIs. They define patient handling as lifting, moving, turning, or ambulating a patient (Garg & Kapellusch, 2012).

The risks of OAIs to the healthcare worker increase as the incidences of patient handling increase (U.S. Department of Labor, 2005) or as the patient weight increases (Busch, 2013; Fisher & Wintermeyer, 2012; Goodloe, Crowder, Arthur, & Thomas, 2012; NREMT, 2013). The location, condition, size, and position of patients put EMS workers at risk for OAIs (Erich, 2013a). Obese patients contribute to lift-related OAIs among the EMS workforce (Busch, 2013; Fisher & Wintermeyer, 2012; Goodloe, Crowder, Arthur, & Thomas, 2012; NREMT, 2013). Carrying a patient for long distances, particularly across rough terrain or down stairs, increases the probability of OAIs (Lavender, Conrad, Reichelt, Meyer, & Johnson, 2000). If maneuvering of a patient requires an awkward body position of the medic, the probability of OAIs increases (Erich, 2013b; Fisher & Wintermeyer, 2012). Forty percent of the assumed work postures of the paramedic predispose the paramedic for OAI (Brice et al., 2012).

The design of the patient compartment in ambulances lends to unsafe positions related to common OAIs among prehospital healthcare providers (Maguire et al., 2005).

Stretcher Operations

EMS personnel maneuver occupied stretchers and other equipment to facilitate patient transportation from the scene, to the ambulance, and then to the hospital (Fredericks et al., 2009). Gershon et al. (1990) identified that handling the stretcher is when most OAIs affecting the back occur. Goodloe, Crowder, Arthur, & Thomas (2012) concur with Gershon's et al. (1990) findings. In Gershon's et al. (1990) study of 23 OAIs, 15 occurred while unloading a stretcher from an ambulance, five occurred while loading the stretcher in the ambulance, and three occurred during surface movement. Fourteen of the injuries in Gershon's et al. (1990) study occurred because of a safety latch malfunction. A safety catch latch is a "C" shaped metal device anchored to the floor of the ambulance at the back doors. The latch engages the stretcher to prevent the stretcher from falling while loading or removing the stretcher from the ambulance. Refer to Figure 6 to see a picture of a C-shaped safety latch anchored to the back floor of an ambulance.

Figure 6. C-shaped safety latch (2016).

Gershon's et al. (1990) findings concur with Goodloe et al. (2012). Goodloe et al. (2012) found that stretcher operations occur in three phases. Each phase represents an opportunity for injuries to occur:

1. Unloading the stretcher from the ambulance

2. Loading the stretcher into the ambulance

3. Moving the stretcher

Goodloe et al. (2012) identified the unloading phase of the occupied stretcher from the ambulance as the activity where most EMS injuries occur. The EMS workforce must be conscious of the risk of OAIs that occurs while operating stretchers, particularly when the patient is morbidly obese (Goodloe et al., 2012).

OAI Prevention Strategies

The EMS profession must determine how to prevent OAIs in order to protect the workforce and reduce the expenses associated with OAIs (Fisher et al., 2009). The first step in formulating a prevention strategy to limit EMS OAIs is to admit the profession is dangerous (Maguire et al., 2005). All injuries are preventable (Shuford, 2013). Without significant improvement in equipment, EMTs will always be manually handling patients (Studenk & Crawford, 2007). Reducing OAIs associated with patient handling requires diminishing the amount of exertion expended during patient management and a decrease in the frequencies of patient handling events (Lim et al., 2011). Factors that contribute to overexertion injuries should be the focus of prevention initiatives (Reichelt & Conrad, 1995).

Pinnacle safety priorities should result in the prevention of worker overexertion— the leading cause of workers' compensation losses (Huang et al., 2009). Through focused and creative efforts, EMS can reduce OAIs (Brice et al., 2012). Aside from the impact on the workers' body, Maguire, Hunting, Guidotti, & Smith (2005) identified that a high injury rate has a large economic impact for EMS agencies

Injury Expense

OAIs in EMS increase expenses and decrease the benefits from human capital (Fredericks et al., 2009). The United States estimates $28 billion loss in productivity secondary to chronic back pain (Rizzo, Abbott, & Berger, 1998). Miller and Galbraith (1995) provide the following list of expense categories related to OAIs:

1. Medical services that include ambulance response, emergency transportation, and all medical care;

2. The loss of wages, fringe benefits, and domestic services that the injured can no longer provide;

3. The organizational and legal costs of investigations, documentation, indemnity claims, and the associated litigation;

4. Workplace disorder because of an increase in overtime pay, loss of expertise, decreased productivity, and increased expense and activities of onboarding to replace employees because of deaths and long-term disabilities;

5. A reduction in the quality of life because of pain and suffering of the worker and family.

A change in the past few years is that executives now acknowledge that injury prevention and ergonomic mitigation are crucial in reducing of the costs of injuries and illnesses (Gagne, 2011). Cost estimates of injuries understate the true economic consequences arising from OAIs and disabilities (Weil, 2001). OAIs result in significant economic consequences, particularly when the OAIs cause functional disabilities that impair the employees' occupational and life activities (Weil, 2001).

Indemnity Costs

The U.S. workers' compensation program requires employers to subsidize the costs of OAIs by contributing to insurance program (ASSE, 2002). Annually, employers pay billions in workers' compensation costs and other expenses associated with occupationally acquired injuries (Erickson, 1997). Liberty Mutual Workplace Safety Index for 2011 states that physical overexertion OAIs resulted in $50 billion in workers' compensation costs (Shuford, 2013). Lowered indemnity rates can reduce operating costs (Rechenthin, 2004). Colford (2005), and Walton, Conrad, Furner, and Samo

(2003) state that OAIs increase the indemnity costs. Higher indemnity cost results in consumables that are more expensive for the customers (ASSE, 2002). David Bradley, an EMS education specialist with a Pennsylvania-based insurer, says that EMS worker's compensation indemnity rates are high because EMS employees are injured frequently (Erich, 2013a).

Average cost of OAI

The average cost to an organization for a cumulative trauma disorder case is $9,856 (National Safety Council, 1999). In the agriculture industry, the estimate of disabling injuries is $5,046 while a non-disabling injury is $347 (Leigh, McCurdy, & Schenker, 2001). Hughes and Nelson (2009) found the average cost of an occupationally acquired back injury claim to be $7,541. Sciatica is a nerve injury caused by lumbar disc herniation (Hughes & Nelson, 2009). The average cost for sciatica including income loss and medical expense was $51,269 (Hughes & Nelson, 2009). Gagne (2011) reports that in the United States the average cost of an OAI for 2007-2008 was $34, 377, which is close to the National Safety Council's (1999) average of $38,000 in cost. The majority of those injuries were muscular strains (Gagne, 2011). The average firefighter workers' compensation cost per injury was $5,168 and the average cost of a physical overexertion injury was $9,715 (Walton, Conrad, Furner, & Samo, 2003). Gagne (2011) goes on to explain that the typical back injury can exceed $10,000 in direct cost and $30,000 to $100,000 in indirect cost. The back injury from sprain/strain requires an average of nineteen therapy visits and nine lost workdays (Gagne, 2011).

Business Impacts

There are two types of business impacts: tangible and intangible. Easily quantifiable tangible impacts are employee turnover, accidents, operating costs, accident cost, and program costs (Buzachero, Phillips, Phillips, & Phillips, 2013). The intangible costs are more difficult to quantify, but they have significant business impacts. Examples of intangible impacts are employee complaints, employee satisfaction, employee engagement, intent to leave, leadership, social responsibility, and environmental friendliness (Buzachero, Phillips, Phillips, & Phillips, 2013).

Cost Categories

Inadequate safety provision that causes OAIs results in direct and indirect costs (Dunlap, 2011). Direct costs are the obvious, easily quantified expenses associated with workplace injuries (Weil, 2001). Indirect costs are unbudgeted, less obvious expenses related to occupationally acquired injuries (Gagne, 2011). According to the National Safety Council's cost formula, an organization with an employee injury can expect a direct cost of $5,000 and an indirect cost of $20,000, which brings the total cost for an occupationally acquired injury to $25,000. If the organization had a profit margin of 10%, the organization would have to capture $250,000 of revenue to offset the expense of an OAI (Gagne, 2011). The intangible or indirect costs of OAI far exceed the direct costs (Dunlap, 2011; Huang et al., 2009; Shuford, 2013).

Direct cost. Direct costs are the obvious expenses associated with OAIs (Weil, 2001). The sources of direct cost are lost work time, rehabilitative work programs (Weil, 2001), and case management (Gagne, 2011). Higher workers' compensation and indemnity premiums (Lahiri, Gold, & Levenstein, 2005; Leigh, McCurdy, & Schenker,

2001), the payments to injured workers, the cost for the replacement worker (Huang et al., 2009), overtime pay (The Safety Site, 2011), and reduction in productivity (Bird & Germain, 1985) increase the organization's direct costs associated with OAIs. Expenses for medical care, supplies (Myers, 2008), and ancillary personal or occupational aids (Gagne, 2011) contribute to the direct cost category. Dunlap (2011) identified disability payments, litigation fees, and the cost of repairing property damage as other direct costs associated with OAIs. Leigh, McCurdy, and Schenker (2001) found that another source of direct cost was social security disability insurance costs, welfare, and private disability insurance. Linhard (2005) names property loss, OSHA fines and citations, retraining expenses, and exposure assessments as other sources of direct costs.

Indirect cost. Indirect costs are unbudgeted expenses and losses associated with OAIs (Gagne, 2011). Indirect costs are more difficult to quantify (Gagne, 2011). Loss of competitive advantage is an indirect expense related to OAIs (Corcoran, 2002). A reduction of economic contribution by the injured worker, difficulties in recruitment, and overcoming a poor safety reputation are indirect costs (Leigh, McCurdy, & Schenker, 2001). ASSE (2002) refers to poor employee morale, reduced customer relationships, and increased levels of absenteeism as indirect costs that result from OAIs. Bird and Germain (1985) identified the loss of business because of a waning reputation leads to increased direct cost. Increases in psychological stress among employees, loss of knowledge, skills, and ability of workforce, loss of reputation (ASSE, 2002), lost efficiency (The Safety Site, 2011), increased operational cost, and loss of quality (Dunlap, 2011) contribute to the mounting indirect costs. Gagne (2011) identified the time to rehire, replace, repair, and investigate injuries as indirect cost. The cost of

decreased productivity by the uninjured co-workers who witnessed the accident is an indirect cost (The Safety Site, 2011). Weil (2001) identified the loss of life, changes in occupational capacity, reduction in the future earnings of the injured, psychological effects on the household members, and diminished quality of life as indirect cost. Difficulties in adjustment, such as psychosocial difficulties experienced by the injured patient or event witnesses are indirect costs (Fisher & Wintermeyer, 2012).

The Business Case for Safety

In most industries, including healthcare, the pivotal question is if ergonomic interventions improve a company's financial performance (ASSE, 2002). In consideration of the previous discussion of the direct and indirect expenses associated with OAIs, many contend that safety interventions will enhance the financial performance of organizations (Colford, 2005; Dunlap, 2011). OSHA contends that safety investments in the workplace will positively affect the organization's productivity and financial performance (OSHA, 2002a). The business case for safety requires a comparison between the cost of ergonomic interventions and the results of the safety intervention (Dunlap, 2011). The ASSE (2002) states that ergonomic interventions enhance the safety function and improve the company's financial performance, despite the difficulty in quantifying some of the benefits. This matches the results that Huang et al. (2009) found when they surveyed top financial executives. Ninety-five percent of the executives stated that the benefits of an occupational safety are predominantly financial (Huang et al., 2009). Those results are realized through increased productivity and avoiding expenditures related to injuries (Huang et al., 2009). Akinyemi and Abiddin

(2013) contend that the financial benefits gained through safety constitute human capital development.

Motivation

Maximizing profit is a potent motivator that causes organization to invest in ergonomic interventions (Frick, 1997; Hughes & Nelson, 2009). Paul O'Neill, Secretary of the Treasury and former long-term chairperson of Alcoa, concurs with the other researchers' findings that ergonomic interventions are sound business investments and should be a foundational element of an organization (ASSE, 2002). Jervis and Collins (2001) found that a company's positive productivity and financial performance are related to its positive safety production (Jervis & Collins, 2001). Colford (2005) quotes Edmund F. Kelly, Chairman, President, and CEO of Boston-based Liberty Mutual Insurance Company as saying that safety enables an organization to improve its financial performance. Ed Galante, Senior Vice-president of Texas-based Exxon Mobile says that safety improves all aspects of the organization, as quoted by Colford (2005).

Return on Investment

When considering a proactive safety stance, the business case for safety requires the consideration of two aspects. Aside from the financially devastating effects of OAIs upon the organization, Weil (2001) adds that OAIs lead to a loss of the return on investment from the human capital (Weil, 2001). Workplace injuries hurt productivity, company morale, and the bottom line (Shuford, 2013). The improved financial performance caused by safety interventions results from a reduction in injury- related expenses and improved productivity (Colford, 2005). A safety program reduces the

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direct and indirect expenses associated with OAIs, which influence the organization's

bottom line (Rechenthin, 2004).

Executives recognize that safety programs require an investment cost; however, it

generates a return on investments in business and human capital (Colford, 2005). To

reduce loss, decision makers should allocate financial resources to areas associated with

physical overexertion, repetitive motion, and bodily reaction (Huang et al., 2009). Bodily

reactions are spontaneous actions to prevent injury such as breaking a fall by sticking an

arm out to lessen the impact (Huang et al., 2009).

Cost Avoidance Through Safety

Safety programs reduce expenses associated with OAIs (Lim et al., 2011; OSHA,

2002; Shuford, 2013). A proactive safety program with ergonomic mitigation can add

financial value by avoiding injury expenditures through the reduction of injury frequency

and severity (Dunlap, 2011; The Safety Site, 2011).

The Competitive Advantage of Safety

Safety can realize a strategic competitive advantage for businesses. This

advantage makes investing in occupational safety programs easier for business executives

(Rechenthin, 2004). A competitive advantage occurs when competitors cannot duplicate

the business value (Barney, 1991). Safety has to be a foundational cultural element of the

organziation and not merely for regulatory compliance for it to produce a competitive

advantage (Rechenthin, 2004). Colford (2005) explains that employees that feel

protected and valued because of the organizational safety efforts improve the

organization's revenue through increased production and improved customer service.

Baxter (2006) and Colford (2005) found that safety programs enhance employee

productivity, job satisfaction, and reduce employee turnover. Shuford (2013) noted that

safety programs not only promote a culture but also improve employee morale. Safety is

an investment in human capital that yields tangible rewards to the organization and its

employees, industry, customers, and community (Colford, 2005; National Safety Council,

1999). In the case of safety, executives must identify the best method to allocate limited

resources that will ensure the fewest accidents and injuries to employees, damage to

equipment, or harm the environment (O'Toole & Nalbone, 2011). A safer workplace

influences every aspect of the company (Rechenthin, 2004) making it more efficient and

more economical (Colford, 2005; Maiti, Chatterjee, & Bangdiwala, 2004). Occupational

safety controls afford employees a greater quality of life (Dunlap, 2011).

Corporate Social Obligation

Colford (2005) implies that there is a corporate social obligation to provide a safe

work environment. This requires the organization to identify best treatment programs

that will have the largest effect to maximize the investment (O'Toole & Nalbone, 2011).

In business resource allocation, expenses are subject to cutbacks while investments that

increase revenue or conserve cost receive funding (Phillips, 2012). Safety has a cost, but

the dividends are tremendous in terms preserving human capital (Colford, 2005). Alan C.

McMillan, president and CEO of the National Safety Council in Chicago, states that

safety produces a financial return on investment through avoided indemnity costs and a

human capital return through employee productivity, morale, and retention (Colford,

2005). Safety does not actualize revenue but avoids financial losses (Rechenthin, 2004).

Safety becomes a competitive advantage when it improves the quality of the organization

not just reduces financial losses (Rechenthin, 2004). The intangible cost of failed safety

systems goes beyond what appears in an organization's bookkeeping record (ASSE, 2002).

Protecting Human Capital

Occupational safety can add value to an organization by protecting the organization's human capital. Organizational safety efforts improve human capital initiatives (Behm, 2009). A workforce should labor without being overly concerned about the possibility of an injury (Dunlap, 2011). Constant concern about suffering an OAI reduces productivity (ASSE, 2002). There is a correlation between an organization's safety performance and its successive productivity and financial performance (Huang et al., 2009; Jervis & Collins, 2001). It is imperative for owner/operators to understand the potential financial losses from a single injury. One safety breech that results in an injury could be financially devastating for the employee and the company (Behm, Veltri, & Kleinsorge, 2004). Dunlap (2011) states that providing safety in an organization is a financial issue from both cost and benefits perspectives. (Dunlap, 2011). Investing in a workplace safety program reduces fatalities, OAIs, and various expenditures such as workers' compensation, medical expenses, penalties, employee replacement, accident investigations (Huang et al., 2009), and avoidance of loss in productivity and wages (Fisher et al., 2009). The cost for a safety program can be far less expensive than the financial consequences of an OAI (Lahiri et al., 2013). Employees and employers share the tragedy and expense of OAIs (Fisher, 2012). OSHA (2007) states that effective safety programs can reduce OAIs by 20% and generate a return on investment of four to six dollars for every one dollar invested in safety.

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EMS Safety

In the EMS work environment, safety and concern should be extended not only to the patient, but also for the provider (Weaver, Wang, Fairbanks, & Patterson, 2012). In order to create a safety culture in EMS, the workforce must perceive that the organizational policies, procedures, and practices are meaningful for the safety of the workforce (Neal, Griffin, & Hart, 2000). Ingraining safety as an integral part of the organizational culture requires management to provide artifacts, or evidence, which demonstrates their safety concern for the workforce (Carder, 2003; Conrad, 2008; Dunlap, 2011; Schein, 1992). A positive correlation exists between management's endorsement of safety and safety outcomes (Cohen, 1977). When employees have a negative perception of an organization's culture concerning safety, the incidence of injury is higher than in those organizations where employees have positive safety perceptions (O'Toole & Nalbone, 2011). Studnek et al. (2011) found that hydraulic stretchers for EMS are appropriate cultural evidence to promote lifting safety in EMS. It is particularly important that employees perceive safety as a crucial organizational construct in employment situations where there is little supervision (O'Toole & Nalbone, 2011). In EMS, medics have minimal on-scene supervision.

Management Expectation

An organizational safety cultural is a function of management expectation and enforcement (Rechenthin, 2004). Management endorsement is a crucial element of a successful safety program (Cohen, 1977). Managers and direct supervisors must mandate safety practices always in the workplace (ASSE, 2002). Cohen (1977) suggests that the key to improved safety adoption in an organization is the outward demonstration of

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management's commitment to safety. Schien (1992) calls an overt expression of the concern for the personnel a cultural artifact. Employees perceive management's endorsement of safety as a gauge of the importance of the initiative (O'Toole, 2002). Creating a safety culture requires management to inspire employee participation (ASSE, 2002). When safety has become a part of the culture, the employees adopt and practice the organization's safety customs and encourage safety behaviors in their co-workers (Pronovost & Sexton, 2005).

Employers must assume the responsibility for mitigating risk, reducing injuries, and increasing the overall health of their workforces (Shuford, 2013). One retort for an organization with a poor safety record is to provide more training and education for the workforce (Huang et al., 2009). Safety training is best cultivated in efficiently designed workplaces that have high degrees of administration's endorsement of safety (Huang et al., 2009) and the appropriate ergonomic equipment (DeMichael, Langton, Bullock, & Wiles, 1982). Safety equipment availability has immediate positive effects on safety performance (DeMichael et al., 1982). In areas where there are high accident rates, there is usually not adequate safety equipment (DeMichael et al., 1982). Fisher & Wintermeyer (2012) found that 27 out of 115 ambulances in his study lacked the necessary supplies and equipment to function safely. The cost of safety programs prohibits some organizations from implementing a complete program (Lahiri et al., 2013)

EMS Culture

A culture change will have to occur in EMS for the profession to embrace a safe work environment (Brice et al., 2012). Pronovost and Sexton (2005) define culture as organizational principles, practices, and policies of personnel behaviors (Pronovost &

Sexton, 2005). The cultural development of an organization, which advocates safety

practices as a routine part of the organizational culture, requires workforce development

of safety skills and behaviors (Rechenthin, 2004).

