The Dissertation Committee for David Curk McFall Certifies that this is the approved version of the following dissertation:

A LONGITUDINAL, DESCRIPTIVE STUDY OF BURN PATIENTS' PERCEPTIONS OF QUALITY OF LIFE AND COMMUNITY INTEGRATION IN THE FIRST 18-MONTHS POST-BURN UNIT DISCHARGE

Committee:

Linda H. Yoder, Supervisor

Patricia A. Carter

Terry Jones

Evelyn Clingerman

Adama Brown

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by

David C. McFall

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Dedication

To my Mama, Henrietta McFall, for her infinite love and support. Thank you for your strength and courage and for providing me with every opportunity to overcome all life's challenges.

To my family for their never-ending love, encouragement, and understanding.

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David C. McFall, Ph.D.

The University of Texas at Austin, 2017

Supervisor: Linda H. Yoder

The evaluation of quality of life (QOL) and community integration are important outcome measures following burn injury. However, little is known about the long-term effects of physical and psychological factors on QOL outcomes in military and civilian burn survivors treated in a military burn center. Furthermore, the reports of long-term community integration outcomes in burn survivors is sparse. The purpose of the descriptive, longitudinal study was to examine the changes in perceptions of QOL and community integration among and between military service members and civilian burn survivors in the first 18-months following discharge to better understand adaptation in the two groups.

Initially, the civilian burn survivors reported worse perceptions of QOL compared to the military participants. However, by 12-months post-discharge, the civilians' SF-36 PCS scores were higher than the PCS scores reported by the military burn survivors. Furthermore, time was a statistically significant predictor of physical QOL outcomes. The military service members' highest SF-36 MCS score was at three-months post-

discharge and by 18-months, their perceptions of mental QOL outcomes were slightly worse than at discharge. At 12-months post-discharge, civilian participants' perceptions of mental QOL were better that the military service members. However, the findings from this study do not offer support that time, group status, age, marital status, burn severity, and length of stay were predictive of mental QOL outcomes in burn survivors using the SF-36. Although the military participants reported higher scores at all time-points, the highest total CIQ scores for both groups were at discharge. The lowest total CIQ scores were at six-months while 18-month scores were only slightly lower than at discharge. Moreover, time group status, age, and marital status were statistically significant predictors of community integration however, the amount of variance accounted for by these variables was not statistically significant.

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CHAPTER 1

INTRODUCTION

Since the discovery of fire, burn injuries have been acknowledged as a threat to our well-being (Cioffi, Rue, Buescher, & Pruitt, 1991). Burns are devastating injuries characterized by depth or degree, percentage of body surface burned, and the causative agent, which may be heat, radiation, radioactivity, electricity, friction, or contact with chemicals (World Health Organization [WHO], 2016). Burn injuries are traumatic events comprised of multivariate risk factors such as age (Esselman, Thombs, Magyar-Russell, & Fauerbach, 2006; Klosova, Tymonova, & Adamkova, 2005), gender (Esselman et al., 2006), race/ethnicity (Goodis & Schraga, 2010; Mistry, Pasisi, Chong, Stewart, & She, 2010), and burn size (Esselman et al., 2006). Burns may alter, limit, or restrict activities of daily living because of burn-related sequelae such as functional limitations, pain, pruritus (Esselman et al., 2006) joint contractures (Esselman et al., 2006; Falder et al., 2009; Saleh, El-Shazyl, Adly, & El-Oteify, 2008), and hypertrophic scarring (Esselman et al., 2006; Tredget, Levi, & Donelan, 2014) that negatively affect all aspects of a patient's life including impairments on esthetic appearance (Stavrou et al., 2014), interpersonal (Stavrou et al., 2014), physical (Peck, 2011; Stavrou et al., 2014), psychological (Peck, 2011; Stavrou et al., 2014), and social (Peck, 2011; Stavrou et al., 2014) functioning.

Burns are a global health problem, accounting for estimated 265,000 deaths worldwide annually (WHO, 2016). Non-fatal burn injuries are a leading cause of morbidity and burns are among the leading causes of disability-adjusted life-years lost in low and middle-income countries (Peck, 2011; WHO, 2016). In the United States (U.S.), burns are typically categorized as accidents, which are the leading cause of death for those aged one to 44 years; ranking fifth after heart disease, cancer, chronic lower

respiratory diseases, and stroke (Centers for Disease Control and Prevention [CDC], 2010). Within the general population, exposure to smoke, fire, and flames are the fifth leading cause of accidental/unintentional death in the U.S. resulting in 3,275 deaths per year (American Burn Association [ABA], 2016; CDC, 2010). Specific groups at increased risk for burn injury are males, the elderly (ages 65 years and older), African Americans, Native Americans, poor Americans, residents of rural areas, and persons with mental, emotional, or physical impairments (CDC, 2010; Goodis & Schraga, 2010). The majority of burn injuries have historically occurred in the home, but occupational burn injuries also are reported to represent a significant economic threat to individuals, families, and communities (Mian et al., 2011).

Members of the military are at greater risk of occupational injury, including burn injuries, than workers in general (Bureau of Labor Statistics (BLS), 2009) because of the higher incidence of mechanized modern conventional warfare (Cioffi et al., 1991) and the increased detonation of explosive devices such as landmines, artillery munitions, mortar rounds (Kuvar, Wolf, Wade, Cancio, Renz, & Holcomb, 2006), as well as improvised explosive devices (IEDs) (Kuvar, Cancio, Wolf, Wade, & Holcomb, 2006). Within the military, burn injuries have a wide range of effects from the individual to the overall status of military operations (Kuvar, Cancio et al., 2006) because military personnel are removed from their roles and transferred for primary burn care (Kuvar, Cancio et al., 2006; Wolf et al., 2006). The ability of military and civilian burn survivors to return to their pre-burn lifestyle and quality of life (QOL) may be hindered by ongoing physical, psychological, and social challenges associated with their burn injuries (Esselman et al., 2006; Mistry et al., 2010; Stavrou et al., 2014; U.S Army Wounded Warrior Program [AW2], n.d.). Challenges faced from prolonged follow-up create persistent difficulties

adapting to alterations from their pre-burn lifestyles. Burn survivors may require substantial long-term rehabilitation to cope with these challenges, making transitions back to the community increasingly difficult (Esselman, 2007; Massman, Dodge, Fortman, Schwardz, & Solem, 1999; Moi, Wentzel-Larsen, Salemark, Wahl, & Hanestad, 2006; Moi, Wentzel-Larsen, Salemark, & Hanestad, 2007; U.S.AW2, n.d.).

Burn injuries result in significant health burden (Greene, Pham, Esselman, & Rivara, 2015). Because of continued advances in burn care and rehabilitation the number of burn survivors has increased, perpetuating the need for inpatient rehabilitation (Tan et al., 2012). Additionally, outpatient rehabilitation can result in a significant improvement in functional outcomes for burn survivors (Greene et al., 2015). However, the utilization rates of inpatient rehabilitation post-burn vary widely within the U.S. Greene and colleagues (2015) reported significant differences in the number of burn survivors discharged to inpatient rehabilitation by state. The researchers also reported the percentage of burn survivors referred to inpatient rehabilitation varied by total body surface area (TBSA) burned and type of insurance. The researchers found only 0.5 percent of uninsured burn patients were discharged to rehabilitation compared to 2.7 percent of burn patients with government-based insurance. They also reported receiving treatment in a burn center as another significant factor in referral to inpatient rehabilitation. A higher proportion (3.2%) of burn patients discharged from burn centers compared to those treated in non-burn centers (1.9%) were referred to inpatient rehabilitation (Greene et al., 2015). Based on their findings, the researchers concluded there was significant variation in rehabilitation use by burn patients following discharge. For example, older insured burn survivors who suffered more severe burns and were treated in burn centers were more likely to be referred to inpatient rehabilitation.

Active duty military service members, their family members, and military retirees receive benefits through the military healthcare system. Military benefits ensure coverage for injuries or diseases that occurred while on active duty and/or that were exacerbated by active military service. In addition to the basic life benefit, (Military Advantage, 2015) military benefits ensure military burn survivors will receive comprehensive inpatient and outpatient rehabilitation and lifetime follow-up in the military healthcare system. Unlike military service members and their beneficiaries, uninsured civilian burn patients may face less than optimal quality of life (QOL) outcomes due to a lack of funding and/or social support (Rosen, Saleh, Lipsitz, Rogers, & Gawande, 2009). Burn outcomes are often influenced by a combination of physical factors such as age (Altier, Malenfant, Forget, & Choiniere, 2002; Anzarut, Chen, Shankowsky, & Tredget, 2005; Farrell, Bennett, & Gamelli, 2010; Moi et al., 2006), gender (Farrell et al., 2010; Moi et al., 2006), and TBSA burned (Altier et al., 2002; Farrell et al., 2010; Fauerbach et al., 2005) or psychosocial factors such as psychological status (Fauerbach et al., 2005), social support and financial status (Farrell et al., 2010). Unless civilian burn patients have health insurance or other financial resources following discharge from the burn center, they may be unable to receive additional care or rehabilitation and may be lost to follow-up (Farrell et al., 2010). Farrell and colleagues (2010) reported that uninsured burn patients were more often male, experienced shorter hospital lengths of stay (LOS), and were significantly more likely to be discharged home.

The changes that result as a consequence of burn injuries are abrupt. These changes may be life-altering and result in long-term rehabilitative needs from the physical and psychological trauma associated with suffering burn injuries. Understanding changes in the burn survivor's perception of QOL and community integration post-burn

injury is profoundly important because it may add clarity in understanding their struggles over time following such a life-altering traumatic event. Such understanding could lead to improved rehabilitation programs for burn survivors. Therefore, this study was conceived to develop a better understanding of changes in perception of QOL and community integration in burn survivors over time and compare differences between military service members and civilians' burn outcomes. A greater understanding of changes in perception of QOL and community integration will enhance the goal of modern burn care, to aide burn survivors to overcome their challenges, achieve and return to the best QOL possible, and integrate back into their communities, including work and school (Klein et al., 2007).

PURPOSE

The purpose of this study was to examine perceptions of QOL and community integration among and between military and civilian burn survivors over time in order to better understand adaptation in the two populations. This study consists of a secondary data analysis of data previously collected in a "parent study" that examined QOL outcomes among burn patients discharged from the United States Institute of Surgical Research Burn Center (USAISR). The Principal Investigator (PI) granted access to the data dictionary from the "parent study" to allow the identification of variables of interest for this study.

DESCRIPTION OF THE PARENT STUDY

The "parent study" from which the data for this study were derived was conducted from 2000 through 2007 with patients who had been treated in the USAISR

Burn Center. All participants provided written consent and the "parent study" was approved by the Institutional Review Boards of Brook Army Medical Center and the Uniformed Services University of the Health Sciences; a secondary approval was obtained from the Medical Research and Material Command. The USAISR Burn Center is located within the San Antonio Military Medical Center (SAMMC), Fort Sam Houston, Texas (formerly known as Brooke Army Medical Center [BAMC]). This Burn Center is the only Department of Defense (DoD) designated Burn Center. The USAISR is an ABA designated burn center and the only ABA designated burn center that treats sufficient numbers of military and civilian burn patients to allow comparisons to be made. The USAISR receives burn victims from military sites worldwide. The USAISR also provides burn care for civilian burn victims in Southcentral Texas. Therefore, patients treated in the burn center are comprised of both military beneficiaries and civilian burn emergencies.