EMS professionals work in difficult and dangerous environments that tax the

medic (Brice et al., 2012). EMS professionals pride themselves on being altruistic (Brice

et al., 2012). The emphasis of others over self during emergencies has produced an

atmosphere where the practitioner disregards his/her personal safety (Brice et al., 2012).

Employees make important decisions about safety rules, practices, and procedures

(O'Toole & Nalbone, 2011). A change is required in the EMS culture concerning safety

(Brice et al., 2012). Organizational culture determines employee behavior even in EMS

(Brice et al., 2012). Eighty-nine percent of EMS professionals reported safety-

compromising behaviors (Weaver et al., 2012). Many medics disregard personal safety

in order to have unrestricted contact to the patient (Brice et al., 2012) and easier skill

performance (Geller, 2005). Employees are the only people who can change the

corporate culture (Erickson, 1997). A safety culture is especially critical where

employees have little or no direct supervision (O'Toole, 2002).

Disregarding safety. Geller (2005) offers some fundamental reasons regarding

why employees of all industries take shortcuts in safety behaviors:

1. It is more convenient to perform tasks without additional safety measures.

2. Organizations encourage unsafe practices by not providing sufficient safety

    preparation, relying on overtime scheduling to cover shifts, and not repairing

    equipment.

Acceptance of safety. Another key to the acceptance of a safety culture is the robust participation of employees in establishing, implementing, and evaluating the safety program (ASSE, 2002). Cohen (1977) states that collaboration on safety programs among employees, supervisors, and management is evidence of organizational adoption of successful safety programs. An employee adopted, safety program could create a non-replicable competitive advantage (Porter, 1985; Rechenthin, 2004). Organizational safety efforts should include extensive involvement from employees to create a culture of safety (Geller, 2005). This promotes employee responsibility and adoption of safety practices (Geller, 2005).

The previous discussion revealed that investments in safety prevention programs and ergonomic adaptations decrease injury rates among the workforce, decrease dollars spent per injury claim, improve employee productivity, and improve organizational morale (Shuford, 2013) which improves the performance of an organization (Colford, 2005). Investments in injury prevention programs and ergonomic adaptations foster a culture of safety and promote a solid return on investment for the organization (Shuford, 2013).

Ergonomics

Ergonomic job redesign is an injury prevention strategy (Beevis, 2003) that modifies tasks to reduce injury risk and enable the employees to perform their task efficiently with minimal risk of injury (Beevis & Slade, 2003; Shuford, 2013). Ergonomic job redesign is contingent on the physical and cognitive capabilities of employees (Brice et al., 2012) and the environment (Beevis & Slade, 2003). This includes the provision of equipment (Reichelt & Conrad, 1995), mechanical controls such

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as lifting devices, administrative policies (Stetler, Burns, Sander-Buscemi, Morsi, & Grunwald, 2003), training programs (Shuford, 2013), and physical fitness programs (Reichelt & Conrad, 1995). Such a work design greatly improves the performance, comfort, and health of the employees (Beevis & Slade, 2003) and solidifies their trust in the organization (Schein, 1992). Ergonomic interventions prevent many OAIs (Lahiri, Gold, & Levenstein, 2005).

Ergonomics Improve Workforce Development

Safety programs and ergonomic interventions will protect the health and wellbeing of employees (Garg & Kapellusch, 2012**;** Tullar et al., 2010; Zhuang, Stobbe, Collins, Hsiao, & Hobbs, 1999). A successful safety program can transform the organizational culture into one of safety and create a non-reproducible, competitive advantage for the organization (Porter, 1985; Wright, Dunford, & Snell, 2001) by building intellectual capital (Rechenthin, 2004). Ulrich (1998) defines intellectual capital as a function of competence and commitment of the workforce. Ulrich credits intellectual capital as the organization's primary asset (Ulrich, 1998). When a safety program permeates the organization's philosophy, policies, and procedures to the extent of adoption by the workforce and management, it will cultivate intellectual capital (Rechenthin, 2004) which provides a strategic competitive advantage for the organization (Ulrich, 1998).

Ergonomic job redesign is a principal of human capital development theory (Akinyemi & Abiddin, 2013). From Schein's work on organizational culture, ergonomics is an artifact (1992) that improves job comfort, health, and safety (Beevis & Slade, 2003). Ergonomics enhance the human capital of an organization by enabling,

protecting, and equipping the workforce to function safely (Beevis, 2003). Ergonomics

contribute to a healthy, present, and productive workforce (Deshkar, 2010). Ergonomic

interventions improve the employee's job satisfaction (Garg, 1999) and reduce employee

turnover (Fisher et al., 2009). Ergonomic interventions are successful in reducing OAIs

and keeping the employees healthy and at work (Fisher et al., 2009).

Ergonomics Improves the Bottom Line of the Company

Ergonomic mitigation reduces the organization's healthcare expense (Lahiri,

Latif, Punnett, & Team, 2013) which improves the company's bottom line through cost

avoidance, improvement in efficiency, improved competitiveness, and increased

productivity (Deshkar, 2010). Aside from the corporate social responsibility to the

employees (Carroll, 1979), ergonomics positively influence the bottom-line of a company

(Beevis & Slade, 2003) by diminishing workers' compensation injury rates, lost workday

rates, the number of repeated injuries, disability costs, and health care costs (Fisher et al.,

2009; Garg, 1999).

Implementing Ergonomic Interventions

Successful implementation of an ergonomic intervention requires management,

leadership, employee participation, hazard reduction, safety training, documentation

review, and assessment of the workplace to expose any hazardous situations that promote

injuries (ASSE, 2002; Jervis & Collins, 2001). Training programs must inform

employees about safety and health programs, the nature of the hazards, controls, and

standards in the organization (ASSE, 2002). The comparison of the cost of the

ergonomic interventions must be leveraged against the value of the benefits gained by the

intervention (Beevis, 2003).

Huang et al. (2009) found that most participants in safety programs preferred interventions that introduced novel safety-focused programs. Garg (1999) found that training without amending the task or environment for safety does not decrease the number of OAIs. Amick (2003) found that work modifications required ergonomic equipment to reduce injuries among office workers. Employing a program that includes equipment modifications and the appropriate training lowers the risk of patient handling OAIs among healthcare workers (Lim et al., 2011).

Examples of Patient Lifting Interventions in Similar Professions

The following are examples of ergonomic intervention programs in healthcare consisting of training and job modifications to reduce lifting injuries. Garg and Kapellusch (2012) found that ergonomic programs implemented in seven nursing facilities were very effective in reducing the frequencies of patient-handling OAIs and workers' compensation expenses. Other studies have found that the implementation of lifting equipment reduced musculoskeletal injuries among nursing home staff (Zhuang et al., 1999). In a study of nursing assistants that carry out the bulk of patient handling within the facilities, an ergonomic lift program reduced the OAIs among the studied population (Kurowski, Boyer, Fulmer, Gore, & Punnett, 2012).

Lim, Black, Shah, Sarker, and Metcalfe (2011) found that a multi-factor intervention program that included training and ergonomic redesign in patient transfer, lifting, and repositioning patients reduced the average lost workdays secondary to OAIs. The hospitals involved in the Lim et al. (2011) study decreased lost workdays by 55%, from 36 days to 16.2 days. The injury cost decreased by 41%, from $3891 to $2302 (Lim et al., 2011). The intervention hospitals in this study consistently experienced fewer

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initial and repeat injuries than the control hospitals (Lim et al. , 2011). The study

population consisted of registered nurses, general duty nurses, and an *other healthcare*

workers category, which included paramedics (Lim et al., 2011).

Collins, Wolf, and Evanoff (2004) found a reduced rate of injuries and lost

workdays among nursing home staff following the implementation of the ergonomic lift

intervention. Beevis (2003) found that ergonomic lift interventions reduced the

frequency of accidents, operator errors, and organizational expenditures related to OAIs.

Injuries among healthcare workers are reduced significantly by implementing mechanical

assist devises along with patient lifting and handling training (Kim et al., 2011).

Nursing home research on mechanical, patient-lift devices, patient lift teams, and

adjustable beds revealed that patient-lift devices are the most effective averages to reduce

OAIs (Collins et al., 2004). However, the prehospital environment prohibits the use of

patient handling devices that are founding in nursing homes or hospitals (Conrad,

Reichelt, Lavender, Gacki-Smith, & Hattle, 2008). The size, weight, transportation, and

the number of people required to operate the devices are a few examples of why patient

handling devices from hospitals and nursing homes are not practical in EMS (Conrad et

al., 2008).

The healthcare workers that had access to mechanical lift devices had fewer OAIs

compared to groups that did not (Yassi et al., 2001). Mechanical lift devices reduce the

tensile forces on the healthcare worker's back, which reduces subsequent injuries (Garg

& Kapellusch, 2012**;** Tullar et al. , 2010; Zhuang et al., 1999). Garg and Kapellusch

found that patient-handling OAIs decreased by 59.8%, lost workdays decreased by

86.7%, lite duty days decreased by 78.8%, and workers' compensation cost decreased by 90.6% following the institution of patient handling devices (Garg & Kapellusch, 2012).

Ergonomics in EMS. EMS is a dangerous profession with many transportation-related factors that increase the risk of OAIs (Maguire et al., 2005). The simultaneous application of education and ergonomic principles is required (Kluth & Strasser, 2006) to prevent substantial numbers of injuries associated with patient handling (Kim et al., 2011). Ergonomically developed patient lifting devices reduce the prevalence of injuries among healthcare workers (Garg, 1999; Kim et al., 2011).

Brice et al. (2012) found that ergonomic job redesigns decreased OAIs among the EMS workforce. There is a need for the development of innovative equipment designed to protect EMS professionals during the performance of their job (Brice et al., 2012). The EMS workforce must be integrally involved in the development of prevention education, engineering systems and equipment, and the creation of ergonomic principles (Sanders, 2012) by identifying effective practices that may be employed throughout EMS (Brice et al., 2012). There is a need for empirical occupational health interventions based on substantial ergonomic studies of tasks performed by medics in the prehospital environment (Studnek et al., 2011). EMS providers must apply the ergonomics principles on a consistent basis to decrease accidents, injuries, and errors (Brice et al., 2012).

Patient handling devices. Fisher and Wintermeyer (2012) found that the following was a prescription for preventing OAIs in EMS:

1. Purchase updated equipment
2. Provide body mechanic education

3. Provide back-up lift assistance

4. Require an exercise regimen

5. Improve the ambulance design

Lifting weights that exceed the body's tensile capacity can lead to disablement secondary to OAIs (Kluth & Strasser, 2006). The EMS workforce readily recognizes the importance of investing in lifting equipment to mitigate OAIs (Conrad et al., 2008) because it is not possible to impose weight restrictions upon the sick or injured patients requiring emergency services (Kluth & Strasser, 2006). A safe lifting limit is 75% of the weight that the female population could comfortably lift (Cooper & Ghassemieh, 2007). It is necessary to reduce strain (Kluth & Strasser, 2006) by limiting the forces used in manual lifting, pushing, pulling, and carrying (Liberty Mutual Insurance Company, 2005). The task dictates the type of ergonomic equipment needed for the EMS profession (Beevis & Slade, 2003). Improved equipment has help EMS handle patients; yet, EMS remains an occupation that often demands more physically than the EMS workforce can provide (Erich, 2013a). It is also necessary to provide ergonomic lifting assistance in order to remove strength discrimination among the EMS workforce (Erich, 2013a).

EMS lift assist devises. Ergonomic redesigns of EMS tasks reduce physical exertion and OAIs (Lavender, Conrad, Reichelt, Meyer, & Johnson, 2000). Hydraulic stretchers will decrease OAIs in EMS by reducing the physical strain on the backs of the EMS workforce while performing patient lifting (Kluth & Strasser, 2006). It is critical that the EMS workforce not use outdated equipment that compromises body mechanics and increases the workload during patient handling (Kluth & Strasser, 2006). Studnek et

al. (2011) found that battery-powered, hydraulic stretchers decreased OAIs in EMS by amending the lifting task. Fredericks et al. (2009) came to the same conclusion: improved stretcher design resulted in significant financial and human capital savings. Battery powered, hydraulic stretchers are an ergonomic solution to EMS OAIs (Fisher & Wintermeyer, 2012; Studnek et al., 2011).

Fredericks et al. (2009) and Studnek et al. (2011) studied the impacts of a manual lift and battery-powered, hydraulic lift stretcher. Both sets of researchers found a reduction in injury expenses and the frequency of injury claims. Fredericks et al. (2009) discovered a reduction in the number of lost or restricted workdays. Specific OAI incidents related to "raising and lowering" the stretcher reduced from $42,114 to $3,412, which is a 92% reduction in cost (Fredericks et al., 2009). This study found positive financial results after the installation of an ergonomic stretcher system (Fredericks et al., 2009). The ergonomically improved stretcher system resulted in substantial cost avoidance from stretcher-related OAIs (Fredericks et al., 2009). Table 1 summarizes the results found by Fredericks et al. (2009). Studnek et al. (2011) found that the stretcher systems reduced injuries, related expenses, and lost workdays. Table 2 summarizes the Studnek et al. (2011) findings.

Table 1

Comparison of Manual and Hydraulic Lift Stretchers

Lift & lower Incidents	Manual lift	Hydraulic lift	Reduction
Claims	$88,453	$51,870	41%
Lost workdays	208	66	68%
Restricted workdays	478	278	42%

Note. Adapted from Fredericks et al. (2009)

Table 2

Electronic Stretcher Associated with Reduced Injury Rate

Time Frame of Hydraulic Stretcher	Total injuries	Injury rate	Lost-time from OAIs	Days Lost from OAIs	Rate of Lost Time from OAIs	Rate of Lost Workdays
Before	1275	69.09	255	8401	12.22	402.51
After	203	28.76	14	273	1.98	38.68

Note. Adapted from Studnek et al. (2011)

A Problem: Cost Prohibited

Financial evaluation of occupational safety measures is an ignored area of research, even in occupations where there are numerous work-related injuries (Lahiri S, Latif, Punnett, & Team, 2013). While it seems hardly disputable that the use of battery-powered, hydraulic stretchers reduces injury rates and expense, the large up-front investment cost is a deterrent to the purchase of these interventions by many EMS employers (Lahiri et al., 2013). This ergonomic intervention requires significant financial investment on the by the owners and operators (Lahiri et al., 2013). The ergonomic redesign for lifting in EMS is hydraulic stretchers but they are expensive tools (Dick, 2013). Citing the expense of equipment, EMS employees are often required to perform tasks without proper lifting devices (Fisher & Wintermeyer, 2012). Ergonomic protective technologies are cost-effective when mitigating the loss of human capital

(Myers, Cole, & Westneat, 2005); however, ergonomic improvements are cost-prohibitive to many EMS agencies (Brice et al., 2012).

Workforce Metrics

Alan C. McMillan, president and CEO of the National Safety Council in suburban Chicago stated that safety prevention programs produced returns in human capital such as employee productivity, morale, and retention (Colford, 2005). Whereas, Baxter (2006) and Rechenthin (2004) found that safety programs and ergonomic interventions improve workforce indicators such as recruitment, retention, and turnover. The same programs positively affect the workforce's perception of the organization in terms of job satisfaction and employee morale (Deshkar, 2010; Rechenthin, 2004; Shuford, 2013). Shuford (2013) found that occupational safety prevention programs reduce injury rates, absenteeism, and expenses associated with injury claims, but enhanced productivity and strengthened the safety culture. Garg (1999) found that safety programs reduce restricted workdays and truncated repeat injuries. Research has found that safety programs and ergonomic interventions improve the financial ability of an organization by reducing the expenses associated with injuries (Rechenthin, 2004; Shuford, 2013) and conserving of the human capital (Fredericks et al., 2009; Shuford, 2013; Studnek et al., 2011).

Intangible Workforce Metrics

Intangible workforce metrics that are difficult-to-quantify indicators of performance or perception. Intangible workforce metrics can add or detract value from an organization (Phillips, 2012). This section contains a brief discussion of the intangible workforce metrics of employee morale and job satisfaction.

Employee morale. Ergonomic or safety programs can influence employee morale. Employee morale is an occupational thermometer to measure intangible workforce indicators such as employees' motivation, employment contentment, loyalty, and work pride (McKnight, Ahmad, & Schroeder, 2001). An efficient safety program endorsed by management improves employee morale (ASSE, 2002; Rechenthin, 2004). There is substantial confirmation that negative employee morale is associated with poor management practices, which potentiate OAIs (Maiti, Chatterjee, & Bangdiwala, 2004).

Job satisfaction. OAIs decrease the level of job satisfaction among the workforce (Weaver et al., 2012). Job satisfaction decreases as exposures to hazardous situations, productivity pressure, boredom, and stress increases (Maiti, Chatterjee, & Bangdiwala, 2004). In EMS, low levels of job satisfaction increase the expense of worker compensation premiums, overtime, and recruitment and training (Studenk & Crawford, 2007). Job satisfaction has an inverse relationship with absenteeism and turnover (Borkowski, 2009). Correcting problems with employee satisfaction can curtail OAIs, productivity losses, worker compensation expenditures, overtime expenses, and recruitment, and on-boarding expenses (Studenk & Crawford, 2007). Improved job satisfaction promotes better safety practices (Maiti, Chatterjee, & Bangdiwala, 2004).

Tangible Workforce Indicators

In the following section, tangible workforce indicators of low workdays and productivity are discussed briefly. Tangible workforce indicators are metrics that are readily quantified (Phillips, 2012).

Lost workdays. Ergonomic interventions influence lost workdays. The U.S. Department of Labor Statistics defines lost workdays as days off work or lite work duty

because of sustaining an OAI (U.S. Department of Labor, 2004). Lost workdays are an expense to the organization because of salaries paid to employees who are not at work (Fisher, 2003). The Bureau of Labor Statistics (2008) stated that 46% of OAIs result in lost or restricted workdays. The Bureau of Labor Statistics (2008) also identified that 4,560 injuries resulted in lost or restricted workdays. OAIs secondary to patient handling are a significant cause of lost or restricted workdays (Garg & Kapellusch, 2012). Lim et al. (2011) found that an occupational safety prevention program significantly decreased the average lost workdays per injury by 55% (from 36 days to 16.2 days). EMS has one of the highest incidences of lost workdays (Bureau of Labor Statistics, 2005). In 2007, a review of data collected by NREMT revealed that the lost workdays rate for EMS was determined to be 8.1 per 100 workers (Studnek et al., 2007) which is higher than the rate of 2.9 per 100 workers for nurses and 1.8 per 100 for all hospital workers (Erich, 2013a). EMS has a higher lost workday ratio than firefighters or police (Reichard & Jackson, 2010). The EMS workforce is seven times more likely to experience lost workdays because of OAIs (National Association of EMTs, 2013).

Productivity and ergonomics. OAIs reduce productivity. Ergonomic interventions influence productivity (OSHA, 2002a). Employees with OAIs may have to reduce the hours worked, change jobs, or either temporarily or permanently leave the workforce (Weil, 2001). Safety/ergonomic investments in the workplace to protect employees OAIs will positively improve productivity thereby enhancing the organization's financial performance (OSHA, 2002a). Safety/ergonomic investments for the workforce will ensure that an organization's employees will continue to be productive (Deshkar, 2010).

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Difficulties in Recruitment, Retention, and Turnover

EMS experiences continual difficulties in recruitment and retention, which are precursors of employment turnover (Brown, Dawson, & Levine, 2003; Franks et al., 2004; Patterson & Yonas, 2007; Patterson et al., 2010). Difficulties in recruitment and retention are significant issues confronting EMS (Patterson et al., 2010) especially for the rural EMS agencies (Franks et al., 2004; McGinnis, 2004). Recruitment and retention of a more diverse workforce in terms of race and gender to EMS is necessary to meet the staffing needs (NHTSA, 2011). Patterson et al. (2010) found that half of all EMS agencies surveyed, experienced incomplete staffing. They found that 37% of ambulance owners/operators/directors said that recruitment is a continual problem (Patterson et al., 2010). Fifty-five percent of owners/operators report difficulties with retention (Patterson et al., 2010). EMS providers in rural and frontier areas experience more difficulty in filling medic positions than their urban counterparts (Erich, 2005; McGinnis, 2004).

Patterson et al. (2010) found that the turnover cost per agency is $71,613.75. Patterson et al. (2010) found that EMS agencies experienced a 10.7% turnover annually. They expected a higher employment turnover rate based on anecdotal evidence and reports on turnover (Franks et al., 2004). More than half (25 out of 40) of the ambulance services in his study suffered from incomplete staffing (Patterson et al., 2010). This is across a variety of compensation patterns such as paid EMS workers, volunteer workers, and a combination of the two (Patterson et al., 2010). According to CompensationForce.com, a 10% turnover rate is acceptable (2013 Turnover rates by industry, 2015). The EMS turnover rate is higher than the Bureau of Labor Statistics report of total employment separations in February 2015 of 3.4% among all none-farm

industries (2015). At the time of the Patterson et al. (2010) research, which is the

benchmark for EMS turnover in this study, the Bureau of Labor Statistic reported the

employment separation rate as 3.2 among all industries and 2.4 in education/healthcare

category (BLS, 2010). Based on the reports of different agencies concerning

employment turnover rates, it is difficult to understand if EMS' turnover rate is too high,

close to the average, or below the average. However, among EMS directors, 37% cited

recruitment as a continual problem and 55% reported difficulty with retention (Patterson

et al., 2010). Freeman et al. (2009) cite recruitment and retention as continual problems

among EMS agencies, especially the rural services; NHTSA's (2008) report on the EMS

workforce concurs.

EMS agencies that have a reputation for OAIs experience more difficulty in

recruiting new employees to the workforce (Studenk & Crawford, 2007). OAIs are the

most frequently cited reason for leaving the EMS profession (National Association of

EMTs, 2013). An injury prevention program could improve the ambulance service's

recruiting efforts and reduce turnover (Rechenthin, 2004).

Employee turnover represents a loss of human capital for the organization (Lahiri

et al., 2013). This is important when considering the national trends that will increase the

demand for ambulance services such as an aging population, worker shortages, and the

potential for disasters and pandemic diseases (NHTSA, 2011). The deficiencies within

the EMS systems that require improvement include staffing levels, recruitment efforts,

employee retention, and unsatisfactory provisions for EMS workers' health and safety

(NHTSA, 2011). EMS officials are facing critical human capital challenges because of

high turnover and poor recruitment (Patterson & Yonas, 2007). The expenses associated

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with turnover are the cost to hire, training, and the reduced competence of new employees compared to experienced workers productivity (Waldman, Kelly, Arora, & Smith, 2010). The cost of turnover represented 3.4% to 5.8% of the yearly budget for a major-medical center (Waldman, Kelly, Arora, & Smith, 2010).

Inverse Relationships among Workforce Metrics

Why do EMTs and paramedics stay at their current employment? Russ-Eft and Levine (2012) found that medics stay in their employment because of narrow career alternatives, occupational commitment, and subjective career success. Subjective career success is the medic's satisfaction with the profession, assignment, professional development, peers, and supervisors (Russ-Eft & Levine, 2012). An inverse relationship exists among employment longevity and the number of hours worked, professional development opportunities, working in rural areas, and employment in a non-fire-based service (Russ-Eft & Levine, 2012). An increase in job stressors decreases job satisfaction, which results in a corrosion of the workforce indicators such as absenteeism, lost workdays, productivity, and employment turnover rate (Borda & Norman, 1997).

Interactions of Recruitment, Retention, and Turnover

According to David and Brachet (2009), a high turnover rate diminishes the human capital accumulation acquired from work experience of medics. The more frequently the employment interruptions occur, the less experience accumulation occurs. Clinical experience is essential for prehospital performance (David & Bachet, 2009). For the purposes of this study, the EMS employment turnover rate is interrelated to recruitment and retention efforts (David & Brachet, 2009; Patterson et al., 2005). Employment turnover necessitates recruitment. Retention negates turnover. The apropos

question would be if safety/ergonomic endeavors such as hydraulic stretchers, affect the employee turnover rate in EMS.

Just like other industries, EMS agencies face the potential loss of human capital as the baby boomers begin to retire and take their knowledge, skills, and experience with them as they leave the workforce (NHTSA, 2011; Dychtwald et al., 2006). Many consider EMS as a young man's occupation (NHTSA, 2008). The branding of EMS as a young man's profession may deter the older worker from remaining in the profession or considering it as an occupation (NHTSA, 2011). Ergonomic job redesigns make it possible for older employees to work longer (Beevis & Slade, 2003). Hydraulic stretchers modify the lifting technique and lessen the workload for medics during stretcher operations (Brice et al., 2012; Erich, 2005, 2013a; Studnek et al., 2011). Dychtwald et al. (2006) postulate that one method to combat talent shortages is to keep older people employed for longer tentures. However, older employees in EMS suffer more OAIs (Kim et al., 2011), which predisposes them to early retirement (Cooper & Ghassemieh, 2007).

Weaver et al., (2012) research provides an example of the necessity of retaining an experienced workforce. Their research shows that the more tenured employees tend to rate organizations more positively in safety production, teamwork, management ability, working conditions, and job satisfaction (Weaver et al., 2012) when compared to the employees that participate in safety-compromising behavior, which are typically younger and more negative in workforce evaluation (Weaver et al., 2012).

Hydraulic stretchers are an EMS-specific ergonomic job redesign that modifies the stretcher operations (Brice et al., 2012; Erich, 2005, 2013b; Kluth & Strasser, 2006;

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Studnek et al., 2011) which may afford older employees longer tenures in EMS. In light of the previous discussion regarding the difficulty of retention in EMS, conserving the accumulated human capital by retaining the older medics longer may be beneficial in alleviating recruitment and retention difficulties.

Annual Ambulance Call Volume

The profitability of an EMS agency influences many employment factors such as the salary of the medics, contemporary equipment, robust education policies, career ladders, recruitment incentives, and retention strategies (SafeTech, 2011). Financial reimbursement received from the number of ambulance responses is the source of an EMS agency's revenue (SafeTech, 2011). Therefore, the more requests an EMS agency receives to provide services, the more revenue generated. Rural EMS agencies do not perform as many ambulance responses as urban EMS agencies (SafeTech, 2011). The annual number of ambulance responses influences the financial ability of an EMS agency to afford ergonomic equipment or other employment incentives (Franks et al., 2004; SafeTech, 2011). Many safety interventions require a large, up-front, financial investment, as does the electronic, hydraulic stretchers. The size of the initial investment prevents many organizations from adopting the safety/ergonomic intervention (Brice et al., 2012; Lahiri et al., 2013). Yet, the financial investment required to improve the safety of the workplace will yield significant financial returns (Huang et al., 2009).

Theories

The following is a discussion of the theoretical supports for this study. Providing ergonomic equipment for the mitigation of OAIs is a concept formulated in Corporate Social Responsibility (Colford, 2005). The human capital development is the

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foundational theory for this study. This theory focuses on the economic benefits to the organization, society, and individual that occurs because of expanding the occupational capacity of the workforce (Shaffer, 1961; Sweetland, 1996; Wang & Swanson, 2008).

Corporate Social Responsibility

Corporate social responsibility (CSR) is the application of social and ethical standards to businesses conduct (Lichtenstein et al., 2004). It represents the merger of economic and social goals to organizational management (Lindgreen & Swaen, 2010) for the improvement of the lives of employees and society (Watts & Holme, 1999). The organization that embraces CSR will demonstrate benevolent behavior toward its constituency (Lindgreen & Swaen, 2010; McWilliams & Siegel, 2001; Rechenthin, 2004; Renaud-Coulon, 2008) which will improve the business prospects for the organization (Carroll & Shabana, 2010). Furthermore, according to CSR, organizations have the responsibility to remain financially solvent to ensure continual employment in well-paying jobs (Drucker, 1984; Wheeler, Colbert, & Freeman, 2003).

Organizational safety is a CSR precept (Colford, 2005) that encourages an organization to identify and mitigate any potentially harmful work situations (Porter & Kramer, 2006). Executives must fully embrace this responsibility (ASSE, 2002) to realize competitive advantages for the business (Rechenthin, 2004). Safety provision programs are directed toward employees (Rechenthin, 2004). A strong safety provision program can help organizations fulfill their ethical obligations (ASSE, 2002). Considering CSR, the question must be raised if EMS agencies have a social responsibility to provide better lifting equipment to their employees (Carroll, 1979).

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When the cost of OAIs is factored into prevention strategies, ergonomic technologies are cost-effective, especially from a CRS perspective (Myers, Cole, & Westneat, 2005).

Businesses stand to be the primary beneficiaries from engaging in CSR (Carroll & Shabana, 2010). Many business leaders acknowledge that there is an apparent correlation between CSR performances and financial performance of a company (BusinessGreen, 2008). However, an organization can damage its competitive advantage and undermine the trust and motivation of the constituencies by not following the principles of CSR (Rechenthin, 2004; Renaud-Coulon, 2008).

Brice et al. (2012), Fredericks et al. (2009), and Studnek et al. (2011) demonstrated that hydraulic stretchers constitute a CSR intervention. Even though hydraulic stretchers are the more expensive transport equipment (Brice et al, 2012), it protect the EMS workforce by reducing injuries (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). Providing hyrdraulic stretchers for the EMS workforce is an expression of CSR.

Human Capital Development Theory

The theoretical foundation for this study is the human capital development theory. Human capital development theory is an economic philosophy (Akinyemi & Abiddin, 2013) with references all the way back to Adam Smith in the 1700s (Sweetland, 1996). The human capital development theory focuses on the economic benefits to the organization, society, and individual that occurs because of expanding the occupational capacity of the workforce (Shaffer, 1961; Sweetland, 1996; Wang & Swanson, 2008). Akinyemi and Abiddin (2013) cite Woodhall (1997) as he explains that *human capital* implies an investment that generates economic gains secondary to productivity. The

workforce is the most important capital of an organization or country (Akinyemi &
Abiddin, 2013). Therefore, the most important investment is human capital (Cohen &
Soto, 2007).

The investments that realize organizational and individual financial gains are
education and health (Becker, 1993; Hansen & Prescott, 2002; Schultz, 1981; Sweetland,
1996). Education expands the occupational potential of people (Schultz, 1971) and is the
main incubator of human capital (Schultz, 1961). Investments in the health of human
capital protect the productive capacity (Becker, 1993; Hansen & Prescott, 2002). The
individual or the organization will not realize a return on their investments if the
workforce is not healthy enough to work productively (Akinyemi & Abiddin, 2013;
Becker, 1993; Hansen & Prescott, 2002; Wang & Swanson, 2008). Therefore, health and
education are reciprocal components of the human capital development theory; each
component is symbiotic to the other (Akinyemi & Abiddin, 2013; Hansen & Prescott,
2002; Wang & Swanson, 2008). Education is the acquired intellectual capacity; whereas
health is the incubator of the acquired intellectual capacity (Akinyemi & Abiddin, 2013;
Hansen & Prescott, 2002; Wang & Swanson, 2008). If the individual's health is not
good, the economic importance of occupational improvements cannot be realized (Wang
& Swanson, 2008). According to the human capital development theory, health performs
a maintenance function by reducing morbidity, which prolongs the time to actualize a
return on human capital investments (Becker, 1993).

Many researchers equate organizational safety programs as health investments
that reduce mortality and morbidity of the workforce as a human capital development
principle (Akinyemi & Abiddin, 2013; Rechenthin, 2004; Schultz, 1981). Brice et al.

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(2012), Fredericks et al. (2009), and Studnek et al. (2011) demonstrated that hydraulic stretchers constitute a human capital intervention because hydraulic stretchers protect the health and ability of the EMS workforce by reducing injuries. Reducing the number of injuries conserves expenses for the organization (Gagne, 2011; Myers, 2008; Weil, 2001) and promotes productivity (Bird & Germain, 1985; Colford, 2005; Jervis & Collins, 2001; OSHA, 2002; Shuford, 2013). Therefore, providing hyrdaulic stretchers for the EMS workforce is an expression of the human capital development theory.

Chapter Summary

The EMS workforce is educated, registered, and certified to provide emergency medical care (Patterson et al., 2005). EMS is a treacherous occupation (Erich, 2013a) often jeopardizing the health and safety of the EMS workforce while providing care in emergencies (Reichard & Jackson, 2010). OAIs have negative impacts for the EMS workforce (Maguire et al., 2005; Weil, 2001). An injured employee will not be able to work to his/her full capacity. Additionally, OAIs contribute to employment turnover and increase recruitment and retention difficulties, which are continual problems in EMS, especially among rural EMS agencies (Franks et al., 2004; Patterson & Yonas, 2007; Patterson et al., 2010).

The initial investment expense for ergonomic/safety equipment is cost prohibitive for many EMS agencies. Based on the human capital development theory, EMS agencies should protect the organizational human capital by providing better lifting equipment. When the potential for loss of human capital occurs because of OAIs, prevention strategies and ergonomic protective technologies are cost-effective (Myers et al., 2005). Safety prevention programs decrease costs associated with OAIs (Fisher, Brodzinski-

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Andreae & Zook, 2009). Ergonomic job redesigns such as lifting assist equipment

reduces associated OAIs (Lahiri et al., 2013; Zhuang et al., 1999). Battery-powered,

hydraulic stretchers are an ergonomic job redesign that conserves the EMS human capital

(Fisher & Wintermeyer, 2012; Fredericks, Butt, and Hovenkamp, 2009; Studnek et al.,

2011). A deferral issue related to the deployment of the hydraulic stretcher among all

EMS agencies is the initial investment expense (Brice et al., 2012). Ergonomic

interventions pay for the implementation cost by reducing the number of injury claims

and subsequent costs (Lahiri et al., 2013; Zhuang et al., 1999). Rechenthin (2004) found

that ergonomic job redesigns lessened recruitment, retention, and turnover problems.

Baxter (2006) found that decreased employee turnover was associated with a robust

safety program. Studenk and Crawford (2007) alluded to the improvement of retention

with safety programs. This aligns philosophically with the human capital development

theory that explicates the need for the workforce to be healthy in order to be productive.

The U.S. Department of Labor (2012) predicts an increased demand for EMS

services in the future as population ages and disease prevalence increases. The EMS

employment pipeline needs fortification in order to meet the predicted increased demand

for prehospital emergency care. The literature review did not provide a full

understanding of how stretcher systems influence recruitment and retention issues in

EMS. Ineffective recruitment and retention confounds EMS (Patterson et al., 2010). The

human capital indicators associated with recruitment and retention discussed in this

chapter are turnover rate, average age (retention), average length of employment tenure

(retention), and percentage of women employees (recruitment). The human capital

indicators particularized in this study illuminate the issues confronting the EMS workforce pipeline.

It is unknown from this literature review how various stretcher systems influence the EMS workforce in terms of turnover, age, length of employment tenure, and percentage of women employees. Further exploration is needed to understand how ergonomic interventions such as hydraulic stretchers, influence the EMS workforce.

CHAPTER III – RESEARCH DESIGN AND METHODOLOGY

This study will investigate the relationship between stretcher systems and EMS recruitment, retention, and turnover issues. The first section of this chapter reviews the purpose, research question, and the objectives of this study. The remainder of the chapter describes the causal-comparative research design, the survey used in this research, the Multivariate Analysis of Covariance (MANCOVA), and the validity and reliability of the study. The chapter concludes with a discussion of the limitations and delimitations of this study.

Purpose

The purpose of this research is to determine if the type of stretcher system influences recruitment (percentage of women employees), retention (age and length of employment tenure), and turnover (employment disruption) of the EMS workforce. Prior research found that hydraulic stretchers reduce revenue loss by preventing OAIs (Beevis & Slade, 2003; Brice et al., 2012; Deshkar, 2010; Fisher et al., 2009; Fredericks et al., 2009; Garg, 1999; Lahiri et al., 2013; Studnek et al., 2011). Other researchers report a relationship between hydraulic stretchers and a reduction in lost workdays (Lim et al., 2011), employment turnover (Lahiri et al., 2013; Rechentin, 2004), and a reduction in recruitment and retention difficulties (Rechentin, 2004). This study extends those empirical efforts to explore the influence that stretchers systems have on the EMS workforce in terms of recruitment, retention, and turnover rates.

Research Question

This study explores the following research question: Do differences exist in retention, recruitment, and turnover rates among EMS agencies that use manual

stretchers, hydraulic stretchers, or a combination of the two stretcher systems? This

question stems from the literature review that alludes to an association between stretcher

systems and EMS agencies' financial performance through OAI prevention. The

literature review exposed a relationship between stretcher systems and human capital

consequences (Fredericks et al., 2009; Garg, 1999; Lahiri et al., 2013; OSHA, 2002;

Rechenthin, 2004; Studnek et al., 2011).

<div align="center">Research Objectives</div>

Inquiry into the research question of this study prompted the formulation of the

following objectives in pursuit of the research question.

RO1: Describe the demographic characteristics of the EMS agencies in this

study.

RO2: After controlling for the influence of the annual ambulance call volume,

compare recruitment (percentage of women employees), retention (age

and length of employment tenure), and turnover (employment disruption)

among EMS agencies that use hydraulic stretchers, manual lift stretchers,

or a combination of stretcher systems.

<div align="center">Population</div>

EMS agencies in Arkansas, Louisiana, and Mississippi constitute the study group

for this research. There are many similarities among these states in terms of health

disparities, obesity rates, certification/license levels of the EMS professionals, and the

rurality of the states. The prevalence of health disparities is a critical factor that affects

the EMS workforce (Busch, 2013; Erich, 2011b; Goodloe, Crowder, Arthur & Thomas,

2012; Kluth & Strasser, 2006; National Association of EMTs, 2013). Following is a

discussion concerning some of the health disparities, the employment conditions, and rurality of Arkansas, Louisiana, and Mississippi.

Arkansas, Louisiana, and Mississippi suffer from a disproportionate number of health disparities (Centers for Disease Control and Prevention, 2011; The Office on Women's Health, 2015). Obesity, smoking, and diabetes contribute to the prevalence of health disparities in these states (Centers for Disease Control and Prevention, 2011; David & Bachet, 2009; NHTSA, 2008, NHTSA, 2011, Sanders, 2012; The Office on Women's Health, 2015). In turn, a higher prevalence rate of these health disparities affects EMS in terms of ambulance call volume, treatment provision, and transportation of patients (Centers for Disease Control and Prevention, 2011; David & Bachet, 2009; NHTSA, 2008, NHTSA, 2011, Sanders, 2012; The Office on Women's Health, 2015). Table 3 shows the rankings of these states' overall rating by leading health indicators as reported by United Health Foundation (2015).