The "parent study" consisted of a descriptive longitudinal design where burn survivors were followed over 18-months after discharge from the Army Burn Center. Data were collected from participants within seven days of discharge from the Military Burn Center and at three, six, 12, and 18-months. The purpose of that study was to examine military beneficiaries' and civilians' perceptions of QOL, satisfaction with life, and return to work after they were discharged from the Military Burn Center. The Principal Investigator (PI) aimed to determine changes in participants' perceptions of these variables over time. Data were collected using seven instruments: (a) the Abbreviated Burn-Specific Health Scale (BSHS-A); (b) the Medical Outcomes Short

Form-36 (SF-36); (c) the Satisfaction with Life Scale (SWLS); (d) the Community Integration Questionnaire (CIQ); (e) a Demographic Data Sheet; (f) a Clinical Data Sheet; and (g) the Vocational and Rehabilitation Questionnaire. These seven instruments were selected because they were included in the National Institute of Disability and Rehabilitation Research (NIDRR) Burn Model System (Burn Consortium) study. The PI of the "parent study" selected these instruments in order to subsequently compare her findings with those reported within the literature from the NIDRR study. Data collected in the "parent study" using the SF-36, the CIQ, and the Demographic and Clinical Data Sheets were used in this study.

BACKGROUND AND SIGNIFICANCE

Although the incidence of burns has decreased as a result of increased prevention of injuries at home and in the workplace, burns remain a significant cause of morbidity (Esselman et al., 2006; Mistry et al., 2010). Burn survivors face important rehabilitation challenges because of the long-term physical and psychological complications (Esselman et al., 2006). Burn survivors are faced with their own reactions to the traumatic event, but also must deal with the reactions of others that may assist or delay adaptation following burn injury and negatively affect QOL and community integration outcomes (Blakeney, Partridge, & Rumsey, 2007; Van Loey & Van Son, 2003). Quality of life is complex and ill-defined with numerous ways to perceive, define, or measure the concept (Costa, Rossi, Lopes, & Coffi, 2008; Novelli, Melandri, Bertolotti, & Vidotto, 2009). Because of the multidimensionality and subjectivity of the concept, there remains no consensus definition of QOL (Cella, 1994; Cromes, Holavanahalli, Kowalske, & Helm, 2002). However, there is consensus about the major domains of QOL. These include: (a) physical, (b) psychological, (c) general symptoms, (d) social concerns, and (e) spirituality

(Aaronson, 1990; Ferrell, Grant, Padilla, Vemuri, & Rhiner, 1991; King, 2003; Schipper, 1990). From a theoretical perspective, the concept of QOL has advanced to a multi-faceted collage comprised of biological, psychological, social, and spiritual factors with specified measurable domains (Strain, 1990). Quality of life clearly means different things to different people and is best evaluated by the person experiencing it (Fayers & Machin, 2009; Ferrell, Wisdom, & Wenzel, 1989).

Community integration encompasses the establishment of social contacts and support networks (Willer, Rosenthal, Kreutzer, Gordon, & Rempel, 1993). Community integration also involves assisting burn survivors to move beyond the patient role and acute hospitalization, enabling them to move toward independence, self-care, and resume roles within the community setting (Bond, Salyers, Rollins, Rapp, & Zipple, 2004; Burrell, Durand, & Fortado, 2003). Blakeney and colleagues (2007) proposed that community integration and the associated social anxiety and social strain are the most important issues encountered by burn survivors. However civilian burn survivors have indicated a lack of assistance with their life struggles from burn care professionals' post-acute hospitalization (Blakeney et al., 2007). Reports of community integration following burn injuries are sparse within the literature and there are few operational definitions that provide a basis for assessment (Esselman, Ptacek, Kowalske et al., 2001; Willer, Linn, & Allen, 1993).

Within the military, community integration is defined as the process of transitioning a service member back into personal and organizational roles post-deployment (National Center for Telehealth & Technology Department of Defense Suicide Event Report [DoDSER] 2012). This period encompasses a variety of positive events such as a return to pre-deployment life and reunions with family and friends.

However, service members also may experience periods of increased stress and tension during this time related to personal, family, and work-related matters (DoDSER, 2012). Service members are at increased risk of exacerbation of deployment-related stress conditions (Institute of Medicine [IOM], 2014). There is a limited understanding of community integration in wounded service members (Currie, Day, & Kelloway, 2011) who also may experience unique challenges associated with community integration requiring additional support during the process of reintegrating into their pre-deployment roles (IOM, 2014).

Burn injuries are a ubiquitous threat in military environments (Atiyeh, Gunn, & Hayek, 2007). Historically, post-World War II, burns have accounted for 8-10 percent of casualties in military operations (Wolf et al., 2006). In modern warfare burn injuries continue to comprise a significant portion of combat and non-combat casualties, typically accounting for 5 to 20 percent of injuries during conventional conflicts (Cancio et al., 2005; Gomez et al., 2009; Kuvar, Cancio et al., 2006; Kuvar, Wade, & Baer, 2009). According to the Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI) Program, in 2008 a total of 53 fatal occupational injuries or one percent of all fatal occupational injuries in the U.S were suffered by members of the military that were stationed in the U.S. (Bureau of Labor Statistics [BLS] CFOI, 2008). The fatal injury rate for members of the military in 2007 was 5.5 fatalities per 100,000 compared to a rate of 3.8 for all workers (BLS, 2008). In military personnel that are deployed, burn injuries occur from direct enemy action during combat operations or as a result of non-combat situations, such as training accidents (Cioffi et al., 1991; Kuvar, Cancio et al., 2006). Burn injuries to military personnel may be further complicated because of concomitant injuries from wounds resulting from explosive devices (Kuvar, Wolf et al., 2006). With

the continued increase in effectiveness and destructive capability of military weaponry, fatal and non-fatal combat-related burn injuries (Atiyeh et al., 2007; Cioffi et al., 1991) and non-burn related multi-traumatic injuries (Aldini et al., 2011; Atiyeh et al., 2007) continue to rise.

Although the severity of combat burns remains high, overall mortality rates have decreased, and outcomes have improved as a result of advances in combat burn care and military protective equipment (Kuvar, Cancio et al, 2006). Kuvar and colleagues (2006) reported that a high percentage of military burn causalities were removed from their roles that support military operations for extended periods of time while receiving specialized burn care and rehabilitation. However, 68 percent of combat-related and 56 percent of non-combat related burn casualties return to military duty. Return to duty is the most frequently observed military disposition but many military personnel that return to duty post-burn injury continue to have medical restrictions, therefore limiting their abilities to perform military duties (Kuvar, Cancio et al., 2006). Such medical restrictions can ultimately affect military readiness.

Burn trauma also is a significant source of injuries within the civilian population. With improvements in burn care and rehabilitation in the U.S., the survival rate following burn injuries is 97 percent (ABA, 2016). The ABA (2016) reported an estimated 486,000 burn patients in the U.S. receive treatment in emergency departments annually. This estimate does not include patients that seek treatment at community health centers, private medical offices, or in urgent care settings (ABA, 2016). Approximately 40,000 burn patients that receive emergency treatment are hospitalized and of these, approximately 3,400 deaths occur annually (ABA, 2016). The BLS (2013) reported 3,160 nonfatal, work-related, heat-related environmental burn injuries, which was an overall

decrease from the 4,160 reported in 2012. Many of these injuries were sustained by men and occurred in the service, transportation, construction, and installation industries. Despite a decline in burn-related mortality (ABA, 2016) burns continue to be a public health concern in the U.S. (Cubbin & Smith, 2002).

Although the number of burn patients that suffer minor to moderate burn injuries receiving treatment in outpatient settings has increased (Moss, 2004), seriously injured military burn casualties and civilian burn emergencies require referral and transfer to a Burn Center. As previously stated, the USAISR Burn Center is unique in that it serves as the sole Department of Defense (DoD) facility and referral center caring for military burn casualties (Cancio et al., 2005; Kuvar, Cancio et al., 2006; Wolf et al., 2006). The USAISR also serves as a regional civilian Burn Center in south Texas, encompassing an area of 80,000 square miles with an approximate population of 3,212,019 in 2012 (Texas Department of State Health Services (TDSHS), 2014; Wolf et al., 2006). The USAISR Burn Center is the only Burn Center in the world that cares for both military and civilian burn patients with the same care protocols and the same burn staff. Therefore, because the USAISR provides primary burn care to two distinct populations, military and civilian burn patients, this study is unique for a variety of reasons, which are discussed in the statement of the problem section.

STATEMENT OF THE PROBLEM

Burn patients have often been excluded from traditional research studies because of the unique attributes of burn injuries such as the hyper-metabolic response and increased risk of infection (Palmieri & Klein, 2007). Moreover, there are a limited

number of burn patients admitted to burn centers (Holmes, 2008; Palmieri & Klein, 2007), which limits the scope of research that can be undertaken. Additionally, civilian burn centers usually do not provide primary burn care to military personnel suffering from burn injuries. Therefore, military burn patients are not included in multicenter collaborative burn research studies or the national burn registry database.

Initially, no single repository of burn outcomes existed. Therefore, researchers and providers relied on the reported incidence relating to burn profiles from a variety of fragmented sources because no single database at the state or national level captured accurate statistics such as burn incidence, causes, use of medical care, costs, and outcomes (Brigham & McLoughlin, 1996). The NIDRR was created in 1978 as one of three components of the Office of Special Education and Research (OSERS) within the U.S. Department of Education (U.S. Department of Education, n.d.). In 1994, the NIDRR established the Burn Model System to develop a comprehensive demographic and outcomes database to facilitate research about various functional and psychological outcomes post-burn injury. However, the NIDRR is not a population database because it includes only data from Burn Model System patients from participating institutions. The USAISR Burn Center is not part of the Burn Consortium and the NIDRR database contains no data about military or civilian burn patients treated at the USAISR Burn Center. Therefore, nothing is known about post-discharge QOL or community integration outcomes experienced by these patients.

This study is unique because military and civilian burn patients treated at the Military Burn Center post-hospitalization were compared. If no civilian patients were treated in the Military Burn Center then military burn patients' post-discharge outcomes could only be compared to patients from other burn centers, which may employ different levels of staffing and follow different care protocols. As previously stated, within the Military Burn Center both military and civilian burn patients are treated with the same staff and burn care protocols. A comparison of military and civilian burn patients treated in civilian burn centers is not possible because of the lack of military burn patients treated in the civilian sector.

This study also will benefit researchers and clinicians by increasing understanding of burn patients' post-discharge QOL and community integration over time. There are few longitudinal studies examining changes in burn survivors' perceptions of QOL and community integration following hospital discharge. Within the literature, most studies examining QOL outcomes in burn survivors are retrospective in nature (Altier et al., 2002; Cochran, Edelman, Saffle, & Morris, 2004; Jonsson, Schuldt, Linder, Bjornhagen, & Ekholm, 1997), requiring participants to recall perceptions of past traumatic experiences that may have occurred several years prior to the study. Furthermore, within the nursing literature, no critical or systematic review concerning QOL and community integration in burn patients was found and no studies were found examining QOL and community integration outcomes in military and civilian burn patients treated in the Military Burn Center. This lack of evidence represents a significant gap in the body of

knowledge about post-hospitalization QOL and community integration among burn patients. Examining longitudinal data, rather than data that rely on past traumatic memories of a burn injury will assist in understanding the course of recovery for burn survivors treated in the Military Burn Center.

Because nothing is known about QOL and community integration over time among and between both military and civilian burn patients treated in the USAISR Burn Center, this research consisted of three specific aims and two research questions within each aim:

1. Examine variations in perceptions of QOL and community integration among and between civilian and military burn patients over 18-months following discharge from the Military Burn Center.

   Research Question 1: What is the variation in military and civilian burn patients' perceptions of quality of life in the first 18-months post-discharge from the United States Army Institute of Surgical Research (USAISR) Military Burn Center?

   Research Question 2: What is the variation in military and civilian burn patients' perceptions of community integration in the first 18-months post-discharge from the USAISR Military Burn Center?

2. Examine relationships between individual characteristics and QOL and community integration among and between civilian and military burn patients over 18-months following discharge from the Military Burn Center.

Research Question 3: What is the relationship between individual characteristics and QOL among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?

Research Question 4: What is the relationship between individual characteristics and community integration among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?

CONCEPTUAL FRAMEWORK

The Roy Adaptation Model.

A conceptual framework serves to guide thoughts in developing knowledge through research (Fawcett, 2005; Fawcett, & Tulman, 1990). The Roy Adaptation Model is a conceptual framework that provides a foundation for the development of scholarly knowledge, the conduct of research, and the guidance of clinical practice (Barone & Roy, 1996). The use of the Roy Adaptation Model fosters organized, comprehensive research through: (a) increasing understanding of basic life processes that promote health and healing; (b) increasing understanding of coping processes during health and illness; and (c) increasing the enrichment of adaptive coping (Baron & Roy, 1996).