Table 3

The States with the Worst Health Rankings of the United States 2014

State	Overall Rating	Smoking Ranking	Diabetes Ranking	Obesity Ranking
Arkansas	49	48	44	48
Louisiana	48	44	45	45
Mississippi	50	47	48	49

Although smoking and diabetes affect the EMS workforce in terms of ambulance call volume, according to the National EMS Assessment, patient obesity is the most significant obstacle to EMS patient care (NHTSA, 2014). The effect that patient obesity has on the EMS workforce is the primary catalyst of this study. Thirty-five percent of Mississippi's population is obese, 34.7% of Louisiana's population is obese, and 34.5%

of Arkansas' residences are obese (CDC, 2012).   This compares to 29.4% for the United

States (CDC, 2012). In Mississippi in 2013, there were 34,149 EMS responses (4.78%)

that had a patient that weighed above 220 pounds (D. Smith, personal communication,

June 16, 2014). Heavier patient weights predispose the EMS workforce to more OAIs

(Busch, 2013; Erich, 2013a; Goodloe, Crowder, Arthur, & Thomas, 2012; Kluth and

Strasser, 2006; National Association of EMTs, 2013). The EMS workforce in these

states may be at a greater risk for OAIs because of the disproportionate number of obese

citizens that reside in those states.

Other similarities among the states besides smoking, diabetes, and obesity are the

geographic location and the rurality of these states (Bishop, 2012). Bishop (2012)

compiled information retrieved from the 2010 U. S. Census and ranked states according

to the percentage of citizens that lived in rural areas. Mississippi ranked the fifth most

rural state and Arkansas ranked eighth among the 50 states (Bishop, 2012). More than

72.4% of Mississippi's residents live in small towns or rural areas (Bishop, 2012).

Louisiana ranked 27th with 38.7% of its citizens living in rural areas or small towns

(Bishop, 2012). This is a critical statistic for this study because rural EMS agencies

experience more difficulties in recruitment and retention (Freeman et al., 2009;

McGinnis, 2004; Patterson et al., 2010). Arkansas, Louisiana, and Mississippi are similar

in the level of medic certifications, the types of EMS agencies licensed, the number of

services, services area, and volunteer structure in EMS (FICEMS, 2012; NHTSA, 2014).

Similarities of the Research Population to National EMS Averages

The implications that health disparities (obesity, diabetes, smoking) of the citizens

in these states have for the EMS workforce solidifies these states as an appropriate study

population for this research. It is estimated that 36,698,670 EMS responses occurred within the United States in 2009; which is approximately 1,217 EMS responses per 10,000 people (FICEMS, 2012). In 2013, Mississippi EMS responded to 364,919 calls for assistance (D. Smith, personal communication, August 26, 2014) compared to the national average per state of 712,926 in 2011 (FICEMS, 2012). Based on the 2013 population of Mississippi of 2,994,079 people (U.S. Census Bureau, 2016), and the number of EMS responses, 364,919 (D. Smith, personal communication, June 16, 2014), there were 1,218 EMS responses per 10,000 people in Mississippi in 2013. Mississippi's EMS call volume in 2013 is equivalent to the national 2011 call volume. The ambulance call volume for Arkansas in 2014 was 390,955 (S. Gann, personal communication, June 1, 2016) with a state population of 2,966,369 in 2014 (U.S. Census Bureau, 2016) which is equivalent to 1,388 per 10,000 people. Given numerical rounding and population increases from 2011 to 2014, this is similar to Mississippi's 2013 call volume and the National call volume in 2011. Louisiana data was not available for analysis (S. Bordelon, personal communication, June 22, 2016).

Study Participants

This study used a census of the population of EMS agencies in Arkansas, Louisiana, and Mississippi, as suggested by Sprinthall (2012) when there is a small population. There were 232 licensed EMS agencies that operate within Arkansas (n = 111), Louisiana (n = 59), and Mississippi (n = 62) invited to participate in this study. Given the finite population size of 232 and to ensure a 95% confidence interval with a 5% alpha (margin of error), the researcher's goal was a response rate of at least 145 completed surveys out of 232 (Sample size calculator, 2015).

Refining the Survey Group and Subjects

The literature reviewed for this study concerned ground transportation units only. Therefore, only ground transportation EMS agencies were included in the research population. Aeromedical services are not included in the study population, nor are industrial EMS services. The researcher did not send introductory letters to these services.

The survey collected data from EMS agencies concerning employees directly involved in treating and transporting patients. Administrative personnel, education personnel, service technicians, etc. were excluded from the study groups. Limiting the data collection to the treating and transporting medics provided a clearer picture of the effects that stretchers have upon the EMS workforce that operates stretchers. The survey instructions explain the exclusion of non-treatment/transport personnel from the data collection.

Data from multi-state services outside of Arkansas, Louisiana, and Mississippi are not included. Health disparities, rurality, obesity rates, health rankings, EMS certification levels, call volume, or injury rates of EMS agencies in adjacent states outside of the study population are not understood. Using data from states outside of the study population could confound the results. If an Arkansas, Louisiana, or Mississippi EMS agency has a dual license outside of the three research states, the information from those outside states was not included in this study. The survey instructions explained the exclusion of information from outside of the states in the study population.

EMS agencies that have multiple locations with different physical and mailing addresses, with a manager for each location, were treated as independent operations.

Each site received an introductory letter to participate in this study. EMS agencies with multiple geographical locations that are listed by one mailing address and one manager was treated as one EMS agency. The EMS agencies meeting the standard received one introductory letter with instructions to the survey.

A list of licensed EMS agencies was obtained from the website of the Arkansas Bureau of EMS. The list was outdated. Three EMS agencies had disbanded or consolidated. The Arkansas list of licensed EMS agencies did not contain email contacts. An internet search provided many contact emails. There were 15 Arkansas EMS agencies that were not included because of a lack of an email contact. The Louisiana and Mississippi licensed EMS agency list was provided by an email request made directly to those departments. The Louisiana and Mississippi lists contained contact names and email addresses. There was one Louisiana EMS agency that had consolidated with another agency. There was one consolidation in Mississippi of two large ambulance services. There were two new ambulance services in Mississippi that were not included on the list of EMS agencies that were added. Table 4 below summarizes the final group of the research participants.

Table 4

Construction of the Research Group

State	Number of contacts by original EMS agency lists.	Adjustments by delimitation, consolidations	Number without email contact	Final Contact Number
Arkansas	206	67	15	124
Louisiana	59	1	0	58
Mississippi	61	9	2	50
Total	326	77	17	232

Institutional Review Board

The University of Southern Mississippi's Institutional Review Board (IRB) for Protection of Human Subjects reviewed all research procedures and instruments prior to collection any data. This research is subject to the constraints of ethical research, approval, and oversight by the USM's IRB. The researcher is responsible for conducting this research within the guidelines of ethical research as defined by the University of Southern Mississippi IRB. The research began once the IRB approved the project. Appendix A is the approved IRB application.

The survey participants were advised three times, in writing, about their rights in research, the benefits, and the risk of harm. The first advisement of participants' rights in research occurs in the introduction letter. See Appendix B for the introduction letter. The second time was in email that announced the survey opening. Appendix C contains the email that announces the opening of the survey. The third time the participants were informed of their rights in research is in the preamble to the survey, which is located on the first page of the survey.

In the Human Subject Research Application to University of Southern Mississippi's IRB, the researcher requested a waiver of documented consent for the following reasons:

1. The only link between the researcher and the participant would be the consent form.

2. This research concerns non-competitive, non-sensitive, non-personal workforce data reported by the human resources personnel of an EMS agency.

3. The research does not manipulate human subjects.

Causal-Comparative Design

For this study, the causal-comparative research design is used to examine the relationships between the independent and dependent variables (Salkind, 2010) by comparing groups that were formed by corporate activities that preceded this research (Gay, Mills, & Airasian, 2009). This design examines phenomenon without manipulating the variables or groups (Salkind, 2010; Swanson & Holton, 2005). According to Johnson (2001), the causal-comparative research design is a non-experimental design, but with a comparison group. Many researchers consider causal-comparative design as the superior non-experimental design because of the use of a comparison group (Gay et al., 2009; Johnson, 2001). Studnek et al. (2011) identified a limitation of their study as the absence of a control group.

The research group formation for this study occurred prior to the research (Gay et al., 2009; Salkind, 2010). In this study, the groups were determined by the type of stretcher system used by the EMS agencies and not by random assignment (Gay et al., 2009; Shadish et al., 2002; Swanson & Holton, 2005). There are three possible levels (groups) of the independent variable in this study: EMS agencies that use manual stretchers only, EMS agencies that use hydraulic stretchers only, and EMS agencies that use a combination of the two types of stretcher systems.

Similar to experimental designs, the causal-comparative research design investigates causal connection by comparing two or more groups (Gay et al., 2009; Salkind, 2010; Swanson & Holton, 2005). This design investigates if the independent variables influence the dependent variables (Gay et al., 2009; Salkind, 2010). This

research collects workforce data from EMS agencies and compares the data by stretcher systems.

The participants in this study were asked to provide workforce information from the previous 12 months as did Patterson et al. (2010). The causal-comparative design is a retrospective approach for studying relationships between independent and dependent variables (Shadish et al., 2002; Salkind, 2010). This study retrospectively examines the workforce consequences of previous capital equipment decisions made prior to the research.

Regardless of the analytical methods used, causal-comparative research does not imply causation, only causal connection (Gay et al., 2009); it will not determine that "true cause-and-effect relationship occurred between the variables" (Salkind, 2010, p. 125). Because of the retrospective nature of the causal-comparative research, it can be difficult to distinguish the cause and effect, or which came first (Gay et al., 2009). However, this design is useful to determine if further, more in-depth, or more expensive research is warranted (Gay et al., 2009; Salkind, 2010). This design is especially useful when other methods are not practical (Salkind, 2010) because of time, cost, ethical concerns (Gay et al., 2009), impracticality, or impossible to manipulate dependent variables such as race, gender, socioeconomics, and educational level (Gay et al., 2009; Salkind, 2010). This study used a causal-comparative design because the groups were formed prior to the research by equipment purchases of stretchers made in the EMS agencies.

<center>Data Collection and Instrumentation</center>

Data collection methods in the causal-comparative design do not differ from other research designs (Salkind, 2010). The researcher developed an original survey to collect

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the needed data from each EMS agency. Although the survey represents an original

instrument, typical demographic survey questions are included and can be found on many

EMS surveys as seen in the exhibits of the *EMS Workforce for the 21st Century, A*

National Assessment (NHTSA, 2008).

The survey contains fourteen questions concerning the number and types of

stretchers, the number of employees, the number of women employees, the age of

employees, and the number of employment turnovers. The survey can be seen in

Appendix D The survey will be provided to participants electronically.

The questions on the survey that are unique to this study are a) the number of

distinct types of stretchers used by EMS agencies, b) service area designation as rural or

urban, and c) the annual number of ambulance responses. The survey collects

estimations about the workforce metrics such as the number of employees, the number

of women employees, the number of employment terminations, length of employment

tenure, and the age of the employees. Because the questions ask for the participants'

estimation, each answer to questions 3 through 14 of the survey will be adjusted by the

level of confidence (rate) of the participant. Questions 3 through 14 of the survey will

be multiplied by the participants' confidence level for the estimations provided as an

adjustment. Vance (2010) states that estimations are used extensively in business as a

method of logical judgments about retrospective information. The technique used to

provide an error adjustment to the estimate by level of confidence is like a technique

used in the Phillips' ROI Methodology to isolate for effect (Phillips & Phillips, 2007).

Each section of the survey contains simple directions, definitions, and examples

when appropriate. The format of the questions on the survey is uniform in construction

and display as recommended by Dillman, Smyth, and Christian, (2014) and Fink (2011).

The researcher is careful to ensure that the visual display of the electronic survey is

similar in appearance across electronic response devices (Dillman et al., 2014). The

survey was aligned to the survey objectives of the study.

Survey Validity

The validity of the survey emanates from the construction (Dillman et al., 2014;

Roberts, 2010; Salkind, 2010; Shadish et al., 2002; Swanson & Holton, 2005). The

review of the survey by an expert panel enhanced the validity of the survey instrument

(Roberts, 2010). An expert panel consisting of three EMS educators, three EMS agency

owners/operators or managers, and a data analyst experienced with survey and

instrumentation reviewed this survey instrument. The expert panel examined the survey

for the alignment between research objectives and survey questions and for face validity

in terms of clarity of instructions/questions, readability, length, process, and details

(Roberts, 2010). The evaluation by the expert panel improved the question construction,

simplicity, and clarity to best extrapolate the data needed to satisfy the research

objectives.

To make the survey easier for participants to answer as to increase the response

rate, the researcher solicited estimations about the EMS workforce. The estimations are

multiplied by the confidence level of the survey participant as an error adjustment for the

data (Phillips & Phillips, 2007; Vance, 2010). The participants of the survey fulfill the

functional role as human resource manager at the EMS agencies. The human resource

managers typically are aware of age, percentage of women employees, length of

employment tenure, and the number of employment disruptions (Greenwood, 2015).

Survey Reliability

Reliability of the survey derives from a pilot testing of the instrument (Roberts, 2010). After modifying the survey based on the expert panel appraisal, the researcher pilot tested the survey instrument in two Mississippi EMS agencies. The agencies are EMServ located in Laurel, MS, ASAP Ambulance Service that has many locations in south-central Mississippi. This pilot group represents a broad spectrum of EMS agencies: large and small, urban and rural, and hospital based and private EMS agencies. Feedback from the pilot study improved the survey and procedures to ensure simplicity of instructions, uniformity of question design, clarity of questions, face validity, reliability, and the electronic research procedures. A questionnaire was administered to participants following the pilot test. The information from the questionnaire was used to improve the survey content, survey construction, instructions, and process. Changes that were implemented because of feedback from the pilot study questionnaire included the name of the survey, construction of questions 2, 10, and 11, and disaggregating the answer to question 14 into two types of ambulance calls. Appendix E contains the post-pilot questionnaire that was adapted for this study from Schultz (2008) as published in Roberts (2010).

Data Collection Process

Following the University of Southern Mississippi's IRB approval, the data collection process began. The first day of the research involved the expert panel review of the survey instrument. In a meeting held at Jones County Junior College, the expert panel consisting of three EMS educators, three EMS agency owners/operators or managers, and a data analyst experienced with survey and instrumentation reviewed this

survey instrument. Corrections were made to the instrument based on the expert panel's

recommendation. The corrections involved changing the name of the survey, some word

choices, clarity of directions, and separating the annual number of calls into transport and

non-transport categories. After the corrections to the survey instrument were made, a

pilot of the survey was conducted. The survey was administered to three EMS agencies to

test the survey instrument and the online process. The follow-up survey was administered

to collect the participants' perceptions about the clarity of the questions and instruction

and the survey process. There were no identified problems.

The first contact with the participants was a personalized, invitation letter that

invited the EMS agency representative to participate in the study. The invitation letter

was sent by U.S. Postal Services. Addresses to the EMS agencies were obtained from a

list of the licensed EMS agencies from each State's Bureau of EMS. The invitation letter

explained the significance of the study and how the results could be used. The invitation

letter contained all the assurances of ethical research such as the rights of participants in

research, termination of participation without reprisal, and the protection of data. The

invitation letter is found in Appendix B.

The letter of invitation described the needed data. The early notification of the

data was an attempt to give the participants adequate time to understand and compile the

requested data. The letter of invitations gave the participants the opportunity to correct

the email addresses or change the point of contact before the survey opened. Four

participants corrected email addresses.

One week after mailing the invitation letter, the researcher sent an email to the

participants announcing the opening of the survey and a link to the online survey. The

researcher had easy access to the data collection services through his employer. The expert committee thought that an online survey would be convenient for participants to use. Additionally, the data files were converted to an Excel spreadsheet and downloaded into SPSS® (Black, 2014).

As recommended by Dillman, Smyth, and Christian (2014), emails were sent to the participants in the morning, so the survey was available on the first workday. A week after the survey opened, a reminder email was sent. The email contained a header as a reminder of the survey title and intent (Dillman et al., 2014). Appendix F contains the reminder email. The week after the reminder email was sent, 174-follow-up phone calls were made to the contact person among the non-respondents. Approximately 50 participants were contacted by phone. A message was left for the others. Appendix G outlines the telephone protocol. Table 5 summarizes the contact procedure.

The research procedure began with an introductory letter sent by U.S. Postal Service to 232 potential participants. The next week, an email was sent that notified the research group that the survey was opened. Fifteen responses were collected from this procedure and four agencies opted out of the research. After seven days, a reminder email was sent to the non-responders. Eight more responses were collected. After seven days, the researcher attempted a phone call to all the non-responders. The researcher talked with 65 contacts from the research group of out 191 nonresponding EMS Agencies. The phone calls resulted in 33 more results collected. Table 5 below recounts the data collection activities.

Table 5

Data Collection Activities

Day	Event	Action	Results
1	Expert Panel Review	Intensive review of survey in terms of words, directions, instructions, intent, processes, and interpretation.	a. Clarification of words b. Separate annual number of calls into 2 categories c. Change the name of the survey
2	Pilot of Survey	Administered to 2 EMS agencies, 7 people, 7 entries	a. No problems identified
3	Letter of Introduction	232 U.S. Postal services emails	a. 4 EMS agencies wrote their responses on the letter of introduction and returned it to the researcher by U.S. Postal Service. b. The researcher added the information to the collector and added responders name in the data base for the incentives
7	Notification of opening of survey	Email to researcher group	• 156 sent • 10 emails bounced; addresses corrected and resent. • 15 responses collected
14	Reminder	Email sent to research group	• 12 responses collected
21-28	Phone Calls	Attempted phone contact with EMS agency representative	• 65 conversations out of 191 calls attempted • 21 responses collected

Table 5 *(continued)*

Day	Event	Action	Results
	Researcher learns that emails were sorted into spam folders	Email sent from researcher's education email account	• 101 additional email sent • 2 responses collected.
35	End of Research	Thank you notes	• 54 total responses collected
42	Awarding of Incentives	Eight participants randomly selected for $25 gift cards incentive	• Email notification

During the phone calls, the researcher learned from four participants that the emails sent by SurveyMonkey® had been directed into the recipients' email spam folder. The researcher, upon permission of the Committee Chairman, sent an additional individual email from the researcher's university email account to avoid the email spam collectors. This resulted in four more results. Appendix H displays the additional email. Also, four participants mailed their responses to the researcher. These responses were entered into the data collection system. The participants' names were added in the data collection system for inclusion in the incentive drawing for eight $25 Amazon gift cards. In total, 54 (23%) responses were collected from 232 solicitations.

In the two weeks following the closure of the data collection, the data analysis occurred. The survey ended on day 35 of the study. After the conclusion of the data collection, the researcher sent thank you notes to the participants. The thank you emails contained a hyperlink for the participants to participate in a random drawing for one of eight $25 Amazon® gift cards. The recipients were randomly selected. The recipients

received incentives via email. Data analysis was completed next. Refer to Table 6 for the data collection plan.

Table 6

Data Collection Plan

Required Action	Time Frame
University of Southern Mississippi IRB approval	
Pilot of Survey	Day 1
Corrections of survey and procedures	Day 4
Pre-survey contact with an invitation by U.S. postal letter	Day 7
Study opens: Email contact with survey link	Day 14
First electronic reminder to complete survey	Day 21
Telephone call follow-up to non-respondents	Day 28
Survey Closes- Thank you notes to participants	Day 35
Download Data from SurveyMonkey® to SPSS®	Day 36
Data Analysis	Day 36-42

Data Analysis

The following is a discussion of the process of analyzing the data in this study. Research Objective One was analyzed with descriptive statistics to disaggregate the demographic details and the granular reasons for employment disruption of the study groups. For Research Objective Two, the Multivariate Analysis of Covariance (MANCOVA) was used to test the association of stretcher systems and recruitment, retention, and turnover.

The MANCOVA examines the average differences between the independent and dependent variables of this study. The dependent variables for this study are percentage of women employees, average age of the workforce, average length of employment tenure, and turnover rates. The independent variable is the type of stretcher system used by the EMS service that the respondent represents. There are potentially three levels or

groups of the independent variable: level 0 corresponds to EMS services that use only

manual stretchers, level 1 corresponds to EMS services that use only hydraulic

stretchers, and level 2 corresponds to EMS services that use a mixture of manual and

hydraulic stretchers. The annual number of ambulance responses is the interval covariate

in the MANCOVA for this study.