Within the literature, several researchers (Headley, Ownby, & John, 2004; John, 2001; Reis, Walsh, Young-McCaughan, & Jones, 2013) who focused on QOL outcomes used the Roy Adaptation Model as a conceptual framework to guide the research. The Roy

Adaptation Model is focused on enhanced interactions between people and their environments to promote adaptation (Boston Based Adaptation Research in Nursing Society (BBARNS), 1999; Roy, 2009) and was the conceptual framework selected by the PI of the "parent study" and therefore, it is the conceptual framework that was used to guide this proposed study (Yoder, 2005).

The Roy Adaptation Model is comprised of assumptions that are philosophic and were scientifically developed by Roy over time (Roy, 2009). The foundation of Roy's Adaptation Model is based on humanism and veritivity (Hanna, 2012; Roy, 2009). Roy (2009) defined humanism as the comprehensive movement in philosophy and psychology that distinguishes the individual and subjective dimensions of the human experience as central to knowing and valuing. Roy introduced the concept of veritivity as a conception of all knowledge being grounded as one. Within the Roy Adaptation Model, veritivity is the principle of human nature affirming a common purposefulness of human existence (Roy, 2009). Furthermore, the Roy Adaptation Model is both inductive and deductive; combining conceptualizations derived from Helson's (1964) adaptation-level theory with the foundation of the model based on assumptions from von Bertalanffy's (1972) general systems theory (Roy, 2009; Tolson & McIntosh, 1996). The contributions of adaptation-level theory serve as the basis for understanding that the individual as a system has the ability to adapt and create changes in the environment.

Military and civilian burn patients treated at the Military Burn Center are cared for by the same multidisciplinary burn care team using the same evidence-based

treatment protocols. However as previously stated, following discharge from the Military Burn Center, military beneficiaries have access to continued outpatient rehabilitation services whereas civilian burn survivors may lack similar access to rehabilitation options based on their insurance funding or the ability to pay for services. The ability of military and civilian burn survivors to access rehabilitative services post-discharge from the Military Burn Center may lead to a divergence in outcomes between the two groups subsequently affecting adaptation and QOL outcomes post-discharge.

Roy advocates for adaptation as an approach to describing people in terms of holistic human adaptive systems (Andrews & Roy, 1986; Roy, 2009; Roy & Roberts, 1981). She depicts people as biopsychosocial beings required to adapt to environmental stimuli and recommends a particular way to view human experiences and responses (Fawcett & Tulman, 1990; Roy 2009). Roy's view is that human adaptive systems possess thinking and feeling capacities, rooted in consciousness and meaning that allow for effective adjustment to environmental changes and in turn, affect the environment (Roy, 2009). For the purposes of the proposed study of changes in perception of QOL and community integration in military and civilian burn patients, key concepts of the Roy Adaptation Model was briefly discussed to explain how the conceptual framework was used to guide this proposed research. The key concepts in the Roy Adaptation Model that was discussed are focal and contextual stimuli and the four adaptive modes (Roy, 2009).

Within the Roy Adaptation Model, the individual is a human adaptive system that involves the complex interaction of inputs termed stimuli (Andrews & Roy; 1986; Roy,

2009). These stimuli are both internal (originating from within the self) and external (originating from the environment). Roy (2009) defined a stimulus as "that which provokes a response" (p. 62). Stimuli encompass all situations, circumstances, and influences that affect the development and behavior of an individual as a human adaptive system (Roy, 2009). Common stimuli affecting adaptation are: an individual's culture, health, socioeconomic status, ethnicity, age, gender, heredity, and genetic factors; the structure and task of family and aggregate participants; the integrity of adaptive modes and adaptation levels, perception, knowledge and skill; and environmental factors such as drug, alcohol, and tobacco use, and political or economic stability (Roy, 2009). According to the Roy Model, the environment incorporates three classes of stimuli: focal, contextual, and residual (Barone & Roy, 1996; Roy, 2009). According to the Roy Model, a person's response to a situation would be a function of the combined effect of the stimuli previously stated. People's responses are a function of their input stimuli and their adaptation level (Andrews & Roy, 1986).

In relation to focal stimuli, the individual focuses on the stimulus and expends energy. With the environment in a dynamic state, many stimuli are not elevated to a focal stimulus; subsequently they do not demand the attention of the person. Determining the type of stimulus may be challenging because a behavior in one adaptive mode may act as a focal stimulus in another and one focal stimulus can affect more than one adaptive mode (Roy & Andrews, 1991). The focal stimulus refers to a specific or central change, such as an acute illness. The *focal stimulus in this study was the burn injury*.

Contextual stimuli consist of all other stimuli present in a situation; however contextual stimuli are not the primary focus of the person's attention, rather they influence how the person deals with the focal stimulus. Therefore, limited energy is expended on contextual stimuli. Contextual stimuli in general are peripheral factors that influence the situation and are measurable (Barone & Roy, 1996; Roy, 2009; Tolson & McIntosh, 1996). *In this study, the contextual stimuli were the military or civilian status of the burn patients as well as their socio-demographic and clinical characteristics*. Residual stimuli are those environmental factors within or external to the human system or characteristics of individual or life situations that are present and relevant but difficult to quantify. The effect of these stimuli on the current situation are not clear (Roy, 2009; Tolson & McIntosh, 1996). These are possible influencing stimuli; however, attempting to measure such stimuli was outside the scope of this study.

According to Roy, adaptation to changing environments takes place in one biological and three psychosocial modes. The biological mode or the *Physiological Adaptive Mode* is concerned with how a person responds physically to stimuli from the environment. These are basic needs necessary to maintain the physical and physiological integrity of the human system. The *Psychosocial Modes* consist of the: (a) Self-Concept Adaptive Mode; (b) Role Function Adaptive Mode; and (c) Interdependence Adaptive Mode. The Self-Concept Adaptive Mode focuses on psychological and spiritual aspects of the person's conceptions of the physical and personal self. The Role Function Adaptive Mode is focused on the need to know who one is in relation to others and roles

occupied by a person in order to act as a functioning unit of society. The Interdependence Adaptive Mode focuses on interactions associated with giving and receiving love, respect, and value. The concern is on development and maintenance of fulfilling affectionate relationships with significant others. Additionally, the primary need within this mode is relational integrity or a feeling of security in nurturing relationships. Within the Interdependence Adaptive Mode, the focus is on two specific relationships: (a) significant others, which are people who are most important to the individual and (b) support systems, which are others contributing to meeting interdependence needs (Andrews & Roy, 1986; Fawcett & Tulman, 1990; Roy, 2009).

The Roy Model (2009), as used in this study, is depicted in Figure 1. The modes identified and defined by Roy (2009) are represented in the model as well as the variables under investigation in this study. The focal stimulus and the contextual stimuli
are depicted by in the two boxes in the upper left, the modes of adaptation are represented in the top two elongated ovals, the four adaptive modes are represented in the following four squares. The study variables are depicted in the parallelograms and the empirical indicators are shown in the rounded boxes. The focal stimulus was represented by the burn injury. Contextual stimuli consisting of the military or civilian status of the burn patient and demographic and clinical characteristics were measured using the Demographic and Clinical Data Sheets developed by the PI of the "parent study." In this study, functional status was an element of the Physiologic Adaptive Mode and was measured using the Physical Functioning Domain of the Medical Outcomes Study Short

Form-36 (SF-36) questionnaire. The Physical Functioning Domain was comprised of the Physical Functioning (limitations in physical activities because of health), Role–Physical Limitations (problems with work and daily activities because of health), Bodily Pain (severity of pain), and General Health Perceptions (evaluation of physical health and the likelihood of improvement) sub-scales of the SF-36 (Fauerbach, Lawrence, Munster, Palombo, & Richter, 1999; Lawrence, Faurebach, Eudell, Ware, & Munster, 1998; Ware & Sherbourne, 1992).

Role function was an element of the Physiologic Adaptive Mode and the Role Function Adaptive Mode and was be measured with the Physical Functioning Domain of the SF-36 and the Community Integration Questionnaire (CIQ). Roles in significant relationships are an element of the Role Function Adaptive Mode and the Interdependence Adaptive Mode and were measured with the Role-Physical Limitation (problems with work and daily activities because of health) sub-scale of the Physical Domain of the SF-36, the Social Functioning (interference with social activities due to physical and emotional health problems), and Role-Emotional Limitation (problems with work and daily activities as a result of emotional problems) sub-scales of the Mental Health Domain of the SF-36, and the CIQ.

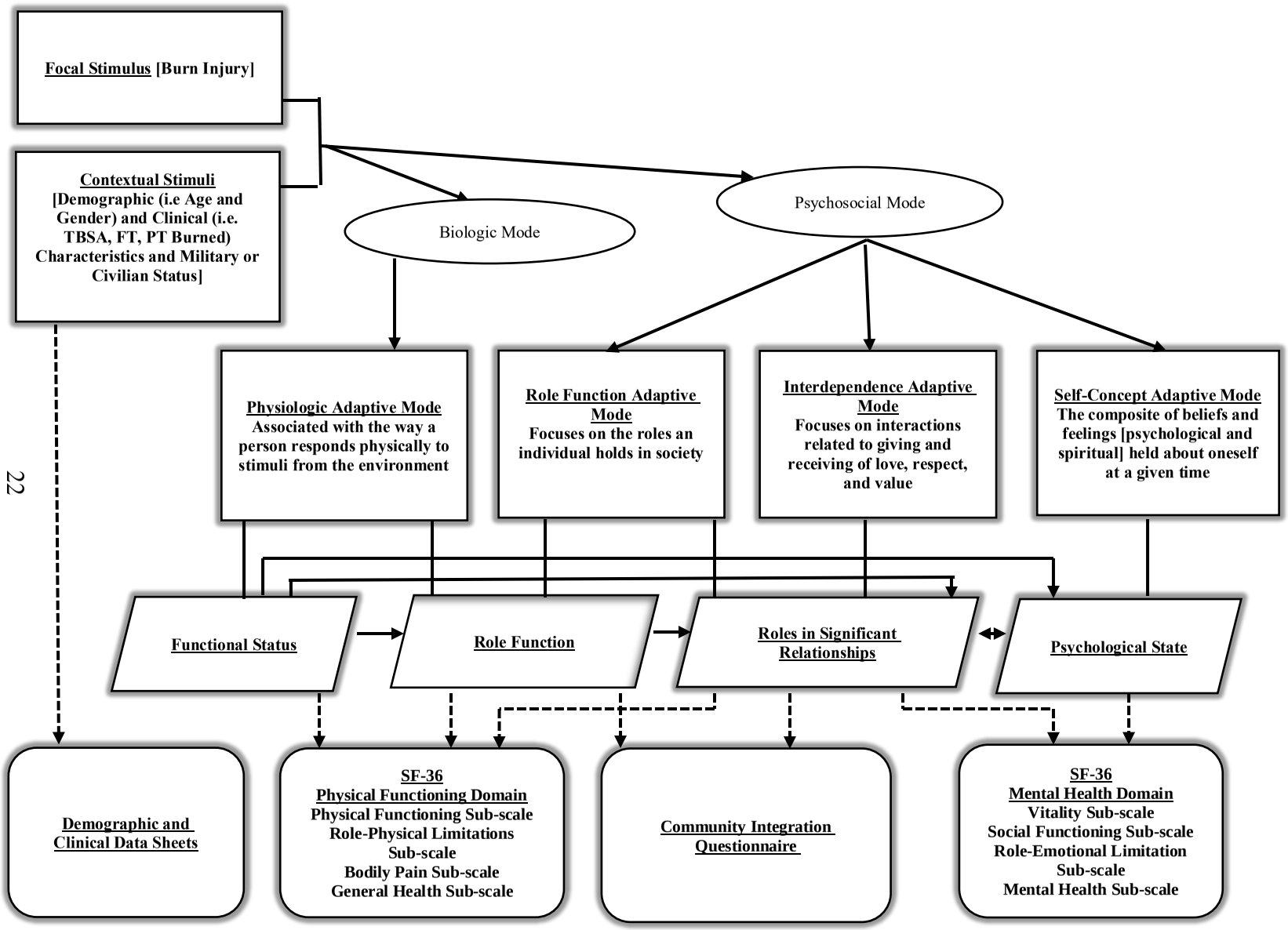


Figure 1. The Roy Model in Longitudinal Outcomes of Adult Burn Survivors: Proposed

The Self-Concept Adaptive Mode was represented by psychological state and was measured by items in the Mental Domain of the SF-36. The Mental Domain consists of the Vitality (energy level), Social Functioning (interference with social activities due to physical and emotional health problems), Role-Emotional Limitation (limitations in usual role and daily activities as a result of personal and emotional problems), and Mental Health (anxiety and depression) sub-scales of the SF-36 (Fauerbach et al., 1999; Lawrence et al., 1998; Ware & Sherbourne, 1992).

The arrows presented in the model represent the proposed nature of the relationships between the concepts based on the evidence in the burn literature, which may be unidirectional or bidirectional (reciprocal). The focal stimulus and the contextual stimuli were believed to exhibit a direct effect on the modes of adaptation and the four adaptive modes. The four adaptive modes provide the specific form or manifestation of coping responses and therefore are the effectors of adaptation (Roy, 2009; Roy & Roberts, 1981). Functional status was believed to have a relationship with role function, roles in significant relationships, and psychological state. Role function is believed to have a relationship with roles in significant relationships. Psychological state is believed to have a reciprocal relationship with roles in significant relationships. As a result of a stress reaction or stimulus, the body experiences a variety of responses between the burn survivors' physical and personal self therefore affecting the burn survivors' ability to respond to environmental stimuli (Roy, 2009). An individual's responses and behaviors can be observed in the four adaptive modes within the Roy Model. Data from this study

may add insight into the proposed nature of these relationships for burn patients treated in the Military Burn Center. Understanding these relationships may also provide insight into the rehabilitation outcomes of QOL and community integration experienced by burn patients treated in other ABA designated burn centers.

DEFINITIONS

The following theoretical and operational definitions clarify the major concepts in this study:

Quality of life is a multidimensional, subjective concept with no consensus definition. The domains of QOL under investigation in this study include: (1) physical; (2) psychological; (3) general symptoms; and (4) social concerns; (Aaronson, 1990; Cella, 1994; Cromes et al., 2002; Ferrell et al., 1991; King, 2003; Schipper, 1990). The physical and psychological domains of QOL were examined using the Medical Outcomes Study [MOS] Short-form 36 Version 1 [SF-36].

Community integration is a multidimensional concept divided into three related yet separate aspects of integration. These consist of: (a) integration into a home-like setting ranging from living in a spousal situation, living with family of origin, or living with unrelated others; (b) integration into a social setting or participating in a variety of activities outside the home; and (c) integration into regular performance of productive activities including participation in employment, education, and volunteer activities (Willer, Rosenthal et al., 1993). In this study, community integration was measured using the Community Integration Questionnaire [CIQ].

Focal stimulus is the internal or external stimulus most directly in the awareness of the individual or the object most prominent in consciousness (Roy, 2009). In this study the focal stimulus is the burn injury.

Contextual stimuli are all other stimuli contributing to the effect of the focal stimulus. These are all internal or external factors presenting to the individual that are not the center of attention and not requiring energy (Roy, 2009). In this study the primary contextual stimuli are the demographic and clinical characteristics of the burn patient as measured by the demographic and clinical data collection sheets and the military and civilian status of the burn patients.

ASSUMPTIONS

The assumptions made in the "parent study" apply to this study. These assumptions were:

1. Sustaining a burn injury is a stressful event (Elsherbiny, Salem, El-Sabbagh, Elhadidy, & Eldeen, 2011; Wisley, Wilson, Duncan, & Tarrier, 2010; WHO, 2012).
2. Quality of life and community integration present issues that are central to burn survivors' rehabilitation (Blakeney et al., 2007; Van Loey & Van Son, 2003).
3. All participants enrolled in the study reported information honestly on all instruments

CHAPTER SUMMARY

There is considerable evidence from the literature that burn injuries are traumatic events negatively affecting patients in a variety of life areas, thereby affecting QOL and community integration. There are numerous interrelated factors that must be considered for a greater understanding of perceptions of QOL and community integration in burn survivors over time. Moreover, adjustment post-burn also may be negatively affected by a person's inability to adapt physically and psychosocially post-burn. This study was a secondary data analysis using data from a larger "parent study" that examined QOL among burn patients, using the BSHS-A, the SWLS, the SF-36, and the CIQ after discharge from the USAISR Burn Center.

The purpose of this secondary analysis was to: (a) determine changes in perceptions of QOL among burn survivors over 18-months using the SF-36 data, (b) determine changes in perceptions of community integration among burn survivors over 18-months using the CIQ data, and (c) determine the strengths of the relationships between demographic and clinical variables, QOL, and community integration in military and civilian burn survivors over 18-months after discharge from the Military Burn Center. This study will contribute to the general body of science concerning QOL and community integration outcomes in burn survivors. It also provides one of the first longitudinal examinations of post-hospital burn outcomes experienced by patients treated in the USAISR Burn Center. Developing a greater understanding of burn survivors' ability to return to pre-burn levels of physical and psychosocial functioning is imperative. In doing so, better interventions for the optimal delivery of rehabilitative health care for burn survivors can be developed.

CHAPTER 2

REVIEW OF LITERATURE

Burn injuries range from minor burns to life-altering injuries that are complex in nature and may result in extended rehabilitation following discharge because of long-term physical and psychological complications (Esselman et al., 2006; Falder et al., 2009). With the integration of Burn Centers, improvements in resuscitation techniques, development of new pharmaceutical agents, and early grafting, total mortality associated with burn injuries has decreased (Esselman, 2007; Leblebici et al., 2006). Despite these improvements, burn survivors are faced with physical, psychological, emotional, and social challenges as a result of their injuries. Burn survivors may experience persistent difficulties adapting to alterations from their pre-burn lifestyles because of the challenges that result from their burn injuries (Esselman, 2007; Massman et al., 1999; Moi, et al., 2007; Moi et al., 2006; Van Loey, Faber, & Taal, 2001; Yoder, Nayback, & Gaylord, 2010). Ultimately, burn survivors, their families, and significant others may need to adapt to long-term alterations in all facets of their lives.

Because of the improvements in burn care, the focus has shifted to morbidity rather than mortality, with an emphasis on QOL and community integration outcomes post-hospitalization for burn survivors (Andrews, Browne, Drummond, & Wood, 2010; Esselman et al., 2006; Fauerbach et al., 2005; Stavrou et al., 2014). Following hospital discharge, many burn survivors require prolonged assistance to adjust to physical,

psychological, and social stressors resulting from such a life-altering injury. As previously stated, a greater understanding of changes in perception of QOL and community integration will enhance the goal of modern burn care; to aide burn survivors to overcome their challenges, achieve and return to the best QOL possible, and complete their community integration including work and school (Klein et al., 2007). Quality of life is complex, comprehensive, and ill-defined with numerous ways to perceive, define, or measure the concept (Costa et al., 2008; Novelli et al., 2009). This chapter provided abackground regarding burn injuries, an overview of QOL among burn survivors as measured by the SF-36, a discussion of community integration experienced by burn survivors and the contribution of demographic and clinical characteristics on QOL and community integration for burn survivors.

MEASURING QUALITY OF LIFE

The selection of a measurement instrument that accurately depicts objective and subjective indicators of QOL in burn survivors may be generic or disease-specific and instrument selection remains controversial (King, 2003). Generic instruments such as health profiles and utility measures may be used in a variety of chronic illnesses and are designed to measure the complete spectrum of dimensions relevant to QOL (King, 2003). One of the most widely used generic QOL instruments is a health profile instrument, the Medical Outcomes Study: 36-Item Short Form Survey (SF-36). This 36-item self-report health profile is not disease, age, or treatment-specific. As a generic instrument, the SF-

36 was designed to measure the contrast between physical and psychological dimensions (McDowell, 2006). The SF-36 includes effective screening for health status by comparing general and specific populations, comparing relative burden of disease, and differentiating health benefits associated with various treatments (Edgar, Dawson, Hankey, Phillips, & Wood, 2010; Edwards et al., 2007; Moi et al., 2006; Ware, 2000).

Findings from QOL studies using the SF-36 support the idea that a multidisciplinary approach to address physical and mental health problems is needed with burn survivors (Jonsson et al., 1997). The SF-36 has been used to measure QOL among burn survivors in multiple countries such as: (a) Canada (Anzarut et al., 2005), (b) Sweden (Jonsson et al., 1997), (c) Norway (Moi & Nilsen, 2012), (d) Australia (Jarrett, McMahon & Stiller, 2008), and (d) China (Xie, Xiao, Zhu, & Xia, 2013) and has been normalized against each country's general population. There is evidence within the literature that some researchers prefer to use generic objective measures of QOL such as the SF-36 because of the ability to effectively compare burn survivors with the general or uninjured population on post-burn outcomes (Cochran et al., 2004).

The SF-36 includes multi-item sub-scales that measure eight dimensions of QOL: (a) physical functioning, (b) role-physical limitations, (c) bodily pain, (d) general health, (e) vitality, (f) social functioning, (g) role-emotional limitations, and (h) mental health. The SF-36 also yields physical (PCS) and mental (MCS) health composite scores or summary measures (Haywood, Garratt, & Fitzpatrick, 2005; McHorney, Ware, Lu, & Sherbourne, 1994; McHorney, Ware, & Raczek, 1993; Ware, 2000; Ware & Sherbourne,

1992). The SF-36 has excellent psychometric properties that are well documented within the literature (McHorney et al., 1993; Moi et al., 2006; Ware et al., 1995).

Limitations were identified in several studies that used the SF-36 as a measure of general health and generic QOL in burn survivors within the literature. Among these limitations were: (a) small sample sizes (Cochran et al., 2004, Dyster-Aas, Kildal, & Willebrand, 2007; Xie et al., 2013); (b) few female participants (Anzarut et al., 2005); (c) mailed questionnaires (Cochran et al., 2004); (d) large amounts of missing data (Klein et al., 2011); and (e) samples consisting only of less severely burned participants (Edgar et al., 2010). Additionally, Dyster-Aas and colleagues (2007) found that there were differences in both the physical and mental domains of the SF-36 of one to six years' post-burn injury and the differences in the physical domain were more pronounced. The researchers also concluded these differences may be because the mental health items on the SF-36 may not adequately correspond to the psychological issues of burn survivors at various time points post-injury.

Within the literature there were a variety of studies that used the SF-36 and focused on a range of outcomes in burn survivors such as: (a) sleep disturbance (Lawrence et al., 1998); (b) body image dissatisfaction (Fauerbach, et al., 2000); (c) posttraumatic distress (Fauerbach, et al., 2000); (d) anxiety (Altier et al., 2002); (e) coping (Fauerbach Lawrence, Bryant, & Smith, 2002); and (f) depression (Thombs et al., 2007). There were 19 studies that used the SF-36 to measure QOL outcomes in burn survivors (Altier et al., 2002; Anzarut et al., 2005; Cochran et al., 2004; Costa et al.,

2003; Dyster-Aas et al., 2007; Edgar et al., 2010; Edwards et al., 2007 Jarrett et al., 2008; Jonsson et al., 1997 1997; Klein et al., 2011; Leblebici et al., 2006; Moi & Nilsen, 2012; Moi et al., 2006; Stavrou, Weissman, Tessone, Zilinsky, Holloway, Boyd, & Haik, 2014; Thombs et al., 2007; Ullrich, Askay, & Patterson, 2009; and Xie et al., 2013). However, there were no studies in the literature where the SF-36 had been used with military or civilian burn survivors treated in the Military Burn Center. Within the literature, the SF-36 findings are presented for the physical domain and mental domain.