MANCOVA

The MANCOVA is an appropriate statistical test to pair with the causal-

comparative design (Garg & Kapellusch, 2012; Gay et al., 2009). According to Swanson

and Holton (2005), MANCOVAs are appropriate when the research intent is to compare

multiple group averages. The MANCOVA is appropriate for this study because there is

one categorical independent variable with three levels, one interval covariate, and four

dependent variables (Gay et al., 2009). Using one larger statistical test, as opposed to

several smaller tests to examine differences among groups, decreases the probability of

Type I statistical error (Gay et al., 2009). The MANCOVA compares the differences

among the groups (Sprinthall, 2012) after removing the influence that the covariate has

on the dependent variable (Huck, 2012). The results yield valuable information about

causal relationships among the variables (Salkind, 2010) and the likelihood that the

results occurred by chance (Statistic Solutions, 2013). From the results of the

MANCOVA, the researcher will make inferences concerning how different stretcher

systems (independent variable) influence the EMS workforce concerning the dependent

variables recruitment (the percentage of women employees), retention (average age of

employees and average length of employment tenure), and turnover of the workforce

(employment disruptions), after removing the effect of the annual number of ambulance

calls (covariate). These tests provide an estimate of how the research groups would perform if each group had equal averages on the control variable (Huck, 2012). Additionally, because the MANCOVA increases the sensitivity of the F-test by considering the relationship between the dependent variables (sum of cross products and matrices of variances), the consequences of assumption violations to the statistical test is reduced (Field, 2009; Sprinthall, 2012). However, violations to assumptions are not acceptable and should be mitigated (Shadish, et al., 2002). Covariate use reduces the probability of type II error and removes the variance that is caused by extraneous variables (Field, 2009; Gay et al., 2009; Huck, 2012).

MANCOVA Assumptions

To conduct the MANCOVA, many data preconditions must be met to ensure accuracy of the output (Field, 2009; Mayers, 2013). Following is a brief discussion of the assumptions of the MANCOVA and the implications related to this study.

Random samples from the population. The complexity of the MANCOVA requires a large data set (Gay et al., 2009). This research uses a census of ground transport EMS services in Arkansas, Louisiana, and Mississippi instead of random sample; this constitutes a violation of the MANCOVA assumption. Huck (2012) suggests cautious interpretation of results when random sampling is not used. Random assignment is the best method of guaranteeing that the statistical inferences are valid (Huck, 2012; Shadish et al., 2002). When groups are pre-formed and randomization is not possible, the MANCOVA is a commonly used statistical instrument, especially in education (Gay et al., 2009). The use of the MANCOVA is equivalent to matching the

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sample groups (Gay et al., 2009). The use of a covariate helps to control for extraneous variances, but it does not fix the lack of random assignment (Huck, 2012).

The lack of random sample in this study necessitates increasing the power of the statistical test to reduce within-group variance (Gay et al., 2009). Therefore, the researcher invited all EMS agencies that meet the selection criteria of this study in Arkansas, Louisiana, and Mississippi to participate in this study. Besides increasing the number of participants in the group, these states are similar in terms of health disparities, obesity rates, certification/licenses levels of the EMS professionals, and the rurality of the states. According to Raosoft.com, 145 responses will ensure a 95% confidence interval with a 5% alpha (Sample size calculator, 2015).

Independence of observations (Huck, 2012). The dependent variable data and the covariate should be independent of each other. (Field, 2009). In this study, the covariate (annual number of ambulance calls) will explain some of the error variances. Neither the turnover rate, average age, average length of employment tenure, nor percentage of women employees influence each other or the annual number of ambulance calls. Therefore, the observations are independent of each other.

Multivariate normality (Huck, 2012). The dependent variables and covariate should be normally distributed for the MANCOVA (Field, 2009; Green & Salkind, 2011). A priori, the Kolmogorov-Smirnov test assesses multivariate distributions for normality (Mayers, 2013). If the Kolmogorov-Smirnov test yields non-significant results, the groups are similarly distributed (Mayers, 2013). Post Hoc, the Levene's test assesses the homogeneity of variance among the dependent variables (Mayers, 2013). If

the Levene's test yields non-significant results, the groups are similarly distributed (Field, 2009).

　　　　Homogeneity of regression slopes (Field, 2009; Green & Salkind, 2011). A priori testing of homogeneity of regression slopes occurred as part of the custom model under the general linear model in SPSS® (Green & Salkind, 2011). The null hypothesis is that there is no difference in the regression slopes between the dependent variable and the covariate. The Levene's test assessed the homogeneity of variance among the dependent variables (Mayers, 2013). If the data does not meet the assumptions, the data could be transformed to z scores, outliers could be eliminated from the set, or different statistical tests could be used ((Fields, 2009; Green & Salkind, 2011).

Data and Statistical Plans

　　　　In causal-comparative research design, researchers separate the study groups based on categorical independent variables (Salkind, 2010). The independent variable in this study is the stretcher type used by the EMS agency. There are three possible levels of the independent variable. The level determination is based on the stretcher system used by the EMS agency. This information was collected by questions twelve and thirteen of the survey. Level zero is the respondents that answer question twelve only; this corresponds to manual stretcher systems users and functions as the quasi control group. The control group in a non-experimental design is one of the benefits of the causal-comparative design (Gay et al., 2009). Level one is determined by the respondent answering question thirteen only; this corresponds to hydraulic stretchers users. EMS services that use a combination of manual and hydraulic stretchers are level two; the

respondents in level two answer both questions twelve and thirteen of the study.

As seen in Table 7, the dependent variables for this study are the percentage of women employees, the average age of the EMS workforce, average length of years employed, and the turnover rate. The annual number of ambulance calls is the covariate for this study. Detailed data alignment between objectives, survey questions, and analysis plans are displayed in Table8.

Table 7

Statistical Model

Independent Variable	Dependent Variables	Covariate
Level 0: Manual	Recruitment (the percentage of women employees)	Number of Ambulance Calls Annually
Level 1: Hydraulic		
Level 2: Combination	Retention (average age of employees and average length of employment tenure)	
	Turnover Rate (Employment disruption rates)	

Table 8

Data Analysis Plan

Research Objectives	Analysis	Variable	Scale	Role
RO1	Descriptive	Q1	Categorical	
Describe the demographic		Q2	Categorical	
characteristics of the EMS		Q3	Interval	
agencies in this study.		Q4	Interval	
		Q5	Interval	
		Q6	Interval	
		Q7	Interval	
		Q8	Interval	
		Q9	Interval	
		Q10	Interval	
		Q11	Interval	
		Q12	Interval	
		Q13	Interval	
		Q14	Interval	
RO2	MANCOVA	Q4*	Ratio	DV
Compare recruitment,		Q5*	Interval	DV
retention, and turnover		Q6*	Interval	DV
based on percentage of		(Σ	Ratio	DV
women employees, average		Q7:Q11)/Q3**	Interval	IV
age, average length of		Q12*	Interval	IV
employment tenure, and		Q13*	Interval	CV
employment disruption		Q14*		
ratios among EMS agencies				
that use hydraulic stretchers,				
manual lift stretchers, or a				
combination of stretcher				
systems.				

Note. *The answers to these questions will be multiplied by the participants' level of confidence as an error adjustment.

**Turnover rate calculation* is a product of the summation to questions 7 through 11, then divided by the number of the ambulance employees (Q3).

Validity and Reliability

The validity of this study emanates from the (a) appropriate research design, (b) the appropriate statistical methodology, (c) the correct interpretation of the results, (d) the methodical construction, evaluation, and testing of the data collection instrument, (e)

appropriate delimitations around the study group, (f) alignment of the literature review, research question, objectives, and survey questions, (g) adherence to research procedures and ethical behavior, and (h) thorough explanation of the constructs (Dillman et al., 2014; Fink, 2003; Gay et al., 2009; Huck, 2012; Roberts, 2010; Salkind, 2010; Shadish et al., 2002; Swanson & Holton, 2005). The principles described above guided the development of this study.

At this stage of the study, all of the threats to validity are difficult to identify (Shadish et al., 2002). During this study, if a threat to validity is exposed that was not identified during the inception of the project; it will be addressed by the directions from research experts' published literature as consulted by this researcher. Below is a discussion of the potential threats and mitigation.

Internal validity

For this study, internal validity requires substantiating the relationship between stretchers systems and changes is recruitment, retention, and turnover. Potential threats to establishing this relationship include history, selections, maturations, and instrumentation.

History is a potential internal validity threat in this study. New requirements for ambulance patient and personnel safety have recently been published. Although the standards do not require electronic stretchers and loading systems, the stretcher restraint system required to meet the SAE-J3027 crashworthiness standard almost necessitates an electronic stretcher (Avery et al., 2014). If all ambulance were retrofitted to accommodate this requirement, this would eliminate the manual stretcher comparison group for this study. If the level 0 independent variable group had low responses, the

researcher would have to examine available data with non-parametric instruments. However, new requirements apply to newly purchased ambulances. There were enough manual stretchers used to compose a comparison group.

Selection could be a threat to internal validity. There could be differences in the study groups that occur axillary to stretcher systems (Shadish et al., 2002). Based on the literature review, the researcher identified that the geographical location as related to call volume (Brice et al., 2012; Franks et al., 2004; SafeTech, 2011) could create extranous noise that would prevent a valid conclusion. Removing the influence of the annual number of ambulance calls (covariate) allowed the researcher to better infer (Gay et al., 2009) relationships among various stretcher systems and recruitment, retention, and turnover. The use of a covariate in the statistical test increases internal validity (Shadish et al., 2002).

Maturation is another potential threat to internal validity. The EMS environment could have changed since the inception of the study (Shadish et al., 2002). Given the change in ambulance specifications related to crashworthiness (Avery et al., 2014), the research question could no longer be revalent. Given that the new standards require safer lifing, loading, and anchoring, stretcher comparison may no longer be applicable. Given that the new regulations apply to newly purchased ambulance and the cost of electronic lift, load, and anchoring systems, there were enough manual stretchers used to compose a comparison group. As a result, the researcher did not have to use non-parametric examinations to study stretcher system effects upon the workforce.

Statistical conclusion validity

Shadish et al. (2002) defined statistical conclusion validity as the degree of certainty reached concerning the relationships between independent and dependent variables. For this study, removing the influence of the annual number of ambulance calls improves the clarity among constructs and variables. Removing the influence of the annual number of ambulance calls (covariate) will allow the researcher to make better inferences (Gay et al., 2009) about the relations among various stretcher systems and recruitment, retention, and turnover. The use of a covariate in the statistical test reduces statistical conclusion errors and increases internal validity (Shadish et al., 2002).

Low statistical power is another potential threat to statistical conclusion validity. The EMS agencies in three states were included to increase the size of the study groups. Arkansas, Louisiana, and Mississippi were chosen for research because of the empirical relationships by EMS operations, geographical region, and health disparities.

Many efforts were employed to improve the survey response rate. The efforts include the readability, personification of the survey, early notification of the needed metrics, electronic delivery, incentives to participate, participation reminders, and estimations as opposed to calculated metrics.

A potential threat to statistical conclusion validity is the violation of the random assignment assumptions of the statistical test. Although the groups for this study were formed prior to the research based on the type of stretcher used by each EMS agency, Gay et al. (2009) states that this assumption is frequently violated in educational research. The Causal-Comparative Design (non-experimental comparison group) and the use of MANCOVA (covariate) as the statistical instrument reduce the effects of the violation.

When the results of this study are reported, full disclosure will be made that the groups were naturally formed prior to the research and not randomly assigned.

Extraneous variance in the experimental setting could interfere with statistical conclusion validity (Shadish et al, 2002). Extraneous variance occurs because geographical location and financial ability of the EMS services are limited by using annual call volume as a covariate in the MANCOVA.

External Validity

EMS Human Capital Development is a very narrow field of study. It is unknown if the results of this study will be generalizable to other foci of study. The constructs are very specific such that the results may not be applicable to other practices of human capital or EMS.

To improve response rate, the survey participants were asked to provide an estimate of the percentage of women employees, average age of the workforce, average length of employment tenure, and employment disruptions frequencies. If the estimations are incorrect, then the conclusions reached concerning causal relationships are incorrect. If measured in a more specific method, the outcome could be different. Use of a covariate, a non-experimental comparison group, and an error adjustment to the estimations are used to mitigate interactions of causal relationship with outcomes (Shadish et al., 2002).

Construct Validity

The data in this study is self-reported, retrospective data, which creates mono-method bias (Shadish et al., 2002). This construct validity threat is lessened by using explicit instructions in the survey, detailed definitions, error adjustments for estimated

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data, narrow delimitations around the research parameters, and examples when necessary to make sure that the information that is reported is consistent and credible. The survey participants fulfill the role of human resource manager at each EMS agency. This position should be the most familiar with the workforce and the data solicited.

The identification of the research question, construction of the research objectives, and the appropriate identification of research variables advance the construct and face validity of the study (Dillman et al., 2014; Fink, 2003; Gay et al., 2009; Huck, 2012; Roberts, 2010; Swanson & Holton, 2005). To prevent inadequate explication of constructs (Shadish et al., 2002), an extensive literature review was conducted. The literature review exposed the knowledge gap this study addresses, the variables in this study, and the definitions of the constructs. An expert panel reviewed the research and instruments for potential construct confounding and for face validity (Shadish et al., 2002).

Limitations

This study has several potential limitations. The following is a discussion of the limitations of the study. An explanation of methods used to mitigate the limitations is discussed.

Generalization

Generalization of the results to EMS is limited because the sample of EMS agencies are from Arkansas, Louisiana, and Mississippi only. Each state is similar because of geographical location in the southeastern United States, the requirement of National Registry endorsement to function in EMS, and because of similar health disparities that confront the EMS workforce. However, it is unknown if the homogeneity

is to the extent that it allows generalization to EMS agencies in other states. This study collected workforce data from EMS agencies, which is a very narrow focus of practice. The study focused on how stretcher systems affect recruitment, retention, and turnover rate of EMS. The generalizability of the results to other areas of human capital practice require further research.

Design and Response Rates

Other potential limitations are the survey design and response rates. The original survey design by the researcher is a potential limitation (Dillman et al., 2014; Shadish et al., 2002). However, the majority of the fifteen questions on the survey are common demographic questions found on several EMS surveys (NHTSA, 2008). To lessen the limitation and improve the reliability, the survey was reviewed by an expert panel and pilot tested before it was used in the study.

Original Survey Design and The Response Rate

To mitigate problems with the original survey design and the response rate, the researcher used many of Dillman, Smyth, & Christian's (2014) and Fink's (2011) suggestions to improve the survey design, prevent inadequate response rate, and prevent statistical conclusion errors (Shadish et al., 2002). Some examples of Dillman, Smyth, & Christian's, (2014) and Fink's (2011) suggestions include question construction, contact methodologies, and survey instructions. Many techniques to reduce the non-response rate of the survey were adopted from Dillman, Smyth, & Christian's (2014). Multiple contacts, personalized correspondence, explanation of how results are used, are examples of strategies employed in this research. The response rate was 23% (54 out of 232).

Level of Confidence as an Error Adjustment

To make the survey more convenient for the respondents to answer and to increase the survey response rate, the researcher asked the survey participants to provide estimations as answers to the survey questions. The data were collected from questions one through 14 of the survey administered to a group of EMS agencies in Arkansas, Louisiana, and Mississippi. Each question of the survey asked the participant to rate his/her level of confidence for each of the estimations provided as the answer to each question. The participants' level of confidence was used as an error adjustment for the data. The adjusted data was used for the descriptive and inferential statistics. This technique was borrowed from Phillips and Phillips (2007) and Vance (2010). Some may view this technique as invalid data, but according to Phillips and Phillips (2007) and Vance (2010), this is an accepted practice in business that yields reliable results.

Lack of Random Assignment

This study did not use random assignment to select the participants. The lack of random assignment in causal-comparative research design increases the probability that the study stretcher groups may differ on a variable that will influence the results (Gay et al., 2009). Because matching or random assignment of the study groups is not possible, a covariate was used to limit the extraneous variables (Gay et al., 2009). Fields (2009) equates the use of a covariate in the statistical instrumentation to matching the study groups. Assignment to the study groups in this study is contingent on the type of stretcher system used by the EMS agency. The MANCOVA was an appropriate statistical instrument for this causal-comparative research design (Garg & Kapellusch, 2012; Gay et al., 2009). It is a common statistical instrument to use where naturally

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occurring groups preexist (Gay et al., 2009). MANCOVAs require random assignment to produce reliable results (Huck, 2012). Careful and cautious interpretation of the results (Huck, 2012) of this study is required. In this research the covariate was statistically non-significant.

Email Spam Collector

While making follow-up phone calls to remind participants to complete the survey, the researcher learned that emails generated by SurveyMonkey® were sorted into the recipients' email spam collector. This resulted in some potential participants never receiving the notification of the research project. The researcher contacted the research chair. Excluding the EMS agencies that opted out of the research, those without an email address, those that had been previously contacted by phone, and those that had already responded, the researcher sent an additional email from an educational email account. Each email was personalized and sent individually. The additional email provided a link to the survey and explained the circumstances. This is a limitation because many potential participants may have been inadvertently omitted.

<div align="center">Chapter Summary</div>

This study used a causal-comparative research design to examine the relationships between the independent and dependent variables (Salkind, 2010) by comparing groups that were formed prior to the research (Gay et al., 2009). There were 232 EMS agencies solicited to participate in this study.

The researcher received approval to conduct this study from The University of Southern Mississippi's Institutional Research Board. After approval, a panel of experts was assembled to review the survey instrument. After the corrections were adopted, a

pilot study was conducted to test the instrument and the processes. A letter of introduction was sent to EMS agencies in Arkansas, Louisiana, and Mississippi followed by an email that provided access to the survey. Chapter IV contains the statistical analysis of the survey results. Chapter V provides the researcher's interpretation of results.

The research procedure began with an introductory letter sent by U.S. Postal Service to 232 potential participants. The next week, an email was sent that notified the research group that the survey was opened. After seven days, a reminder email was sent requesting participation in the survey. After seven days, the researcher called all the non-responders by telephone. The researcher talked with 65 representatives in the research group of out 191 EMS Agencies. During the phone calls, the researcher learned from four participants that the emails sent by the online survey had been directed into the recipients' email spam folder. An additional email was sent to from the researcher's university email account to avoid the email spam collectors. In total, 54 (22.8%) responses were collect from 232 solicitations.

A MANCOVA was conducted in SPSS® version 20, to examine the differences among EMS agencies that use hydraulic stretchers, manual stretchers, or a combination of each stretcher type. To control extraneous influences, the annual number of ambulance calls was used as the covariate in the statistical analysis (Sprinthall, 2012). The results of the statistical analysis are contained in Chapter IV. The findings, conclusions, and recommendations are discussed in Chapter V.

CHAPTER IV – RESULTS

EMS is an essential element of the healthcare system of the United States. As the

population in the United States grows older and health disparities increase, there is a

predicted increase in demand for EMS (NHTSA, 2008; NHTSA, 2011). Many EMS

employers experience difficulties with recruitment, retention, and turnover of the EMS

workforce (Brown, Dawson, & Levine, 2003; Franks et al., 2004; Patterson & Yonas,

2007; Patterson et al., 2010). To prepare for the future demands of EMS and to meet the

current staffing demands, it is important to protect and promote EMS (NHTSA, 2008;

NHTSA, 2011). This research project investigates how different stretcher systems impact

EMS recruitment, retention, and turnover rates. This study compared the recruitment,

retention, and turnover rates among EMS agencies that use manual, hydraulic, or a

combination of the stretchers. The study results will improve the understanding of how

stretcher systems impact EMS employment issues.