SF-36 Physical Domain of Quality of Life

The Physical Composite Score (PCS) represents the physical domain of QOL and reflects changes in physical health perceived by the burn survivor. The sub-scales that comprise the PCS reflect alterations in physical functioning, role-physical limitations, bodily pain, and general health perception. The sub-scales and the PCS summary are the most valid SF-36 scales for measuring physical health (Ware, 2000). The lowest possible PCS score is indicative of limitations in self-care, physical, social, and role activities. Severe bodily pain and tiredness also would be present in addition to overall health being rated as poor (Ware & Gandek, 1998). The absence of physical limitations or disabilities or deficiencies in well-being in conjunction with high energy levels and an overall health status rating of excellent are indicators of the highest possible PCS score (Ware & Gandek, 1998). Of the studies that used the SF-36 to measure QOL outcomes in burn survivors, four measured both PSC and MCS (Cochran et al., 2004; Fauerbach et al.,

2005; Jonsson et al., 1997; Wasiak et al., 2014) summary and sub-scale scores. The remaining five studies used the SF-36 to measure either PCS or MCS (Altier et al., 2002; Anzarut et al., 2005; Edwards et al., 2007; Moi & Nilsen, 2012, Ullrich et al., 2009) summary and sub-scale scores.

In a follow-up study of 18 burn survivors one-year post-burn, Jonsson et al. (1997) found burn survivors had lower QOL scores in all SF-36 physical domain sub-scales. The lowest (worst) score was for bodily pain. Jonsson and colleagues (1997) identified that 10 percent of burn survivors required rehabilitation one-year post-burn injury despite early burn injury treatment and interventions that continued after discharge. The researchers concluded that burn survivors may benefit from individualized rehabilitative programs that are based on specific injuries and needs.

In a longitudinal study from the Burn Model System that examined recovery among survivors with major burn injuries at hospital discharge, six, and 12 months after burn injury Fauerbach and colleagues (2005) found participants with greater physical burden took substantially longer to improve compared to participants with small or medium physical burden levels. Physical burden was based on the TBSA burned, the presence of inhalation injury, facial burns, and hand burns. Moreover, participants were divided into three physical burden groups for evaluation. These three groups were based on patients with less than 10 percent TBSA burned, those with 10 percent TBSA burned, and those with greater than 10 percent TBSA burned. There were statistically significant differences of the burn patients at hospital discharge when compared to the normed

population. However, at 12-months the burn patients with small and medium physical burden levels returned to near normal physical sub-scale scores. At 12-months, participants with greater physical burden reported statistically significant lower mean PCS (40.3, $p < 0.05$) and mean physical functioning (60.8, $p < 0.05$) sub-scale scores when compared to the U.S. normed population (83.3). Although not statistically significant, participants with larger physical burden also reported smaller degrees of improvement in the SF-36 role-physical (53.0) and bodily pain (55.1) sub-scale scores. Burn survivors with larger physical burdens took longer periods of time to recover physical functioning. These findings indicated that the level of burden a burn patient experiences determines the rate and degree psychosocial and physical recovery for quite some time.

Compared with Canadian population norms, burn survivors in Canada had significantly lower SF-36 role-physical limitation (69.1 versus 82.1, $p = .0067$; *t* test, $p = < 0.05$) and general health perception (67.2 versus 77.0, $p = .00014$; *t* test, $p < 0.05$) sub-scale scores (Anzarut et al., 2005). Based on these results, the researchers concluded physical disability in burn survivors as measured by role-physical limitation and perceptions of general health were related to lower QOL outcomes due to the size of total FT burn compared to TBSA burned (Anzarut et al., 2005).

Similarly, in a longitudinal study supported by Burn Model Systems funding aimed at predicting limitations in physical functioning in U.S. burn survivors of serious burn injuries, Edwards et al. (2007) found that a higher percentage of total body surface

area grafted (TBSG) (p = .02) was significantly associated with physical disability. Participants were assessed at discharge and at six months, one year, and two-year follow-up appointments. They found that greater TBSAG (p = .005) was significantly associated with greater pain and greater TBSAG (p < .05) was predictive of lower SF-36 role-physical sub-scale scores. (Edwards et al., 2007).

Ullrich and colleagues (2009) reported that SF-36 bodily pain and physical function sub-scale scores increased from one-month to one-year after discharge from a Burn Center (p < .01 respectively) but did not improve between the one and two-year time points. The researchers found that when controlling for physical functioning one year after receiving burn care, SF-36 bodily pain sub-scale scores were significantly associated with physical functioning (β = .25, p = .05) scores two-years post-burn care. The researchers identified pain as a risk factor for alterations in function post-burn injury and concluded pain may have an interactive effect on physical functioning, which varies based on time post-burn injury.

In summary, regardless of early burn treatment and interventions burn survivors require rehabilitation for a substantial period (up to one year) following burn injury. Burn survivors that suffered more severe burn injuries and greater physical burden experienced poorer physical QOL outcomes compared to burn survivors with less burn severity and physical burden. Burn survivors with greater physical burden required extensive recovery and rehabilitation periods compared to burn survivors with less burn severity and physical burden. Furthermore, the level of burden experienced by burn survivors greatly

affects their physical and psychosocial recovery over time. Burn survivors with greater total FT burned also had worse physical and general health perceptions compared to the normed population, which resulted in poorer physical QOL outcomes. Total body surface area grafted and pain also were associated with poorer physical QOL outcomes in burn survivors. Pain also may have an ongoing interactive effect on physical functioning.

SF-36 Mental Domain of Quality of Life

The Mental Composite Score (MCS) reflects changes in mental health perceived by the burn survivor. The sub-scales that comprise the MCS reflect alterations in vitality, social functioning, role-emotional limitations, and mental health. The MCS summary measure and mental health, role-emotional, and social functioning sub-scales were shown to be the most valid of the SF-36 scales as mental measures, which were reproduced in cross-cultural and longitudinal tests (Ware, 2000).

In a follow-up study of 18 burn survivors' one-year post-burn, Jonsson and colleagues (1997) found burn survivors reported lower QOL scores in all SF-36 mental domain sub-scales when compared to the normed Swedish population. They reported that overall QOL was lower in burn survivors compared to the normal population. However, the researchers noted that it was unclear if the differences in QOL scores were related to the burn injury or a possible pre-injury behavioral health diagnosis such as personality disorder or major depression.

Fauerbach and colleagues (2005) used a one-way analysis of variance to compare pre-burn levels of the SF-36 MCS summary and sub-scales scores between risk levels of psychological burden. They found that SF-36 pre-burn MCS summary and sub-scale scores were significantly different compared to U.S. population mean scores. The SF-36 MCS summary (43.6, p <.001), role emotional (71.4, p < .001) social functioning (74.5, p <.001), and mental health (66.8, p < .001) sub-scales scores were significantly lower in burn survivors with high distress psychological burden compared to U.S. norms. Burn survivors with high psychological burden had lower (worse) SF-36 mental domain (MCS summary and sub-scale scores) at hospital discharge and one year compared to the U.S. normed population. Moreover, the high distress group had overall SF-36 MCS summary and sub-scale scores that were significantly worse than the low distress group. The researchers also found the rate of improvement in MCS scores was significantly slower in burn survivors with high psychological burden compared to those with low psychological burden (-0.1 vs 3.1, p = .002 respectively). Therefore, one can conclude that the degree of burden/distress experienced by burn survivors determines the level of psychosocial recovery.

In a study of 95 adult burn patients, Moi and Nilsen (2012) explored pathways leading to self-perceived general health and overall QOL in burn survivors and found that the SF-36 mental health sub-scales scores of vitality (R^2 =0.62, p < 0.001) and social functioning (R^2 = 0.69, p < 0.001) were significantly associated with the SF-36 general health perception sub-scale scores. Furthermore, the vitality sub-scale score (R^2 = 0.66,

$p < .001$) remained as the only significant factor associated with the overall SF-36 QOL scores. In the final model, the adjusted analysis explained 49 percent of the variance. Based on their findings, the researchers concluded that burn survivors perceived their QOL as related to vitality and their symptoms.

In a study of predictors of health status and QOL 12-months post-burn, Wasiak et al. (2014) found that FT burn (-0.32, $p = 0.019$) was a significant univariate predictor of 12-month SF-36 MCS scores in burn survivors. They reported pre-burn MCS ($R^2 = 0.342$, $p = < 0.001$) scores also were multivariate predictors of 12-month post-burn SF-36 MCS scores in burn survivors. Although burn survivors with complex psychosocial impairments and/or pre-existing psychiatric illness were excluded due to anticipated difficulties in maintaining follow-up, based on the results of the study burn survivors with lower mental health status scores pre-burn also had lower SF-36 MCS scores at 12-months.

In summary, although some studies rated perceptions of QOL prior to burn injury with the SF-36, at the time of discharge, most burn patients scored worse on the sub-scales of the SF-36. Patients with lower physical and psychological burden and/or distress were improved at 6-months and demonstrated results nearly equal to the normed population at one year whereas, the patients with high psychological burden continued to do worse that the normed population. Furthermore, SF-36 mental health scores are related to the amount of physical burned experienced by burn patients and their QOL outcomes. In burn patients, there are inconsistencies within the literature in reported psychological

outcomes and overall SF-36 sub-scale scores. Although burn survivors reported adjusting relatively well to their burn injuries, there is evidence that burn injuries negatively affect physical psychological, and overall QOL outcomes in burn survivors. Moreover, burn survivors indicated bodily pain was significantly associated with physical functioning; vitality and social functioning were significant factors associated with general health perceptions and vitality played a significant role in overall QOL following burn injury.

Demographic characteristics

There are factors that may have an effect on outcomes associated with burn rehabilitation among which are demographic characteristics (Tang et al., 2016). A demographic characteristic that may have a significant effect on overall QOL outcomes experienced by burn survivors is age. Eight studies demonstrated a relationship between age (Altier et al., 2002; Anzarut et al., 2005; Edwards, et al., 2007; Klein et al., 2011; Moi et al., 2006; Moi & Nilsen, 2012; Wasiak et al., 2014; Xie et al., 2013) and QOL outcomes in burn patients.

Age as related to SF-36 PCS Scores

Altier and colleagues (2002) conducted a study where 49 burn survivors were matched with 49 healthy volunteers. The results demonstrated that among the older burn patients age was negatively correlated with physical function (r = -0.21, p < 0.001), suggesting that older burn survivors tended to be more limited in performing physical

activities. However, the older healthy volunteers in the control group did not experience similar physical limitations therefore; the limitations experienced by burn patients are related to their burn injury and not their age.

In a study of 95 Norwegian burn survivors questioned approximately 47-months post injury, Moi et al. (2006) found that when adjusting for age, burn survivors had significantly lower scores than the normed population in the SF-36 physical functioning (78.9, $p < 0.001$), role-physical limitation (68.0, $p < 0.01$), and general health (67.4, $p < 0.001$) sub-scales. The researchers found that although burn survivors reported overall QOL outcomes comparable to the normed population, study participants had consistent limitations in performing self-care and physical activities such as running, lifting, problems related to their work, and their daily activities. Based on these results, burn survivors reported significant limitations in performing routine physical and work activities due to their physical limitations.

As previously stated, when Edwards and colleagues (2007) used Generalized Estimating Equations (GEE) to predict SF-36 bodily pain and role-physical limitation sub-scale scores among U.S. burn survivors over a two-year follow-up period. They reported older age was strongly associated with greater pain ($p < .01$) and greater role physical limitation. Based on these study findings, younger age is associated with better physical and mental QOL outcomes in burn survivors.

In a study that examined burn outcomes in patients age 55-years and older, Klein and colleagues (2011) found the majority of improvement in PCS scores within the first

six-months following discharge occurred in the 55-64 and 65-74 aged groups respectively. Patients 75-years and older required more time to demonstrate significant functional improvements in SF-36 PCS summary scores and continued to make significant improvement up to 12-months post-discharge. These findings suggest an age-related recovery trajectory indicating that longer periods of rehabilitation may be beneficial in older adults to achieve maximum functional improvements.