Demographic Characteristics

Research Objective One requires a description of the EMS agencies that

participated in the survey. The EMS agencies were classified as urban or rural. The

frequencies of ambulance employees, the percentage of females, average age, and the

length of employment tenure are presented. Tables 9 through 15 display the

demographic information of the EMS agencies that participated in this study.

Classification of Service Region of EMS agencies

There were 54 responses to the survey which represent 27 EMS agencies in

Arkansas, 7 in Louisiana, and 20 in Mississippi. Most of the respondents in this study (*n*

= 38) classified the EMS agencies as rural services. This finding is consistent with the

FICEMS (2012) statement that the majority of all EMS agencies are rural, although the

majority of EMS events occur in the urban areas. In this study, 16 (30%) of the EMS

agencies classified themselves as urban services. Franks et al. (2004), McGinnis (2004),

and Russ-Eft and Levine (2012) concluded that recruitment and retention was particularly

problematic for rural services. Table 9 displays the EMS agencies by the residing state

with the frequencies and percentages of urban and rural services.

Table 9

Classification of Service Region of EMS agencies

	Urban Services		Rural Services		Total	
State	Frequency	%	Frequency	%	Frequency	%
Arkansas	9	33.30	18	66.70	27	50.00
Louisiana	3	42.90	4	57.10	7	13.00
Mississippi	4	20.00	16	80.00	20	37.00
Totals	16	29.62	38	70.38	54	100.00

Note. As an error adjustment, all frequencies reported in this table has been adjusted by the confidence level of the participant. All

frequencies are rounded to the next whole number.

Workforce Size

The respondents to the survey reported a total of 3,349 employees for 54 EMS

agencies. This is an average of 62 employees per service. Women employees accounted

for 26% (861) of the EMS workforce in this research group. Mississippi EMS agencies

reported the highest percentage of women employees (27.81%) and the highest

frequencies of women (403) in the workforce. Louisiana EMS agencies reported the

lowest percentage (20.89%) and frequency of women (76). It should be noted that there

were only seven Louisiana EMS agencies that participated in this study. Table 10

disaggregates the total number of employees by state into the frequencies and

percentages.

Table 10

Demographic Descriptive Statistics: Number of Employees

State	Number EMS Agencies Participating	Number of Employees	Average number of Employees	Number of Female Employees	Percentage of Females
Arkansas	27	1540	57	382	24.80%
Louisiana	7	362	52	76	20.89%
Mississippi	20	1447	72	403	27.81%
Group Totals	54	3349	62	861	25.76%

Note. As an error adjustment, all frequencies reported in this table has been adjusted by the confidence level of the participant.

Age of Employees

The average age of the EMS workforce in this study is approximately 33 years

old. This compares to the LEADS II Survey findings that the average age of the

registered medics as 32 years old (NREMT, 2014). The Arkansas EMS agencies had the

oldest average age of 34 years old. The Mississippi EMS agencies reported the youngest

average age at 31.64. Table 11 disaggregates the average ages by state, range, and

standard deviation of the research group.

Table 11

Demographic Descriptive Statistics: Age of employees

Age of Employees	Average	*SD*	Min	Max
Arkansas	34.01	7.11	30.00	60.00
Louisiana	32.10	5.23	25.50	38.80
Mississippi	31.64	6.17	22.14	45.00
Research Group	32.90	6.55	22.14	60.00

Note. As an error adjustment, all frequencies reported in this table has been adjusted by the confidence level of the participant.

Length of Employment Tenure

Among the 54 EMS agencies in this research, 7.94 years was the average length of employment tenure of medics. The tenure ranged from a minimum of 0.43 years to 20 years as the maximum. The average tenure in this study was a shorter tenure as compared to the 2011 National Assessment of EMS which reported the mean tenure as 11.2 years for Paramedics and 9.8 years for EMT-Basics. The Arkansas EMS agencies had an average employment tenure of 8.44 years. The Louisiana EMS agencies had the longest average employment tenure of 9.27 years. The Mississippi EMS agencies reported the shortest employment tenure of 6.8 years. Table 12 displays the average tenure for the research group disaggregated by state.

Table 12

Demographic Descriptive Statistics: Length of Employment Tenure

State	Average	*SD*	Min	Max
Arkansas	8.44	4.61	1.40	20.00
Louisiana	9.27	1.85	6.30	12.00
Mississippi	6.80	3.31	0.43	12.75
Total Group	7.94	3.95	0.43	20.00

Employment Disruptions and Turnover Rate

To study employment turnover, the survey collected (a) the number of non-voluntary employment terminations, (b) the number of voluntary employment resignations, (c) the number of retirements, (d) the number of employees disabled from work, and (e) the number of employee deaths. The data were used to calculate the EMS employment turnover rate for the previous 12 months.

The aggragated turnover ratio was calculated by totaling the responses of questions 7 through 11 of the survey. To compute the turnover rate, the sum of employment disruptions was divided by the number of total ambulance personnel. The numerators, denominators, and method of calculation are refined from Patterson et al. (2010) and NHTSA (2008). The mathematical operation is the same, but more descriptive details for turnover rates were collected.

The research group reported 401 total employment disruptions. This is a turnover rate of 12% for the research group. This compares to Paterson et al. (2010) findings of a 10.7% turnover rate of their study group. The EMS agencies from Louisiana had the lowest turnover at 9%. The EMS agencies from Mississippi in the research group reported the highest turnover at 15%.

Resignations accounted for most of the employment turnover (227) in the research group. Deaths were the least common cause (6) of employment turnover. The turnover frequencies and rates for the different causes of employment disruptions are reported in Table 13.

Table 13

Frequencies of Employment Disruptions and Turnover Rate

State	Involuntary Termination	Resign	Retire	Disable	Death	Total Disruptions*	Turnover Rate**
Arkansas	45	85	11	5	2	148	10%
Louisiana	3	15	13	1	0	32	9%
Mississippi	78	127	3	9	4	221	15%
Total	126	227	27	15	6	401	12%

Note. All data reported in this table has been adjusted by the confidence level of the participant. Frequencies are rounded to the nearest whole number. *Involuntary Termination + Resigned + Retired + Disabled + Died = Total Disruptions. **(Total Disruptions / Total number of ambulance employees in study) X 100.

Number of Stretchers

This research group reported the use of 140 (23%) manual stretchers and 468 (77%) hydraulic stretchers. Disaggregated by level of independent variable, there were 8 EMS agencies that used manual stretchers exclusively. Most EMS agencies (27) used hydraulic stretchers exclusively. Nineteen of the EMS agencies used a combination of manual and hydraulic stretchers. Disaggregated by state, Arkansas reported the use of 79 manual stretchers and 214 hydraulic stretchers; which is the most hydraulic and manual stretchers in the research group. The Louisiana EMS agencies reported the use of one manual stretcher, which is the least of the research group. The Mississippi EMS agencies reported 60 manual stretchers and 199 hydraulic stretchers. Table 14 displays the frequencies and percentages of the types of stretchers used in the total research group and by state.

Table 14

Demographic Descriptive Statistics: Number of stretchers

	Manual Stretchers		Hydraulic Stretchers		
State	Frequency	Percentage	Frequency	Percentage	Total
Arkansas	79	27.08	214	72.91	293
Louisiana	1	1.78	55	98.21	56
Mississippi	60	23.15	199	76.84	259
Group Total	140	23.08	468	76.91	608

Note. All data reported in this table has been adjusted by the confidence level of the participant.

Annual Number of Ambulance Calls

External conditions that confound the study's scope may affect the outcome (Sprinthall, 2012). The profitability of an EMS agency influences many occupational factors such as the salary of the medics, contemporary equipment, robust education policies, career ladders, recruitment incentives, and retention strategies (SafeTech,

2011). An EMS agency's revenue is related to the financial reimbursement it receives

for the number of ambulance responses provided (SafeTech, 2011). Generally, the more

ambulance calls an EMS agency performs, the more revenue generated. Rural EMS

agencies do not perform as many ambulance responses as urban EMS agencies

(SafeTech, 2011). In this study, the annual number of ambulance responses per service

could skew the results (Franks et al., 2004) because of the financial ability of an EMS

agency (SafeTech, 2011) to afford hydraulic stretchers (Brice et al., 2012). Therefore,

the annual number of ambulance calls was used as a covariate in the statistical test to

mitigate revenue inequities among the EMS agencies. Use of a covariate in this study

should provide a clearer picture of the influence that the types of stretchers have on

recruitment, retention, and turnover in EMS.

Survey question 14 collected the annual number of ambulance responses.

Adjusting the averages of the dependent variables by the covariate should reduce the

probability of a Type II error, increase the power of the procedure, and control for

extraneous variables (Huck, 2012). Maguire et al. (2005) performed a similar adjustment

in their research. David and Brachet (2009) used the number of hours worked at an EMS

agency as a covariate in their study of paramedic experience and on-scene times. They

accounted for the amount of hours worked by the medic when they calculated the injury

rate per 100 full-time equivalents instead of a ratio of injuries per workers. Although not

used as a covariate, Fredericks et al. (2009) statistically adjusted their results on a per

ambulance call volume to understand expense related to stretcher-related OAIs.

The expert panel that reviewed the survey in the validation process asked that

question 14 be disaggragated into transport and nontransport data. Ambulance calls that

transport a patient are called transport ambulance calls. Ambulance calls that are canceled or the patient refuses treatment/transportation are nontransports. Nontransports represent an unreimbursed drain of resources from the EMS agencies.

The total number of ambulance calls reported for the research group was 571,058. This number is dissaggrated into transports of 384,475 (67.32%) and non-transports of 186,563 (32.66%). The EMS agencies from Mississippi in the research group reported the highest percentage of transports (71.59%) and the lowest percentage of non-transports (28.40%).

Table 15 displays the descriptive information from question 14 of the *EMS Stretcher Systems* survey, found in Appendix D.   More details concerning the grouping of the EMS agencies by the stretcher type is discussed in the next section. More details concerning the significance of the covariate as a part of the MANCOVA in RO2 are discussed later in this chapter.

Table 15

Covariate Table: Annual Number of Ambulance Calls

| State | Non-Transports | | Transports | | |
	Frequencies	Percentage	Frequencies	Percentage	Total
Arkansas	67,335	37.68	111,322	62.30	178,677
Louisiana	35,544	36.37	62,177	63.62	97,721
Mississippi	83,684	28.40	210,976	71.59	294,660
Group Total	186,563	32.66	384,475	67.32	571,058

Note. All data reported in this table has been adjusted by the confidence level of the participant.

Assumptions Testing

When data preconditions or assumptions are violated, the statistical results and conclusions can be flawed (Field, 2009; Mayers, 2013). In this study, the data

preconditions were tested to ensure the accuracy of the statistical output (Field, 2009; Mayers, 2013). The following is a discussion of the assumptions of the MANCOVA and the implications related to this study.

Equality of Covariance Matrices

One assumption for the MANCOVA is that the covariances of the groups are equal (Field, 2009). In this study, Box's test was used to evaluate the equality of covariance matrices, essentially testing the homogeneity assumptions. This test assesses if the variances of the covariate and the dependent variables are the same for all levels of the independent variable (Green & Salkind, 2011). If the results of the Box's test are not significant ($p > 0.001$) (Mayers, 2013), no differences were found and homogeneity is assumed (Green & Salkind, 2011; Mayers, 2013). If the test is significant ($p < 0.001$), equality of variances and covariance among the dependent variables in the levels of the independent variable is rejected (Mayers, 2013). The conclusions of the MANCOVA will not be valid if the assumptions of homogeneity are violated. The results of the Box's test are displayed in Table 16. Box's results in this study yield a non-significant result of $p = 0.024$ which exceeds $p = 0.001$ (Mayers, 2013). Therefore, the null hypothesis of no difference is accepted. It is assumed that there is equality of covariance matrices.

Table 16

Box's Test of Equality of Covariance Matrices

Test	Results
Box's M	41.35
F	1.72
df1	20.00
df2	1740.61
Sig.	0.02

Note. Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

Random Sampling from the Population

One assumption for the MANCOVA is that the study groups are randomly formed (Field, 2009). This research uses a census of ground transport EMS services in Arkansas, Louisiana, and Mississippi instead of random sampling. This is a potential violation of the MANCOVA assumption. The use of a covariate helps to control for extraneous variances, but it does not remedy the lack of random assignment (Huck, 2012). Huck (2012) suggests cautious interpretation of results when random sampling is not used. When groups are pre-formed and randomization is not possible, as in this research, the MANCOVA is a commonly used statistical instrument (Gay et al., 2009). The MANCOVA is equivalent to matching the sample groups (Gay et al., 2009).

Independence of Observations

Another assumption for the MANCOVA is the independence of observations (Field, 2009). The observations in this study are independent of each other because the dependent variables provide no information about the occurrence of the other variables in the study (Huck, 2012). A connection does not exist between the variables. The data were collected at one point in time and not over a continuum, therefore each observation is measured only once (Field, 2009). Neither the turnover rate, average age, average length of employment tenure, percentage of women employees, or the annual number of ambulance calls influence each other. Therefore, the observations are independent of each other and the assumption of independence of observation is assumed.

Homogeneity of Regression Slopes

An assumption of the MANCOVA is homogeneity of regression slopes. Testing is required to assure that the statistical results are not flawed. A priori testing of the homogeneity of regression slopes occurred as part of a custom model ANOVA that was conducted on the interaction term of independent variable and covariate (Green & Salkind, 2011). The null hypothesis for this testing is that no differences exist in the regression slopes between the independent variable and the covariate. The results are Wilks' $\Lambda = 0.925$, $F = 0.464$, and $p = 0.879$. It is concluded that there is homogeneity of regression slopes between the independent variable and the covariate. Table 17 displays the results of the Multivariate test on the interaction of IV and CV.

Table 17

Multivariate Tests on the Interaction of IV and CV

Independent Variables	Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	Wilks' Lambda	.041	277.890[b]	4.000	47.000	.000
Total Ambulance Calls	Wilks' Lambda	.937	.789[b]	4.000	47.000	.538
Stretcher groups	Wilks' Lambda	.925	.464[b]	8.000	94.000	.879

Note. a. Design: Intercept + TotalCallsAdj + Group * TotalCallsAdj. b. Exact statistic. c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Post Hoc, a Levene's test was conducted to determine the homogeneity of variance among the dependent variables (Mayers, 2013). If the Levene's test yields non-significant results with a p value exceeding 0.05, homogeneity of variance among the dependent variables is assumed and the MANCOVA results are reliable (Fields, 2009). If the Levene's test yields significant results with a p value under 0.05, homogeneity of variance is not assumed. All the tests for the dependent variable yielded non-significant results. Therefore, the assumption of homogeneity of variance among the dependent

variables is assumed. The Levene's test for each dependent variable is contained in Table 18 below.

Table 18

Levene's Test of Equality of Error Variances

Dependent Variables	*F*	*df*1	*df*2	Sig.
Age	2.389	2	51	0.102
Tenure	1.833	2	51	0.170
Turnover Rate	.802	2	51	0.454
Female Rate	.762	2	51	0.472

Note. Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Design: Intercept + Total Calls + Group

Relationship Between the Variables

Research Objective 2 sought to determine the relationship between the independent and dependent variables in this study by using a MANCOVA statistical test. The dependent variables of this study are recruitment (the percentage of women employees and the average age of the EMS workforce), retention (the average length of EMS employment tenure), and EMS turnover rates (the rate of employment disruptions).

The independent variable is the type of stretcher system used by the EMS services in the research group. There are three levels of the independent variable in this study. Level 0 included 8 EMS services that use only manual stretchers. Level 1 included 27 EMS services that use only hydraulic stretchers. Level 2 included 19 EMS services that use a combination of manual and hydraulic stretchers.

Recruitment by Percentage of Women Employees

An essential variable in this study is the female employee ratio among EMS agencies that use manual stretchers, hydraulic stretchers, or a combination of the two stretcher systems. To gain an understanding of recruitment issues in EMS, Research Objective Two includes the percentage of women ambulance employees among the EMS agencies that responded to the survey. The stretcher system related to the highest percentage of women employees represents the stretcher system associated with fewer recruitment difficulties in EMS. This study found that the hydraulic stretcher did not influence the percentage of women employees. Of the women in this study group, 51 worked at one of the eight EMS agencies that used a manual stretcher exclusively, 524 worked at one of the 27 EMS agencies that used a hydraulic stretcher exclusively, and 285 worked at one of the 19 EMS agencies that used a combination of manual and automatic stretcher.

Retention by Average Age

To gain an understanding of retention issues in EMS, Research Objective Two includes average age measures. Survey question 5 collected the estimated average age of the workforce at each EMS agency that participated in the study. A comparison of average age among EMS agencies that use manual, hydraulic, or a combination of those stretchers was conducted. The stretcher system that is related to the oldest average age of employees represents the stretcher system associated with fewer retention issues.

This study found that the hydraulic stretcher did not influence the age of the EMS workforce; statistical non-significance was found among the stretcher systems in this group. The average age of the research group was 32.88 years old. The average age of

medics employed with a service that used manual stretchers only (stretcher group 0) was

35.43. The average age of medics employed with a service that used hydraulic stretchers

only (stretcher group 1) was 32.88. The average age of medics employed with a service

that used a combination of manual stretchers and hydraulic stretchers (stretcher group 2)

was 31.81. This compares to 2014 LEADS Survey Update from NREMT, which reported

the average age of the EMS workforce as 32 years. The age of the EMS workforce in this

study is similar to reports from NREMT (2014).

Retention by Average Length of Employment Tenure

To gain insight into retention issues in EMS, this study collected the average

length of employment. A comparison based on manual stretchers, hydraulic stretchers, or

a combination of the two stretcher systems was made among the EMS agencies. The

stretcher system related to the longest length of employment tenure represents the

stretcher system associated with fewer retention difficulties in EMS.

Longer employment tenures create greater accumulations of human capital

(Akinyemi & Abiddin, 2013; Becker, 1993; Wang & Swanson, 2008). Longer

employment tenures promote the accumulation of more clinical experience (David &

Brachet; 2009). Clinical experience is essential for prehospital performance (David &

Bachet, 2009).

Among the EMS agencies participating in this study, the average length of

employment tenure was 7.94 years. This finding is similar to the report from David and

Brachet (2009) of the average length of employment tenure for paramedics as 7.3 years

among private EMS agencies. The stretcher group that had the longest employment

tenure of 9.13 years was the manual stretcher only group. The hydraulic stretcher only

group had a 7.36 years employment tenure. The combination of manual and hydraulic

stretcher group had an average tenure of 8.27 years. The EMS agencies from Louisiana

reported the longest EMS tenure among the participating agencies at 9.27 years. It is

interesting to note that Louisiana had the most fire department-based EMS agencies in

the research group. Russ-Eft and Levine (2012) reported that fire-based EMS agencies

experience the longest employment tenures. David and Brachet (2009) found the average

length of employment tenure among fire-based EMS agencies as 10.8 years. The EMS

agencies from Mississippi reported the shortest average employment tenure among the

participating EMS agency at 6.8 years. Among the research group Mississippi had the

highest ambulance call volume and the lowest length of tenure.

Turnover Rate by Employment Disruptions

In pursuit of an answer to the research question for this study, Research Objective

Two concerns measures of employment turnover rate. The aggregated turnover rate was

calculated as part of Research Objective One then used in the MANCOVA test. A

comparison was made of the dependent variable of turnover rate based on the levels of

stretcher systems. The stretcher system related to the lowest employment turnover rate

represents the stretcher system associated with fewer turnover difficulties in EMS.

There were 401 employment disruptions in this study. The employment

disruptions were classified as involuntary terminations (126), resignations (227),

retirement (27), disability (15), and death (6). The turnover rate for the manual stretcher

group was 9%, the hydraulic stretcher groups was 13%, and the combination of manual

and hydraulic stretcher group was 12%. Arkansas' turnover rate was 10%. Louisiana's,

with the most fire-based EMS agencies in the study and the most retirements at 13, had

the lowest turnover rate among the participating EMS agencies at 9%. Russ-Eft and Levine (2012) reported that fire-based EMS agencies had lower turnovers in their study. The Mississippi EMS agencies' turnover rate was the highest among the participating EMS agencies at 15%. Mississippi had the fewest retirements out of the research group (3), the most resignations (127), and the most involuntary terminations (78) out of the research group.

The total research group had a turnover rate of 12% as compared to the finding of 10.7% turnover annually by Patterson et al. (2010). The study group has a larger percentage of turnovers as compared to the Patterson et al. (2010) finding. However, it was not a statistically significant finding.

Descriptive Statistics by Stretcher System

This section is a discussion of the SPSS® descriptive outputs for the MANCOVA conducted to fulfill Research Objective Two. The MANCOVA tested the relationship between stretcher systems and recruitment (the percentage of women employees and the average age), retention (the average length of employment tenure), and turnover rates (employment disruptions) in EMS. Using SPSS® version 20, a MANCOVA was conducted to test the variances between stretcher groups of the various levels of the independent variable, after controlling for the annual ambulance call volume.

To understand the relationship between the independent variable (stretcher group) and the dependent variables in this study, the averages, standard deviations, and frequencies are displayed for comparison in Table 19. Each dependent variable is stratified by each level of the independent variable.

The oldest average age of employees (35.4) was found in the manual stretcher group (level 0 independent variable). The longest average tenure of 9.1 years was associated with manual stretcher group (level 0 independent variable). The lowest turnover rate of 9.5% is associated with manual stretcher group (level 0 independent variable). The highest percentage of female employees was associated with manual stretcher group (level 0 independent variable). Table 19 is an SPSS® version 20 output from the MANCOVA that depicts the average of dependent variables by the independent variables.

Table 19

MANCOVA Descriptive Statistics

Dependent Variable	Stretcher Group	Average	*SD*	*N*
Age	Manual Stretchers Only	35.43	4.89	8
	Automatic Stretchers Only	32.88	8.12	27
	Mixed Stretcher Type	31.81	4.19	19
	Total	32.88	6.55	54
Tenure	Manual Stretchers Only	9.13	4.14	8
	Automatic Stretchers Only	7.36	3.06	27
	Mixed Stretcher Type	8.27	4.95	19
	Total	7.94	3.95	54
Turnover Rate	Manual Stretchers Only	9%	.06	8
	Automatic Stretchers Only	13%	.18	27
	Mixed Stretcher Type	11%	.10	19
	Total	12%	.14	54
Female Rate	Manual Stretchers Only	27%	.16	8
	Automatic Stretchers Only	26%	.18	27
	Mixed Stretcher Type	22%	.13	19
	Total	25%	.16	54

MANCOVA Results

The MANCOVA tested the covariate for significance in the Multivariate test. As discussed previously in this chapter, the researcher postulated that controlling for the

annual number of ambulance calls as a covariate would limit confounding created by

financial inequalities among the EMS agencies. After the statistical testing results of

Wilks' Λ= .849, F (4, 47) = 2.082, p = .098, the researcher concludes that controlling for

the total number of ambulance calls was not statistically significant. Table 20 provides

the SPSS® version 20 output for the MANCOVA multivariate test discussed above.

A MANCOVA was used to compare the dependent variables of recruitment

(percentage of women employees), retention (age and tenure), and turnover (employment

disruptions) by the independent variable stretcher systems (stretcher groups). Wilks' Λ

was used to test for differences between stretcher systems among recruitment (percentage

of women employees), retention (age and tenure), and turnover (employment

disruptions). The results are Wilks' Λ = .938, F (8, 94) = .384, p = .927. The model is not

significant for differences in the dependent variables among the levels of the independent

variable. Table 20 provides the SPSS® version 20 output for the MANCOVA

multivariate test discussed above.

Table 20

Multivariate Test – Wilks Lambda

Independent Variable	Value	*F*	Sig	Partial Eta Squared
Intercept	0.044	253.804	0.000	0.956
Total Ambulance Calls	0.849	2.082	0.098	0.151
Stretcher groups	0.938	0.384	0.927	0.032

Chapter Summary

The data for this study were collected from 54 participating EMS agencies in

Arkansas, Louisiana, and Mississippi by SurveyMonkey® on-line survey. The data were

downloaded into a Microsoft Excel file, adjusted by confidence level of the participants, and summarized into categories to answer Research Objective One. The categorized data were displayed in the 7-13 tables regarding Research Objective One. The file was downloaded into SPSS® version 20 and the MANCOVA was conducted. The results of the assumption testing and the MANCOVA are displayed in Tables in 16-20.

All assumptions of the MANCOVA were tested and accepted except for random sampling. This research used a census of the ambulances services in Arkansas, Louisiana, and Mississippi. Statistical significance was not found for the covariate (number of ambulance calls annually) in this model. Statistical significance was not found among recruitment (percentage of women employees), retention (age and tenure), and turnover (employment disruptions) by the levels of the independent variable stretcher systems. The interpretation of the results of the MANCOVA is discussed in Chapter V.

CHAPTER V – DISCUSSION

In this chapter, the results of the study are interpreted and discussed in terms of the research questions of this study. The research question and objectives are reviewed at the beginning of the chapter. The researcher's findings, conclusions, and recommendations are discussed along with the possible implications the results have for EMS. The recommendations for further research are presented.

Research Question

This study was designed and conducted to answer the following research question: Do differences exist in recruitment (percentage of women employees), retention (age and length of employment tenure), and turnover (employment disruption) among EMS agencies that use manual stretchers, hydraulic stretchers, or a combination of the two stretcher systems? This question emerged from a finding in the literature review. The literature review exposed a relationship between stretcher systems and human capital consequences (Fredericks et al., 2009; Garg, 1999; Lahiri et al., 2013; OSHA, 2002; Rechenthin, 2004; Studnek et al., 2011). This research extends the work of Brice et al. (2012), Fredericks et al. (2009), Patterson et al. (2010), and Studnek et al. (2011) to examine recruitment, retention, and employment turnover by stretcher system. EMS decision makers report recruitment, retention, and turnover as a critical issue impacting the viability of EMS (Brown, Dawson, & Levine, 2003; Franks et al., 2004; McGinnis, 2004; Patterson & Yonas, 2007; Patterson et al., 2010).

Findings, Conclusions, and Recommendations

This section discusses the findings, conclusions, and recommendations of this study. The results yielded valuable information about causal relationships among the variables. The researcher discusses the findings from the research, the conclusions reached, and recommendations for the use of the results.

Recruitment, Retention, and Turnover by Stretcher System

The first finding concerns the relationships between the independent variable (stretcher systems), the covariant (annual number of ambulance calls), and the dependent variables of recruitment (percentage of women employees), retention (age and tenure), and turnover (employment disruptions). Statistical non-significance was found for all relationships in this model.

The researcher concludes no workforce differences exist in recruitment (percentage of women employees), retention (age and tenure), and turnover (employment disruptions) by stretcher systems within the research group. The hydraulic stretcher system did not improve recruitment, retention, and turnover outcomes in this research group. Factors other than stretcher systems are influencing recruitment, retention, and turnover in the EMS workforce that are beyond the scope of this study.

The researcher recommends further research to investigate the provocation and prevention strategies of negative outcomes related to recruitment, retention, and turnover in EMS. Industry leaders could consider if occupational or organizational practices are depleting human capital from EMS.

Failure to address recruitment, retention, and turnover issues in EMS could result in a revolving door of employees. This could prevent an accumulation of clinical

experience and human capital, which David and Brachet (2009) state are essential for prehospital medicine. Inadequate staffing could increase overtime payments and cause a failure to meet the demand for services. EMS agencies could incur increased recruiting expenses as well.

Human Capital Development Theory

The second finding in this research relates to the human capital development theory. Human capital development theory states that economic gains are possible for the workforce and the organization by expanding the occupational capacity of the workforce (Akinyemi & Abiddin, 2013; Shaffer, 1961; Sweetland, 1996; Wang & Swanson, 2008; Woodhall, 1997). The literature review identified that hydraulic stretchers are associated with decreased incidents of OAIs, the related expenses, and lost workdays (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). Because of the beneficial EMS workforce outcomes associated with the use of hydraulic stretchers, the researcher considered hydraulic stretchers as a human capital intervention. However, statistically-significant differences were not found in recruitment, retention, and turnover among the EMS agencies that used manual stretchers exclusively, hydraulic stretchers exclusively, or a combination of both stretcher systems.

The researcher concludes hydraulic stretchers did not support the human capital development theory among the EMS agencies included in this study. This conclusion regards the mitigation of negative recruitment, retention, and turnover outcomes. As identified in the literature review, other researchers found beneficial human capital outcomes related to hydraulic stretchers (Brice et al., 2012; David & Bachet, 2009; Fredericks et al., 2009; Studnek et al., 2011).

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Given the predicted increase in demand for EMS, the need to fortify the employment pipeline (NHTSA, 2008; NHTSA, 2011), and the need to preserve the clinical expertise of the EMS workforce (David & Brachet, 2009), the researcher recommends further research to uncover human capital conservation strategies for EMS. The researcher recommends this study be replicated with a larger population in the research group to see if the results are simular. The researcher recommends using a different methodology, such as qualitative research, to identify if the results are similar. The replication of this study can inform the statistical conclusion validity of each study and the generalizability of the results. Failure to address human capital conservation strategies could doom EMS to loss of clinical expertise, increased recruitment efforts and expenses, and increased employment turnover.

Cost of Hydraulic Stretchers

Brice, et al. (2012) reported that many EMS agencies would not be able to purchase hydraulic stretchers because of the expense. This is not indicated in this study. The majority of the stretchers, 77% (468), were hydraulic. Manual stretchers contributed only 23% (140) of the stretchers in this research. Most EMS agencies (46) provided access to hydraulic stretchers. Only eight EMS agencies used manual stretchers exclusively.

As evidence to support the CSR theory, the researcher concludes most EMS agencies support their employees by providing hydraulic stretchers. Cost does not appear to be a factor when purchasing a stretcher. Most EMS agencies in this study embraced the constructs of CSR by demonstrating benevolent behavior toward employees (Lindgreen

& Swaen, 2010; McWilliams & Siegel, 2001; Rechenthin, 2004; Renaud-Coulon, 2008) by providing ergonomic stretchers which protect employees from OAIs.

The literature review revealed hydraulic stretchers reduce the number of lift-related OAIs and associated expenses (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011). This study found that hydraulic stretchers did not enhance recruitment, retention, or prevent turnover. However, purchasing hydraulic stretchers can prevent OAIs, protect the EMS workforce, keep human capital in the EMS workforce, and fortify the EMS pipeline for upcoming service demand increases.

Women in the EMS Workforce

Women constituted 26% (861) of the EMS workforce within the research group of this study (3349). This compares to the LEADS Survey Update from NREMT (2014) that reported the percentage of women employees registered as an EMT or Paramedic as 34%. When compared to the sister profession of law enforcement, only 11% of women are officers (FBI Uniform Crime Reporting, 2013). In fire services, only 7.3% are women (Haynes & Stein, 2017). As compared to law enforcement and fire services, there is a larger percentage of women in EMS.

Based on the results of this study, the literature review, and that the population of the United States contains 51% women (Census, 2016), employing more women in EMS could be a solution for inadequate staffing in EMS. The researcher concludes there is a need for greater representation of women in the EMS workforce. Correcting the gender inequity could be beneficial for both women and EMS employers. Women employed in EMS could earn a living wage and employers could benefit by having a skilled workforce and complete staff.

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Dychtwald et al. (2006) recommended the recruitment of the nontraditional gender as a solution for talent shortages. This is a possible answer for EMS recruitment issues. The type of stretcher system employed does not appear to influence the proportion of women in the EMS workforce, so a need exists to research other potential influences. Future research could focus on the cause of inadequate recruitment, retention, and turnover of women in EMS.

The researcher recommends EMS industry leaders consider if occupational or organizational practices exclude women from EMS employment. EMS can closely examine hiring and operational practices for overt or covert biases that interfere with the advancement of women in EMS. One example of overt biases that could eliminate women from the profession is the shift structures. If a woman is the primary caregiver of children and the EMS shifts are 24-hours long, this could inhibit women from working in EMS. Even if EMS agencies use 12-hour shift structures, if the shift begins before daycare centers open, or ends after daycare centers close, this could prevent women from working in EMS. Future research recommendations are to investigate the employment attractors or eliminators of women in EMS. Failure to develop structures to recruit and retain more women risks the continuance of inadequate staffing.

Average Age of the EMS Workforce.

Statistical non-significance was found among the stretcher systems and the age of the workforce in this study. This study found that the hydraulic stretcher did not influence the age of the EMS workforce. The manual stretcher group was associated with the oldest age medic and the hydraulic stretcher group was associated with the youngest age medic. From the literature review, one may expect the oldest average age to be associated with

the hydraulic stretcher group and the youngest average age associated with the manual

stretcher group (Brice et al., 2012; David & Bachet, 2009; Fredericks et al., 2009;

Studnek et al., 2011).

The researcher concludes other factors besides hydraulic stretchers influence the

mean age of the EMS workforce. This research suggests the type of EMS agency (fire

department-based, hospital-based, volunteer, private, or municiple) may be a contributor

to recruitment and retention of the workforce. Most EMS agencies in this research that

used manual stretchers exclusively were volunteer and rural services. The EMS agencies

that experienced the oldest average age simultaneously reported lower ambulance call

volumes.

Dychtwald et al. (2006) recommended the retention of older employees as a

solution for talent shortages. Retaining a workforce that accumulates more clinical

experience is essential for prehospital performance (David & Bachet, 2009). Experience

is an incubator of human capital development (Akinyemi & Abiddin, 2013; Becker,

1993; Wang & Swanson, 2008).

The researcher recommends EMS industry leaders consider if occupational or

organizational practices inhibit older workers from continuing employment in EMS. Age

bias is often very subtle in hiring or operational practices. Subtle age biases could

interfere with the advancement or continuation of older workers in EMS.

Further research is required to understand the factors that influence the age of the

EMS workforce. The researcher recommends future research investigate how the type of

EMS agency (fire department-based, hospital-based, volunteer, private, or municiple) and

ambulance call volume influence retention. Research could investigate the attractors and

detractors of EMS employment by age. Without the ability to make evidenced-based decisions, EMS organizations risk incomplete staffing and the loss of clinical experience and human capital accumulations that reside in the older worker.

Employment Tenure

This study found that hydraulic stretchers did not influence the length of EMS employment tenures. Employment tenure represented an indicator of retention in this study. Statistical non-significance was found among the stretcher systems and the average employment tenure of the workforce in this study. Hydraulic stretchers were associated with the shortest employment tenures within the research group. Manual stretchers systems had the longest employment tenures.

The researcher concludes factors other than hydraulic stretchers influence the length of employment tenure in this study group. Suspected influencers include the type of EMS agency (fire department-based, hospital-based, volunteer, private, or municiple) and ambulance call volume. The fire department-based EMS agencies and the EMS agencies that used manual stretchers exclusively in this study experienced the longest employment tenures. The EMS agencies in this research using manual stretchers exclusively experienced lower ambulance call volumes.

The researcher recommends further research into EMS employment tenure. Future research could investigate EMS employment conditions that support an employment tenure leading to retirement. Future research could investigate how the type of EMS agency and ambulance call volume influence employment tenure. The researcher recommends EMS industry leaders identify and rectify the occupational or organizational practices that constrain longer employment tenures in EMS. Specifically,

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financial compensation and a lack of a professional career ladder could be investigated.

Aside from losing employees with clinical experience and human capital accumulations,

failure to address the employment tenure issues could subject EMS to continued direct

and indirect expenses related to frequent employee turnover.

Employment Disruptions and Turnover

This study found no statistical differences in employment disruptions and

turnover by stretcher groups. Although employment turnover was not statistically

different by stretcher system used, the manual stretcher group had the lowest turnover

rate of 9% and the hydraulic stretcher group had the greatest turnover rate of 13%. Based

on the literature review, one may expect the lowest turnover rate to be associated with the

hydraulic stretcher group and the largest turnover rate to be associated with the manual

stretcher group. In this study, the EMS agencies from Louisiana had the lowest turnover

and the most fire department-based EMS agencies. The EMS agencies from Mississippi

experienced the highest turnover. Mississippi EMS agencies had the largest ambulance

call volume.

The researcher concludes forces outside the scope of this research influence

employment disruptions and turnover. The suspected forces are the same as the previous

conclusions, ambulance call volume and the type of EMS agency. Additionally,

compensation rates and the quality of supervisory staff should be considered.

Further research is recommended to understand the causes and prevention of

employment disruptions and turnover in EMS. Future research should concentrate on the

EMS drivers of lower employment turnover. Future research should investigate how the

type of EMS agency and ambulance call volume influence employment disruptions and

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turnover. Additionally, the researcher recommends that EMS industry leaders consider if occupational or organizational practices hinder longer employment tenures in EMS such as compensation rates and supervisory practices.

The fire department-based services in this study had the longest employment tenure and lowest turnover rate. This is consistent with the findings of other researchers (David & Brachet, 2009; Russ-Eft & Levine, 2012). This warrants an empirical examination of fire department-based EMS agencies. EMS industry leaders could apply the fire department-based EMS agencies constructs that improve employment tenure and decrease turnover to the other types of EMS agencies. EMS could benefit by retaining the workforce for longer periods, decreasing on-boarding efforts and expenses, and complete staffing.

Mississippi EMS

The study found that Mississippi EMS agencies participating in this study had the highest ambulance call volume, the most employment turnover, the youngest workforce age, and the shortest employment tenures. In terms of recruitment, retention, and turnover, Mississippi's outcomes were negative as compared to the other states in this study.

The researcher concludes that other forces outside the scope of this research are influencing Mississippi EMS in terms of recruitment, retention, and turnover. Suspected influencers include the type of EMS agency (fire department-based, hospital-based, volunteer, private, or municiple) and ambulance call volume. Another explanatory consideration of Mississippi EMS agencies' outcomes in this study, may be the higher prevalence rate of health disparities in Mississippi (Centers for Disease Control and

Prevention, 2011; The Office on Women's Health, 2015). Health disparities affect EMS in terms of ambulance call volume and transportation of patients (David & Bachet, 2009; NHTSA, 2008, NHTSA, 2011, Sanders, 2012;).

The researcher recommends further research into EMS practices in Mississippi. A study should use a qualitative methodology to learn constructs specific to Mississippi EMS recruitment, retention, and turnover. Additionally, this study should be replicated with an expanded study group but conducted exclusively in Mississippi. A panel representative of all components of Mississippi EMS, should review the outcomes and formulate mitigation strategies.

Similar to the recommendations of the other findings in this study, Mississippi industry leaders could examine if regulatory, occupational, or organizational practices cause negative recruitment, retention, or turnover outcomes in Mississippi EMS. Future research should empirically investigate the type of EMS agency and ambulance call volume. A comparative analysis of EMS practices and performances among states is warranted. If there are regulatory, occupational, or organization practices in other states that promote better recruitment, retention, and turnover outcomes, industry leaders should consider adopting those practices in Mississippi.

<div align="center">Further Considerations</div>

This study suggests there are no workforce differences in recruitment (percentage of women employees), retention (age and tenure), and turnover (employment disruptions) by stretcher systems within this research group. The hydraulic stretcher system did not improve recruitment, retention, and turnover outcomes in this research group. At first consideration, one may conclude that hydraulic stretchers do not make a difference in the

workforce. However, the literature review revealed that hydraulic stretchers reduce the number of OAIs, lost workdays, and expenses associated with injuries (Brice et al., 2012; Fredericks et al., 2009; Studnek et al., 2011).