In a study of 99 Australian burn patients and characteristics that predict health status and post-burn QOL outcomes, Wasiak and colleagues (2014) reported that SF-36v2 PCS (51.8; SD = 12.6) scores at 12-months post-burn were significantly worse compared to SF-36v2 PCS pre-injury (55.6; SD =9.2) scores. They also found that younger age (R^2 = 0.401, p < .001) was a univariate predictor of better physical health status 12-month post-burn. Based on the results of a multivariate analysis, younger age (R^2 = -0.26, p < 0.001) also was a significant predictor of better physical health status 12-months post-burn.

In summary, older survivors of burn injuries reported greater limitations in physical outcomes, therefore negatively affecting overall QOL outcomes. Although burn survivors, aged 55 to 74 years of age exhibited the greatest physical improvement in the first six months post-burn, burn survivors aged 75-years or older reported longer recovery periods in relation to physical outcomes but continued to show improvement up to 12-months post-burn. Based on these results, this age group may benefit from longer periods

of physical rehabilitation. Although younger age in burn survivors was the strongest predictor of improved physical QOL outcomes following burn injury.

Age as related to SF-36 MCS Scores

In a Canadian study, Anzarut and colleagues (2005) reported that overall survivors of severe burn injuries reported good QOL outcomes in the sub-scales that comprise the SF-36 mental domain. They found that younger age at the time of burn injury was a strong independent predictor of improved QOL after a major burn injury. Also, a demonstrated decrease in age of nine years was associated with a clinically significant improvement in the SF-36 MCS scores. However, it is important to note that the patients in this study were approximately 28 years old (SD +/- 1.8).

In a study of 95 Norwegian burn survivors questioned approximately 47-months post injury, Moi et al. (2006) found that when adjusting for age, burn survivors had significantly lower scores than the normed population in the general health perception (67.4, $p < 0.001$), social functioning (79.2, $p < 0.001$), and role-emotion limitations (73.1, $p < 0.001$) sub-scales. However, burn survivors' scores in the vitality (57.0), bodily pain (72.5), and mental health (75.3) sub-scales were not different compared to the normed Canadian population. Based on these result, burn survivors perceived their social and emotional health hindered their social activities.

In a 2007 longitudinal study supported by Burn Model System grants, Edwards and colleagues used Generalized Estimating Equations (GEE) to predict SF-36 vitality

sub-scale scores among U.S. burn survivors over a two-year follow-up period. They found older age was strongly associated with greater vitality (fatigue). Based on these results, younger age was associated with better mental QOL outcomes in burn survivors.

In a study that examined burn outcomes in patients age 55-years and older, Klein and colleagues (2011) reported for the two youngest groups (aged 55 to 74 years) the recovery trajectory showed the maximum improvement in SF-36 MCS summary scores did not occur until two years following burn injury. However, for participants aged 75 years and older, the largest improvement in mental status occurred within six months post-burn and remained constant over the next 18-months. They reported that although the MCS scores of the SF-36 varied by age at time of discharge and there was minimal improvement between the three groups, the drop in SF-36 MCS scores at discharge resulted in a significant age group effect that was present over the course of the study. Overall the 64 to 75 age group and the 75 and older age group had better MCS scores than patients in the youngest cohort (55 to 64 years of age) (Klein et al., 2011).

In a longitudinal study evaluating generic health status and overall QOL in burn survivors, Moi & Nilsen (2012) found, when adjusting for age, burn patients had significantly worse SF-36 social functioning (79.2; $p < 0.001$) and role-emotional (73.1; $p = < 0.001$) sub-scale scores compared to the normed population. They reported there was a statistically significant negative correlation between age and general health on the SF-36 ($r = -.20$, $p < .05$). Participants were enrolled in this study over a period of 47-

months post-burn injury and generic health as evaluated by the SF-36 remained significantly lower compared to the normed population.

In a cross-sectional study to evaluate QOL outcomes in 20 Chinese burn survivors with greater than 70 percent TBSA burn, Xie and colleagues (2013) reported SF-36 MCS scores were correlated with age at the time of the burn injury (r = .43, p = .06). Based on results of multiple linear regression analysis, age at time of burn injury (R^2 0.622; p = 0.037) was correlated with SF-36 MCS scores. Based on these results, older Chinese burn survivors QOL outcomes were not satisfactory and were significantly worse when compared to the normed Chinese population.

In a study of predictors of health status and QOL in Australian burn survivors 12-months post-burn, Wasiak et al. (2014) found that age (-0.15, p = 0.010) was a significant univariate predictor of 12-month SF-36 MCS scores in burn survivors. They also reported age [R^2 = 0.26, p = <0.001] as a strong multivariate predictor of QOL outcomes based on the SF-36 MCS scores 12-months post-burn. The researchers also reported that pre-burn SF-36 MCS scores were predictive of 12-month SF-36 MCS scores, which indicate burn survivors experiencing lower (worse) mental health outcomes 12-months post-burn also were experiencing lower mental health status prior to suffering a burn injury.

In summary, older survivors of burn injuries reported greater limitations in physical outcomes, therefore negatively affecting overall QOL outcomes. Younger age in burn survivors was the strongest predictor of improved physical and mental QOL

outcomes post-burn injury. Despite this, younger burn survivors experienced the greatest improvement in psychological QOL outcomes two years following burn injury whereas older burn survivors exhibited improved mental QOL outcomes in the first six months post-burn with continued improvement over time. However, burn survivors, aged 75-years or older reported longer recovery periods in relation to physical outcomes, indicating this age group may benefit from longer periods of physical rehabilitation.

Injury-related Characteristics

The most often reported injury-related variables related to QOL outcomes in burn survivors are total body surface area (TBSA) burned (Altier et al., 2002; Anzarut et al., 2005; Fauerbach et al., 2005; Jarrett et al., 2008; Xie et al., 2012; Wasiak et al., 2014), total body surface area-full thickness (TBSA-FT or FT) burned (Anzarut et al.,, 2005; Dyster-Aas et al., 2007; Moi et al., 2006; Wasiak et al., 2014), length of stay-days (LOS) (Cochran et al., 2004; Anzarut et al., 2005; Mio & Nilsen, 2012; Xie et al., 2012; Wasiak et al., 2014).

Total Body Surface Area Burned (TBSA) as related to SF-36 PCS Scores

Fauerbach and colleagues (2005) found burn survivors with smaller (8.2 versus 5.3, $p = .03$) and intermediate (9.3 versus 5.3, $p = .003$) physical burden had less physical impairment and significantly faster improvement in PCS levels. They also found that burn survivors with the greatest physical burden (> 30%) exhibited slower increments of improvement on the SF-36 physical functioning (17.6; $p = < .0001$), role-physical (15.8;

p = .01), and bodily pain (9.6 (p = .02) sub-scale scores as well as SF-36 PCS summary scores. Furthermore, physical functioning returned to near normal levels at one year in people with smaller burns but not in the group with the largest injuries. Based on these results, larger burns impeded the rate of recovery for physical health and QOL outcomes related to physical functioning.

In a longitudinal study conducted over a 12-month period that measured physiotherapy-related outcomes in 86 Australian burn survivors, Jarrett and colleagues (2008) found that TBSA burn dichotomized as ≤ 10 percent and > 10 percent had a significant effect on results. Overall, participants in the > 10 percent group had lower SF-36 (F = 8.5, p = .005) scores compared to the participants in the ≤ 10 percent group. They also reported burn survivors with TBSA > 10 percent had significantly worse SF-36 total ([discharge 39.7, 1-month 61.0, 3-month 64.8; F = 62.6, p = .000]) scores compared to SF-36 total (admission 71.2) scores). Furthermore, burn survivors reported worse SF-36 PCS ([discharge 34.5, 1-month 58.7, 3-month 63.1; F = 83.2, p = .000]) summary scores. Burn survivors' SF-36 scores had returned to near baseline by six months post-burn, which may be the result of fewer burn survivors that suffered more severe burn injuries.

In a study of 20 Chinese patients with greater than or equal to 70 percent TBSA burned, Xie et al (2013) found differences in the SF-36 scores among burn survivors and the standard population of Mainland China. Compared to the general population, burn survivors had significantly lower SF-36 physical functioning (54.5, p <.001), role-physical limitations (26.2, p < .001), and bodily pain (66.3, p <.001), sub-scale scores

Because the burn survivors' SF-36 scores were significantly worse than the standard Chinese population, the researchers concluded that the findings demonstrated that the QOL of burn survivors who suffered severe burn injuries were not satisfactory and their QOL outcomes were significantly worse compared to the standard Chinese population.

Wasiak et al. (2014) demonstrated less TBSA burned (R^2 = -0.26, p = 0.006) was predictive of better physical health status at 12-months post-burn as demonstrated by higher SF-36v2 PCS scores. Total body surface area burned also was not an independent predictor in the final multivariate model. Fifteen participants did not complete the SF-36v2 at each (pre-burn and 12-months post-burn) data collection point. These 15 participants had a significantly higher, (p = 0.01), TBSA burned compared to participants with complete data. Based on these results, the researchers concluded that generalizability of the study results were limited because burn survivors with significantly greater TBSA burned had incomplete data on the SF-36v2.

Total Body Surface Area Burned (TBSA) as related to SF-36 MCS Scores

Leblebici and colleagues (2006) also reported that TBSA burned was negatively correlated with two of the SF-36 mental domain sub-scales. These were the SF-36 vitality (r = -.586, p = .03) and role-emotional limitations (r = -.805, p = .00) sub-scales. Based on the results, although there was no relationship between TBSA burned and QOL outcomes related to physical function, greater TBSA burned was associated with poorer psychosocial QOL outcomes in burn survivors.

As previously mentioned, in a longitudinal study conducted over a 12-month period that measured physiotherapy-related outcomes in 86 Australian burn survivors, Jarrett and colleagues (2008) found that TBSA burn dichotomized as ≤ 10 percent and > 10 percent had a significant effect on results. The researchers reported that overall, participants in the > 10 percent group had lower SF-36 (F = 8.5, p = .005) scores compared to the participants in the ≤ 10 percent group. They also reported burn survivors with TBSA > 10 percent had significantly worse SF-36 total ([discharge 39.7, 1-month 61.0, 3-month 64.8; F = 62.6, p = .000]) scores compared to SF-36 total (admission 71.2) scores). Burn survivors also reported worse SF-36 MSC ([discharge 50.5, 1-month 65.0, 3-month 65.7; F = 23.8, p = .000]) summary scores. By the six-month measurement period, burn survivor's SF-36 scores had returned to near baseline, which may be the result of fewer burn survivors that suffered more severe burn injuries.

In a study of 20 Chinese patients with greater than or equal to 70 percent TBSA burned, Xie et al (2013) found differences in the SF-36 scores among burn survivors and the standard population of Mainland China. Compared to the general population, burn survivors had significantly lower scores in SF-36 social functioning (66.2, p < .001) and role-emotional limitations (33.3, p < .001) sub-scales. Because the burn survivors' SF-36 scores were significantly worse than the standard Chinese population, they that the findings demonstrated that the QOL of burn survivors who suffered severe burn injuries were not satisfactory and their QOL outcomes were significantly worse compared to the standard Chinese population.

Total Body Surface Area-Full Thickness Burn (TBSA-FT or FT) as related to SF-36 PCS Scores

From the results of a univariate analysis, Anzaurt and colleagues (2005) found that TBSA-FT burned was significantly negatively correlated with SF-36 PCS scores (r = -0.390, p = < 0.01) and predicted SF-36 PCS scores at follow-up (R^2 = 15%, p <.001). Full thickness injury also was the only variable included in the final partial model. Using stepwise regression, total FT was a significant predictor of SF-36 PCS summary scores at follow-up with the partial and complete model predicting 15 percent ($p < 0.001$) of total variability in SF-36 PCS summary scores. Based on the results of the study, the researchers concluded that burn survivors that suffered severe burn injuries experienced QOL outcomes comparable to those of the normed population. They found that TBSA-FT burned was the strongest predictor of physical QOL in burn survivors. Furthermore, an increase in total FT injury of 7% was associated with a clinically significant decrease in the SF-36 PCS score.