The EMS workforce pipeline must be fortified to meet the predicted increase in demand (NHTSA, 2008; NHTSA, 2011). Preservation of human capital acquired through clinical experience is crucial for EMS (David & Bachet, 2009). It is imperative to understand the promoters and inhibitors of recruitment, retention, and turnover in EMS. The prevention of turnover, expanding the percentage of women employees, retaining the older employee, and promoting longer tenures are measures that could fortify the workforce.

The following is a discussion about suspected concepts beyond the scope of this study that may impact EMS recruitment, retention, and turnover issues. This information is offered as a springboard for discussion in EMS and future EMS research. Prehospital healthcare requires bravado to practice in an unstable environment. The same bravado that is necessary to handle dangerous situations may proliferate occupational burnout and increase turnover. Industry leaders could investigate methodologies to minimize the burnout syndrome. Anecdotal suggestions for research include more attention to emotional/psychological OAIs, shorter shifts, and longer off-work periods between shifts. Burnout may not be a result of experiences encountered on one job in EMS. Burnout could be a product of inadequate compensation that prompts many medics to work multiple jobs within EMS.

Financial compensation shapes the level of talent and ability attracted to EMS. While employers may desire to keep compensation lower to maximize profitability,

education requirements have increased to match the prehospital skill set. The mismatch in compensation and increasing initial and continuing education requirements may contribute to turnover and shorter employment tenures. If the advanced skill set is essential for EMS, then the education requirements should match the skill set. However, to attract the level of employee capable of the education requirements, requires a better compensation rate. A better compensation rate for employees may not be possible without a better reimbursement rate from insurances. Compensation for non-transport calls is another reimbursement inequity that if corrected, could provide better compensation for medics. In this study, one-third of the ambulance calls were non-transportation calls. Non-transportation calls consume resources from the EMS agencies but are not reimbursable.

A lack of advancement opportunities in EMS could contribute to short employment tenures and increased turnover. After several years of providing patient care, a medic may desire to advance to management, education, or other non-clinical positions. In the current structure, there are not many positions for medic promotion. The researcher offers two suggestions: (a) create career ladders that outline progression plans to achieve higher status, compensation, and promotions, and/or (b) expand the practice area of medics into industry, safety, or other healthcare settings. Expanding the practice area of medics may concern EMS agency owners and operators. They may perceive an expanded practice area as greater competition for employees. However, an expanded practice area may attract more people to the profession and retain medics in the profession.

Russ-Eft and Levine (2012) identified that discontent with supervisors increases medics intent to leave an EMS agency. It is important that medics in leadership or

supervisory roles receive formal education in the principles of management. Formal management training may decrease turnover, increase retention, increase productivity, conserve resources, and avoid U.S. Department of Labor law violations. Improving the quality of management could decrease medics' intent to leave. Failure to address this issue may sabotage EMS management and proliferate the difficulties in recruitment, retention, and turnover.

Further research is necessary to understand the relationships among recruitment, retention, and turnover and the type of EMS agency, ambulance call volume, and governmental, occupational, or organizational practices. The researcher suspects that ambulance call volume and the type of EMS agency structure are critical influencers of recruitment, retention, and turnover. After empirical consideration of the influence of ambulance call volume and the type of EMS agency, policies, procedures, and prevention strategies should be designed to minimize turnover and maximize retention.

The researcher recommends EMS industry leaders use this research to guide decisions concerning equipment purchases, human capital conservation, and workforce planning. The literature review showed that hydraulic stretchers are ergonomic investments, protective of the EMS workforce. Hydraulic stretcher decreases expenses related to OAIs. Clinical experience is an incubator of human capital. Efforts are necessary to retain the experienced workforce. Workforce planning contemplates the regulatory, organizational, and occupational practices necessary to insure a patent EMS pipeline such as compensation, career ladders, and management training.

Summary

This study used a causal comparative design to compare the recruitment, retention, and turnover rates among ambulance services that use manual stretchers, hydraulic stretchers, or a combination of the two stretchers systems. The intent was to improve the understanding of how ergonomic capital equipment investments affect the EMS workforce in terms of recruitment, retention, and turnover.

There are no workforce differences in recruitment (percentage of women employees), retention (age and tenure), and turnover (employment disruptions) by stretcher systems within the research group. The hydraulic stretcher system did not improve recruitment, retention, and turnover outcomes in this research group. Factors other than stretcher systems may influence recruitment, retention, and turnover in the EMS workforce that are beyond the scope of this study.

The limitations of the study and the mitigating initiatives were discussed. Generalization of results to EMS, survey design and response rates, estimations as answers the survey questions, random assignment to select the participants, and emails generated by SurveyMonkey® that were sorted into the recipients' email spam collector were identified as the limitations. The researcher took appropriate measures to mitigate the limitations.

Finally, much research is needed to reveal the best practices of human captial development of the EMS workforce especially given that the intervention expected to increase female participation and extend job tenure for older workers did not appear to make a difference in the states studied. Based on interesting factors that emerged in conducting this research, recommendations for future research were made. Future EMS

workforce research should (a) focus on employment attractors and detractors to women and the older employees in EMS, and (b) investigate the relationship between ambulance call volume, service type, EMS employment conditions, and recruitment, retention, and turnover.

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INSTITUTIONAL REVIEW BOARD
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NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17011203
PROJECT TITLE: The Influence of Manual and Hydraulic Stretchers on Recruitment Retention, and Turnover of the Emergency Medical Services Workforce
PROJECT TYPE: New Project
RESEARCHER(S): Gregory M. Cole
COLLEGE/DIVISION: College of Science and Technology
DEPARTMENT: Human Capital Development
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 02/13/2017 to 02/12/2018
Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX B – Introduction/Invitation Letter

Date

ContactName
EMSagency
Address
City, *Zip code*

RE: The influence of manual and hydraulic stretchers on recruitment, retention, and turnover of the Emergency Medical Services workforce

Dear *ContactName*,

As you know, EMS is an essential element of the healthcare system of the United States. The Bureau of Labor Statistics predicts an increased demand for EMS in the coming years as the population of the United States grows older and health disparities increase. Many EMS employers are struggling with employment issues such as recruitment, retention, and turnover. It is important to protect and promote the EMS workforce to meet the predicted increase in demand for services. You can help this effort by participating in a research project concerning the EMS workforce effects from different stretcher systems. The study results will help to improve the understanding of EMS workforce and stretcher systems.

You were identified as the contact person at *EMSagency* on a list of licensed EMS agencies in your state. On insert date, you will receive an email containing a link to the survey. This is a one-time collection of information. It will take up to 20 minutes to complete the survey. All submissions are anonymous. No personal information is required; only non-competitive, non-sensitive employment data from *EMSagency*. There are no repercussions if you not participate or withdraw from the study. There are no risks for harm. *EMSagency* nor you will be portrayed negatively or even disclosed by name in any publication concerning this study.

Additionally, each participant has an opportunity to join in a random drawing for one of eight $25 Amazon gift certificates for completing the survey.

Contact Dr. Dale Lunsford, Assistant Professor of Human Capital Department, University of Southern Mississippi, Long Beach, Mississippi at dale.lunsford@usm.edu or 228-214-3429 to confirm the legitimacy of this request.

If email address below is incorrect or if you are not the appropriate representative of *EMS Agency*, please contact me at 601.517.3511 or gregory.cole@ usm.edu:

emailaddress

Below is a table that summaries the information needed for the upcoming survey. The information regards *EMSagency*'s workforce and operations. To decrease the amount of time required to complete the survey and improve the quality of data, in the next week, please fill out this table concerning *EMSagency* prior to the opening of the survey. Once the survey opens, enter the data in the survey.

Requested information regarding ambulance employees in the last 12 months		
Number of ambulance employees		
Number of women employees		
Average age of employees		
Average length of employment tenure		
Number of involuntary terminations		
Number of resignations		
Number of retirements		
Number of disabilities	On the Job:	Off Job:
Number of deaths	On the Job:	Off Job:
Number of manual stretchers in use		
Number of hydraulic stretchers in use		
Annual number of ambulance responses		

I look forward to working with you to improve the information regarding the EMS workforce. Thank you for your time and favorable consideration of my request. Respectfully,

Gregory M. Cole, MPH,
PhD Candidate
Human Capital Development
University of Southern Mississippi-Gulf Coast Campus
gregory.cole@usm.edu
601-517-3511

Questions concerning the research should be directed to Gregory Cole at (601) 517-3511. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits.   The project has been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the Administrator, Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-5997.

emailaddress

RE: The influence of manual and hydraulic stretchers on recruitment, retention, and turnover of the Emergency Medical Services workforce.

Dear *contactname*,

Last week a letter was sent to you asking for your help with a study concerning the effects that various types of stretchers have on the EMS workforce. To access the survey double click the link below or enter it into your internet browser's address bar:

https://www.surveymonkey.com/r/EMS_Workforce_Ergonomic_Solutions

Your responses are voluntary and will be kept confidential. Your name or the *EMSagency*'s name will not be disclosed in any publication. If you have any questions about the survey, please contact Gregory Cole at 601-517-3511 or email at

gregory.cole@usm.edu.

The participants that complete the survey has an opportunity to join in a random drawing for one of eight $25 Amazon gift certificates.

By taking 20 minutes, you will be adding to our understanding of how various types of stretchers effect the recruitment, retention, and turnover of the EMS workforce. I look forward to receiving your responses.

Many Thanks,

Gregory M. Cole, MPH, NRP
PhD Candidate
Human Capital Development
University of Southern Mississippi-Gulf Coast Campus
gregory.cole@usm.edu
601-517-3511

APPENDIX D – Survey Instrument

Welcome to the survey! Thank you for participating.

Your input is extremely valuable to this research project. The intent of the project is to study how the EMS workforce is affected by different stretcher types. This data is being collected for a dissertation to fulfill the requirements of a PhD in Human Capital Development. However, future articles and publications obtained from this study will inform EMS about the relationship between various stretchers systems and the EMS workforce in terms of employment recruitment, retention, and turnover.

This survey contains four sections and 14 total questions. It will take approximately 20 minutes to complete the survey. To complete this survey, you will need to know

1. Number of ambulance employees

2. Number of women ambulance employees

3. Average age of your ambulance employees

4. Average length of employment of ambulance employees

5. Number of ambulance employees that were terminated, resigned, retired, disabled, and died

6. Number of various stretchers at your service

7. Annual ambulance call volume and cancellations.

Much of this information can be obtained from employment rosters of the last 12 months, drivers' insurance information with the ambulance company, employment records, or dispatcher ledgers.

Participants' Rights in Research and Consent

1. The information you provide will be anonymous. No personal information is

2. required, only noncompetitive, non-sensitive, employment data regarding the

   EMS agency that you represent.

3. All information will be summarized and reported collectively; no single EMS

   agency will be identified.

4. Participation is voluntary. You are encouraged to participate but there are no

   negative consequences for not participating.

5. You may withdraw from this study at any time without consequence.

6. The benefit of participating in this survey is that you are contributing to the

   discovery of the best practices of the EMS workforce concerning patient transport

   devices, numbers of women employees, age of the work force, length of

   employment, and employment disruptions. Additionally, eight $25 Amazon gift

   cards will be given to randomly-selected participants of this survey. At the end of

   the survey, directions are provided to add your name into the drawing for the

   Amazon gift cards.

7. There are no foreseeable risks of participating in this study.

Questions concerning the research should be directed to Gregory Cole at (601) 517-3511.

Participation in this project is completely voluntary, and participants may withdraw from

this study at any time without penalty, prejudice, or loss of benefits. The project has been

reviewed by the Institutional Review Board, which ensures that research projects

involving human subjects follow federal regulations. Any questions or concerns about

rights as a research subject should be directed to the Administrator, Institutional Review

Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-5997.

I understand my rights in this research and agree to voluntarily participate.

1. Yes

2. No

Section 1: Demographics

This section concerns information about the ambulance personnel employed at your service. Ambulance personnel are paramedics, nurses, EMTs, AEMTS, Intermediates, or drivers who work on/in an ambulance at your agency. This does not include administrators, educators, office personnel, services technicians, mechanical/maintenance employees unless they have direct and routine patient treatment/transportation responsibilities. Do not include information for operations outside of Arkansas, Louisiana, or Mississippi.

1. In which state is your EMS agency located? If your service is located in multiple states, choose the state that you work in the majority of the time.

   a. Arkansas

   b. Louisiana

   c. Mississippi

   d. None of the above

2. What is the primary service area for your EMS agency?

   a. County/Rural

   b. City/Urban

3. Estimate the number of ambulance personnel employed by your service?

4. Estimate the number of female ambulance personnel at your service.

5. Estimate the average age of the ambulance employees at your service.

How certain are you that the estimates for question 2, 3, and 4 are correct?

The level of certainty is measured from 0 to 100%. EXAMPLE: If you are

absolutely certain that your estimate is correct, slide the bar to 100%. If you are 80%

certain that your estimate is correct, place the slider below on 80. If you feel

uncertain about the estimate for question 3, 4, and 5, place the slider on a low

number that indicates your level of certainty.

Section 2: Employment Turnover

This section concerns the number and types of employee turnovers within your

company in the last 12 months.

Employee turnover is the formal and informal discontinuance of employment with

your EMS agency. Employment turnover can by initiated by the employer or

employee. This includes the number of employees that were terminated, quit, fired,

resigned, died while employed, retired, disabled, or left without notification. Do not

include employment turnover information for service operations outside of

Arkansas, Louisiana, or Mississippi.

6. Estimate the average length of employment (in years) of ambulance employees at
    your service.

How certain are you that the estimate for question 5 is correct?

7. Estimate the number of ambulance employees who were involuntarily terminated
    from employment with your agency in the last 12 months.

8. Estimate the number of ambulance employees who resigned from their employment with your agency in the last 12 months.

9. Estimate the number of ambulance employees in the last 12 months who retired from their EMS employment.

10. Estimate the number of ambulance employees in the last 12 months, who discontinued their employment with your agency because of a disability that

    a. Occurred on-the-job while employed by your agency:

    b. Did not occur on-the-job, while employed by your agency:

11. Estimate the number of ambulance employees who died in the last 12 months

    a. On-the-job while employed by your agency:

    b. Not on-the-job, but while employed by your agency:

How certain are you that the estimates for questions 6, 7, 8, 9, and 10 are correct?

Section 3: Stretchers

The next questions concern the number and types of stretchers used in your service.

A stretcher system is a device used to facilitate safe patient movement and transport when operated correctly.

Do not include stretcher information for service operations outside of Arkansas, Louisiana, or Mississippi.

12. Estimate the number of manual-lift stretchers used by your current EMS employer.

13. Estimate the number of battery-powered, hydraulic stretchers (all automatic lift stretchers) used by your current EMS employer.

How certain are you that the estimates for questions 12 and 13 are correct?

Section 4: Annual Number of Ambulance Calls

The next question concerns the annual number of ambulance responses at the EMS agency where you work full time. Ambulance responses are the scheduled and non-scheduled, emergency and non-emergency, requests for treatment and transportation. Do not include Annual Number Ambulance Calls information for service operations outside of Arkansas, Louisiana, or Mississippi.

14. What is the number of ambulance responses in the last 12 months?

    a. The number of cancellations, refusals, standbys, and lift assist:

    b. The number of calls that resulted in patient transports (emergency & non-emergency):

How certain are you that the estimate for question 14 are correct?

THANK YOU for taking the time to participate and provide input into this important study.

If you would like to be included in the drawing for one of the eight $25 Amazon gift cards, _**CLICK HERE**_ and you will be linked to a separate survey to collect your contact information. The information in this survey remains anonymous and independent form your contact information and responses provided in this survey.

If you are not interested in the drawing, click NO then FINISH to exit the survey.

_**NO**_

APPENDIX E – Post Pilot Survey

Please answer the following discussion questions about the *EMS Workforce Composition by Stretcher System.* Please be candid and succinct about the survey and the process.

1. Overall, how easy was it for you to access the survey?

2. How easy was it to navigate from page to page?

3. Please describe any technical problems that you encountered while attempting to access or navigate from page to page.

4. Were the directions clear and easy to understand?

   A. If not, how can the survey directions be improved?

5. Were there any typographical errors that you discovered?

6. Was it difficult to get the information for this survey?

7. Was computing the average employee age difficult?

   A. If so, why?

8. Was computing the average length of employment tenure difficult?

   A. If so, why?

9. How many minutes did it take to complete the survey?

10. Please share any other comments or suggestion you may have that would help make this survey more successful.

APPENDIX F- Email Reminder

emailaddress

RE: First Reminder concerning *The Influence of Manual and Hydraulic Stretchers on the Composition of the EMS Workforce*

Dear *contactname*,

A few days ago, I sent you an email asking for your help with a study concerning the effects that various types of stretchers have on the EMS workforce. If you or someone at *EMSagency* that fulfills the human resource function has already completed the questionnaire, please accept my sincere thanks. If you have not gotten to it yet, please complete the survey as soon as possible. Double click the hyperlink below or enter it into your internet browser's address bar or:
www.surveymonkey.com/EMSworkforceandstretchers/

By taking 20 minutes, you will be adding to our understanding of how various types of stretchers effect the composition of the EMS workforce. If you have any questions about the survey, or if you need a paper survey, please contact Gregory Cole at 601-517-3511 or email at gregory.cole@usm.edu. Remember, each respondent has an opportunity to participate in a random drawing for one of eight $25 Amazon gift certificates for completing the survey.

I look forward to receiving your responses.

Appreciatively,

Gregory M. Cole, MPH, NRP
PhD Candidate
Human Capital Development
University of Southern Mississippi-Gulf Coast Campus
gregory.cole@usm.edu
601-517-3511

APPENDIX G - Telephone Contact Protocol

1. Obtain non-respondents from SurveyMonkey®.

2. Call telephone number.

3. Ask for identified contact person.

4. Is this a convenient time for a brief conversation? If not, when do you want me to call you back? Record time.

5. Did you receive the email containing the link to the survey?

    a. If not confirm email address.

    b. Correct email if necessary.

    c. Resend the email immediately while respondent is on phone.

6. What are your questions regarding the survey?

7. How can I help you complete the survey?

8. When will you be able to complete the survey?

9. Thank you for contributing to research. It is important to understand the influence that stretcher have on the EMS workforce.

10. Remember to register for the random drawing of one of eight $25 Amazon gift certificates at the end of the survey.

APPENDIX H - Additional Individual Email to Avoid the Email Spam Collectors

Several days ago, I sent a research solicitation via SurveyMonkey. I am trying to collect workforce data from the EMS agencies in Arkansas, Louisiana, and Mississippi. Several participants told me that the invitation went into email Spam folders, which prevented them from seeing the request. I am sending this request again through a different method in case you never saw the request. I apologize for the multiple contacts.

The research project regards the impact of various stretcher systems on the EMS workforce in terms of recruitment, retention, and turnover. Several EMS agencies from Arkansas, Louisiana, and Mississippi have already completed the survey-Thank You. If you have not had the opportunity to complete the survey yet, please do so as soon as possible. Click the hyperlink below.

https://www.surveymonkey.com/r/StretcherSolutionsEMSWorkforce

If you have questions about the survey or if you need a paper survey, contact Gregory Cole at 601-517-3511 (call or text) or email me at gregory.cole@usm.edu. The survey should not take any longer than 20 minutes. The data requested is non-sensitive, non-competitive workforce metrics from the previous 12 months of your service's EMS operations. Of course, all submissions are anonymous.

For completing the survey, each respondent has an opportunity to participate in a random drawing for one of eight $25 Amazon gift cards.

Thank you for contributing to the growing body of EMS research.

Appreciatively,

Gregory M. Cole, MPH, NRP
PhD Candidate
Human Capital Development
University of Southern Mississippi-Gulf Coast Campus
gregory.cole@usm.edu
601-517-3511

NOTE: Questions concerning the research should be directed to Gregory Cole at (601) 517-3511. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits. The project has been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the Administrator, Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-5997.

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