In a subsequent study of 86 Swedish burn survivors with an average TBSA burned of 17.5% (SD 15.3, range 0.1-80.0%) with a TBSA-FT or 7.9% (SD 11.2, range 0-48%), Dyster-Aas et al. (2007) reported burn survivors who had a greater percentage of FT injury had a lower likelihood of returning to work compared to those with smaller percentages of TBSA-FT burned. Based on the results, the researchers concluded burn survivors who were not working compared to those that returned to work had lower QOL outcomes.

The presence of a FT injury was associated with significantly lower scores in physical function, role-physical limitations, and general health sub-scale scores. Therefore, the researchers concluded that the presence of a FT injury may be a greater threat to long term QOL than TBSA burned (Moi et al., 2006). Wasiak et al. (2014) demonstrated lower FT burn severity was predictive of better physical health status at 12-months post-burn (R^2 = -0.71, $p < 0.001$) as demonstrated by higher SF-36v2 PCS scores compared to TBSA burned alone. They also reported that FT burn severity was a predictor of better mental health status 12-months following burn injury (R^2 = -0.32, p = 0.019). Full-thickness burn severity also was a multivariate predictor of 12-month post-burn SF-36v2 PCS scores (R^2 = -0.51, p = 0.009) and 12-month SF-36v2 MCS scores (R^2 = -0.36, p = 0.033) (Wasiak et al., 2014).

Total Body Surface Area-Full Thickness Burn (TBSA-FT or FT) as related to SF-36 MCS Scores

The final partial and complete model predicted 25 percent ($p < 0.001$) and 44 percent ($p < 0.001$) of total variability in the SF-36 MCS summary scores (Anzarut et al., 2005). Wasiak et al. (2014) reported that FT burn severity was a predictor of better mental health status 12-months following burn injury (R^2 = -0.32, p = 0.019). Full-thickness burn severity also was a multivariate predictor of 12-month post-burn SF-36v2 MCS scores (R^2 = -0.36, p = 0.033).

Length of Hospital Stay (LOS) as related to SF-36 PCS Scores

Anzarut et al. (2005) reported LOS as being significantly correlated with SF-36 PCS (r = -.313, $p < 0.05$) summary scores. However, based on the results of multivariate analyses, Anzarut and colleagues (2005) found LOS was not a predictor of QOL outcomes in burn survivors. In a study to identify concepts related to QOL in burn survivors, Moi and Nilsen (2012) reported LOS was the best indicator of physiological health. Based on the results of the study, LOS was related to greater TBSA burned and complications that were associated with long-term effect on symptoms, functioning, and health.

Xie and colleagues (2013) demonstrated hospital LOS was significantly correlated with SF-36 PCS (r =.40, p =.08) scores. They reported LOS was positively correlated with PCS scores and concluded (related to age at time of injury) that burn survivors experienced better QOL outcomes with greater LOS during the initial hospitalization. In a study of predictors of health status and QOL 12-months following severe burn injury, Wasiak and colleagues (2014) reported higher SF-36v2 PCS scores were predicted by shorter hospital (R^2 = -0.24, p = 0.001) stay. They also found LOS was not a predictor in multivariate models of 12-month SF-36v2 PCS scores in burn survivors.

Length of Hospital Stay (LOS) as related to SF-36 MCS Scores

Xie and colleagues (2013) reported hospital LOS was significantly correlated with SF-36 MCS (r = .53, p = .02) scores. They reported LOS was positively correlated with MCS scores and concluded (based on age at time of injury) that the longer the duration of the initial hospitalization, the better the QOL outcomes of the burn survivors. In summary, although there is evidence within the literature that clinical characteristics such as TBSA burned have a significant effect on QOL outcomes, the evidence is not consistent. It is also unclear as to which clinical variables exert the largest negative effect on QOL. Therefore, continued research is needed to evaluate the effect of clinical variables on QOL outcomes after a burn injury.

COMMUNITY INTEGRATION

Prior to the 1980's, survival was a successful outcome for burn survivors. However, because of advances in burn rehabilitation, burn survivors have rehabilitative expectations that reach far beyond traditional standards achieved by earlier rehabilitation outcomes (Besemann, 2011). Community integration has been a focus for researchers and clinicians for more than three decades since the WHO emphasis on community participation (McColl, Davies, Carlson, Johnston, & Minnes, 2001; WHO, 1981). Although community integration may be the ultimate goal of survivors of disabling injuries (Salter, Foley, Jutai, Bayley, & Teasell, 2008), confirming that community integration has been achieved following rehabilitation is difficult because of a continued

lack of consensus regarding the definition and measurement of community integration (McColl et al., 2001; McGrew, Johnson, & Bruinninks, 1994).

Community integration and the associated social anxiety and social strain are primary concerns for burn survivors (Blakeney et al., 2007) and the evaluation of community integration is a meaningful outcome criterion in survivors of burn injury (Esselman et al., 2001). However, there is a dearth of evidence related to community integration post-burn injury. Within the literature various terms, such as community reintegration and community re-entry have been used interchangeably with community integration (Willer, Linn, & Allen, 1993). Although such terms were commonly used, they rarely were operationally anchored or used with clarity; therefore, a clear definition remains elusive. Despite the continued focus on the concept within the literature, there remains no consensus among researchers or clinicians regarding a clear definition of community integration (McColl et al., 1998; McColl et al., 2001).

In a qualitative study to expand on the conceptualization of community integration McColl et al. (1998) specified the most operational definition for communicating the magnitude of community integration was having something to do; somewhere to live; and someone to love. Esselman et al. (2001) defined community integration as the ability to participate in one's expected community role at home, participating in both leisure community activities and productive activities such as work, school, or volunteering. Dijkers (1999) defined community integration as: acquiring or resuming age and gender, culture-appropriate activities that include independence/

interdependence in decision-making and productive behaviors carried out through participation in complex relationships with family, friends, and others in a community setting.

In an overview of the conceptualization of community integration Yasui and Berven (2009) concluded community integration is a function of various factors (individual and contextual) involving multiple dimensions (physical, social, and psychological). Moreover, the researchers found the importance of relationships with families, peer groups, and neighborhoods were significant factors in community integration as was the degree of independence, the importance of environment, and the importance of having productive and leisure "things to do" (McColl et al., 1998; Yasui & Berven, 2009). For the purposes of this study, community integration is defined as integration into a home-like setting, into a social network, and into productive activities such as employment, school, or volunteer activities (Willer, Rosenthal, Kreutzer, Gordon, & Rempel, 1993).

Within the literature there is evidence supporting the general consensus that community integration is a multifaceted concept, which may include a variety of experiences, elements, or domains such as: (a) a home-like setting (Willer, Rosenthal, et al. 1993); (b) relationships with others (personal, family, and social) (McColl et al., 1998; Sander, Clark, & Pappadis, 2010; Willer et al., 1993); (c) development of living skills and independence in one's living situation (Esselman et al., 2001; McColl et al., 1998; Sander et al., 2010); (d) productive activities (work and school) (Esselman et al., 2001;

McColl et al., 1998; Sander et al., 2010; Willer et al., 1993); and (e) leisure activities and volunteerism (Esselman et al., 2001; McColl et al., 1998; Willer et al., 1993). Despite consensus about possible elements, the majority of discussions and studies about community integration do not provide a definition, a systematic listing of dimensions or components of the concept. Therefore, this places the responsibility on the reader to surmise a definition based on the issues covered in an article or indicators/variables used in a study (Dijkers, 1999). Complete community integration has often been characterized within the literature as consisting of three main areas: (a) employment or other productive activities such as school; (b) independent living or being active in one's role at home; and (c) social activities such as leisure, recreation or volunteering (Esselman et al., 2001; Sander et al., 2010).

MEASURING COMMUNITY INTEGRATION

Common instruments used to measure community integration include the Craig Hospital Assessment and Reporting Technique (CHART) (Whiteneck, Charlifue, Gerhart, Overhosler, & Richardson, 1992), the Community Integration Questionnaire (CIQ) (Willer, Linn, et al., 1993), and the Community Integration Measure (McColl et al., 2001). The CIQ is the tool most widely used to assess community integration (Cummins & Lau, 2003) and can be completed quickly and easily by most individuals; it places relatively low burden on participants. In addition to being used in burn survivors, the CIQ has been used extensively to measure outcomes in individuals with other

debilitating conditions such as: spinal cord injury (Gontkivsky, Russum, & Stokic, 2009) and neurologic conditions (Siegert, Jackson, Playford, Fleminger, & Turner-Stokes, 2014). From a review of the burn literature, no studies were identified where the CIQ has been used with military burn survivors or patients treated in the Military Burn Center, USAISR. Therefore, this study fills an important gap in the literature.

The CIQ was proposed as a brief assessment of community integration or the degree to which an individual is capable of executing appropriate roles within the home and community (Colantonio, Dawson, & McLellan, 1998; Willer et al., 1993). The CIQ was developed as a measure of reduced handicap based on the WHO definition of handicap. According to the WHO (1981) handicap is a disadvantage for an individual, because of an impairment or disability that limits or prevents the fulfillment of a role that is normal (depending on age, gender, and social and cultural factors) for that individual. There were few instruments available that specifically addressed the six specific areas of role function identified by the WHO that can be affected by handicap: (a) orientation, (b) physical independence, (c) mobility, (d) occupation, (e) social integration, and (f) economic self-sufficiency (Willer, Lin, & Allen, 1993; Willer et al., 1993).

For the purpose of developing an instrument to measure community integration, community integration was viewed as the inverse of handicap, that is, effective role performance in community settings (Willer et al., 1993). To achieve higher levels of reliability, the CIQ does not consist of items that focus on feelings or emotional status but instead uses behavioral indicators of integration (Willer, Ottenbacher, & Coad, 1994;

Dijkers, 1997). The CIQ is a 15-item scale with three subscales that assess the extent of community integration in the home, social participation, and productive activities (employment, school, and volunteer work) comprised of three subscales labeled:
(a) home integration; (b) social integration; and (c) productive activity. The scale can be self-administered, or a family member can serve as a proxy. Higher scores indicate greater community integration.

Home Integration

The home integration subscale assesses active participation in the operation of the home or household (Willer et al., 1993). In a study of U.S. burn survivors treated at one of four regional medical centers, Esselman and colleagues (2001) reported no significant change in home integration scores over a two-year period. The mean cross-time correlations (Time 1 with Time2, Time 1 with Time 3, and Time 2 with Time 3) demonstrated for home integration were ($r = 0.73$, $p < 0.001$). The researchers reported that the direction of the correlations indicated that participants with the highest scores at one point in time tended to have the highest scores at subsequent time points, indicating improvement in those patients. They also found various aspects of community integration were predicted by different aspects of participants' lives such as; gender best predicted home integration scores, living status, and marital status.

Women tended to have higher levels of home integration compared to men. Conversely, married individuals and those living with at least one other adult tended to

have lower scores due to fewer opportunities for shared daily activities and duties within the household. In a multiple regression equation with home integration scores regressed on gender, living status at time of burn, living status at discharge, marital status, burn size, and Functional Independence Measure (FIM) scores; the overall equation was significant ($R^2 = 0.29$), $F(6,156) = 10.62$, $P < 0.001$; gender ($\beta = 0.30$; $T(156) > 2.47$, $p < 0.001$) and living status at discharge ($\beta = -0.34$; $T(156) > 2.47$, $p < 0.001$) were each statistically significant. Esselman and colleagues (2001) reported social situational factors such as: gender, living status, and marital status at discharge exhibited the greatest influence on home integration scores. Based on the study results, they reported there was no clear indication for female burn survivors reporting better home integration compared to male burn survivors. A person's living situation strongly influences home integration scores. Burn survivors who reported living alone had no opportunity to share basic household duties, therefore reported better home integration scores. Burn survivors who are married or reside in a shared living situation, have less opportunities to complete task independently. Sharing household duties and activities resulted in lower (worse) home integration scores.

Social Integration

Social integration refers to participation in a variety of activities outside the home such as shopping, leisure activities, and visiting friends and is a key component of community integration (Willer et al., 1993). Furthermore, other aspects of social

integration reflect aspects of interpersonal relationships such as having a best friend and participating in activities with friends who are not disabled (Willer et al., 1993). In a study of community integration in burn survivors, Esselman et al. (2001) showed notable stability in correlations across follow-up time periods (six, 12, and 24 months) in the social integration subscale (r = 0.50, p < .001). They also demonstrated that social integration subscale scores were best predicted by scores on the FIM, TBSA, and marital status, with married individuals generally reporting less social integration. The researchers regressed social integration scores on marital status and burn size and reported the overall equation was statistically significant (R^2 = 0.05), $F(2,175) = 5.06$, p < 0.01. Both marital status (β = -.18; $T(175) > 2.05$, $p < 0.05$) and TBSA (β = -.16; $T(175) > 2.05$, $p < 0.05$) made unique statistically significant contributions. Although statistically significant, because of the small amount of the variance accounted for, the overall equation is not representative of a high degree of clinical significance. However, the researchers concluded burn survivors may suffer significant physical changes and scarring that may have a negative effect on social activities.

Productive Activity

Willer et al. (1993) reported that although their review of the literature provided significant insight into community integration issues, they sought to add clarity to the three areas of role performance. Despite the value placed on employment by society, Willer and colleagues (1993) believed individuals with disabilities should be recognized

for educational pursuits and volunteer activities that replace or supplement employment when they developed the CIQ. Therefore, the productive activity aspect of community integration includes the extent to which a person ventures out of the house on a daily basis and it encompasses work, school, and volunteer activities in which individuals regularly participates (Willer et al., 1993).

Although Esselman and colleagues (2001) reported no overall significant change in CIQ total or subscale scores over time, the change in productive activity $F(2,148) = 2.75$, $P = 0.067$) demonstrated a consistent increase from six to 24-months post-injury. The mean correlations across follow-up time periods measured for productive activity ($r = 0.47$) remained stable across patients and all individual correlations were statistically significant beyond the $p < 0.001$ level (Esselman et al., 2001). The researchers reported that productive activity subscale scores were most consistently associated with age, injury-related variables such as TBSA and LOS, and work-related factors such as employment status at time of injury and employment satisfaction. Older participants tended to have lower productivity scores as did those with larger TBSA burned and those with greater hospital LOS (Esselman et al., 2001).

When productive activity subscale scores were regressed on seven socio-demographic, injury-related, and work-related variables (age, gender, and living situation at time of injury, employment status at time of injury, employment satisfaction, TBSA burned, hospital LOS, and FIM scores at 12-months), and the overall equation was statistically significant ($R^2 = 0.26$), $F(7,72) = 3.69$, $p < 0.01$. Moreover, living status

(*Beta* = 0.24; $T(72) > 2.11$, $p < 0.05$) and employment status (*Beta* = 0.27; $T(72) > 2.11$, $p < 0.05$) each accounted for significant unique variance in the final model (Esselman et al., 2001). The researchers concluded burn survivors may suffer significant physical changes and scarring that may have a negative effect on productive activities.

COMMUNITY INTEGRATION AND QUALITY OF LIFE

Only two studies (Cromes et al., 2002; Costa et al., 2003) examined community integration and QOL outcomes in burn survivors. In a study of predictors of QOL, Cromes et al. (2002) reported improved community reentry as a predictor of higher QOL at six ($R2 = 0.65$, $p < 0.05$) and 12-months ($R^2 = 0.58$, $p < 0.05$) post-burn injury. Based on these results, the researchers concluded the resumption of home, social, and productive activities are significant predictors of QOL outcomes at six and 12-months post-burn injury. Conversely, Costa and colleagues (2003) demonstrated no relationship between CIQ scores and physical impairment scores. The researchers concluded the lack of a relationship between CIQ scores and physical impairment was complex and biopsychosocial models are needed to in order to gain an understanding of the interaction between variables that affect overall outcomes. There are few reports of studies within the literature of community integration among burn survivors. There were no studies within the literature examining community integration and QOL outcomes in military and civilian burn survivors treated in the Military Burn Center.

As previously stated, burn injuries result in unique attributes that often result in burn survivors being excluded from traditional research studies. Additionally, there are a limited number of burn survivors admitted to burn centers and civilian burn centers do not provide primary burn care to military burn survivors, which excludes military burn survivors from collaborative research and national burn registry databases. The USAISR provides primary burn care to two distinct populations, military and civilian burn survivors. Comparing differences among and between military and civilian burn survivors treated at the USAISR would be beneficial to clinicians and researchers by increasing understanding of outcomes related to community integration over time. The goals of modern burn care are to return burn survivors to the best QOL possible, including the return to work, an acceptable appearance, and community integration (Klein et al., 2007). Likewise, the goal of rehabilitation is to return the survivors of debilitating injuries to work, school, recreational, and community activities (Esselman et al., 2006). Because so little is known about community integration among burn survivors, continued research examining community integration and QOL outcomes in burn survivors is important.

CHAPTER SUMMARY

Quality of life is a dynamic concept that consists of physical, psychological, social, and general health domains. Burns are catastrophic, life-altering events, negatively affecting burn survivors in a variety of life areas, thereby possibly affecting one or more

QOL domains. Research has shown that over time burn survivors had a QOL much the same as the general population, indicating burn survivors perceived their lives comparable to a non-burned population. Conversely, the evidence has also offered support that burn survivors suffer negative effects in all domains of QOL post-burn, therefore indicating that they may perceive having poorer QOL outcomes at various times during their rehabilitation.

With the increased survival rate following burn injury because of improved burn care and rehabilitation, burn survivors have higher expectations associated with rehabilitation outcomes. Chief among these is integration into ordinary community settings, services, and activities. Community integration also is a dynamic concept comprised of subjective perceptions as well as objective domains, which are identified within the literature as: (a) social integration, (b) home integration, and (c) productive activity integration. In the aftermath of a traumatic life-altering injury, burn survivors return to the best QOL possible includes successful social relationships and their successful integration into community life.

There are inconsistencies in reported physical and psychological functional outcomes of burn survivors, as well as a lack of consensus as to the degree of QOL and community integration outcomes experienced by burn survivors. As previously indicated, no research was found in the literature that prospectively examined QOL and community integration in burn survivors following discharge from the Military Burn Center. The more recent emphasis on QOL and community integration outcomes among burn

survivors has increased due to improvements in burn care resulting in reductions in mortality. Therefore, the evaluation of QOL and community integration in burn survivors should begin as soon as possible following admission to the acute care phase of hospitalization. This study filled a gap in the literature by measuring changes in perception of QOL and community integration in burn survivors over time. The proposed research answered important questions concerning: (a) the changes and differences in perception over time in QOL and community integration and (b) the relationship between socio-demographic and clinical characteristics, QOL, and community integration in military and civilian burn survivors in the first 18-months following discharge from the Military Burn Center.

Developing a greater understanding of the degree to which burn survivors are able to return to optimal levels of physical, psychological, and social functioning, as well as general health is imperative. In doing so, better interventions for the optimal delivery of rehabilitative care for burn survivors can be developed. Health care providers play an integral role in the delivery of health care throughout burn survivors' rehabilitative burn recovery. As a result of a traumatic life-altering event, burn survivors are faced with significant rehabilitation due to the long-term physical and psychological complications associated with burn injuries. Quality of life is complex, comprehensive, and ill-defined with each individual perceiving it differently based on life circumstances. Clarity in understanding QOL and community integration among military and civilian burn survivors over time is important in order to gain a better understanding of the

rehabilitation process and to determine if differences exist within these two types of patients. Therefore, understanding changes in perception of QOL and community integration in burn survivors over time is crucial to assisting military and civilian patients in regaining the best QOL possible post-burn injury.

CHAPTER 3

METHODOLOGY

In this chapter describes the research methodology that was used to determine if there was any change over time in QOL and community integration between military and civilian burn survivors in the first 18-months following Burn Center discharge after treatment in the Military Burn Center is described. A description of the research design, sample, and selection criteria, procedures for data collection, processes to ensure the protection of human subjects, instruments and their related psychometric properties, and data analysis procedures are presented.

RESEARCH DESIGN

As previously discussed in the purpose and description of the "parent study" sections respectively, this study consists of a secondary data analysis. A descriptive longitudinal design was used in this secondary data analysis to determine changes in perceptions of QOL and community integration over time in military and civilian burn survivors. Instruments with known validity and reliability were used for data collection. The PI of the "parent study" selected instruments that were included in the NIDRR Burn Model System study in order to subsequently compare findings with those reported in the literature from the NIDRR study. The Burn Model System data repository contains no data from military or civilian burn survivors treated in the Military Burn Center. Data

collected in the "parent study" using the SF-36, the CIQ, and the Demographic and Clinical Data Sheets were used in this study.

In this study, data were analyzed using both non-parametric and parametric procedures. According to Polit and Beck (2008), descriptive longitudinal research is appropriate for studies that begin with a presumed cause then move forward in time to a presumed effect while observing, describing, and documenting whether there is a change in variables over time. Based on this definition, such a longitudinal research design is well suited for this study.

SAMPLE SELECTION CRITERIA

Sample

As previously discussed, study participants in this study were recruited from the USAISR Burn Center, located within San Antonio Military Medical Center (SAMMC), Fort Sam Houston, Texas. This Burn Center is the only Department of Defense (DoD) and ABA designated Burn Center and the only ABA designated Burn Center that treats sufficient numbers of military and civilian burn patients to allow the proposed analyses to be made.

The "parent study" was explained to potential participants by a member of the research team. They were given the opportunity to ask questions about study involvement and were invited to participate in the study. During the informed consent process, potential participants were provided a consent form for written (signed) informed consent for enrollment into the study. The inclusion criteria for the primary study were: (a) be at

least 18-years of age, (b) be hospitalized for a minimum of 72-hours for burn injury care, (c) speak and read English or Spanish, and (d) consent to participate in this study over a period of 18-months. Patients with functional impairments could request assistance from a research team member when completing the written instruments. Spanish translation was provided on an as needed basis. The "parent study" was approved by the Institutional Review Boards (IRBs) for the USAISR, SAMMC, and the Uniformed Services University of the Health Sciences; a secondary approval was obtained from the Medical Research and Material Command.

Power Analysis

In this study the parameter estimation that was used was restricted maximum likelihood (RELM). Restricted Maximum Likelihood (REML) was chosen because it has generally been shown to produce more robust effects in relation to studies with smaller sample sizes (Glaser & Hastings, 2011). Hox (2010) reported that the use of a minimum of 73 participants were required to achieve a power of .80. In this study there were 88 unique participants that were measured at five time-periods: discharge, three, six, 12, and 18-months.

INFORMED CONSENT AND DATA COLLECTION PROCEDURES

Participants in the "parent study" were recruited from the USAISR Military Burn Center based on a review of admitted patient's medical records to determine if they met

inclusion criteria. Eligible participants were approached, and the study purposes and procedures were explained including the longitudinal design of the study; the importance of obtaining complete data from each participant was stressed. Patients that met study criteria and agreed to participate were asked to read and sign an IRB approved consent form. Every effort was made to reduce participant burden.

In the "parent study," participants were asked to complete the written instruments for the first time within 72-hours of discharge from the Burn Center. They subsequently completed the same instruments at three, six, 12, and 18 months post-discharge from the Burn Center. At discharge, the survey booklet participants completed contained five instruments. These instruments were: (a) the Abbreviated Burn-Specific Health Scale (BSHS-A), (b) the Medical Outcomes Short Form-36 (SF-36), (c) the Satisfaction with Life Scale (SWLS), (d) the Community Integration Questionnaire (CIQ), (e) a Demographic Data Sheet, (f) a Clinical Data Sheet. At three, six, 12, and 18-months, the survey booklet that participants completed consisted of seven instruments. The additional two instruments were: The Vocational and Rehabilitation Questionnaire. The focus of this secondary data analysis is on four of these instruments: The Demographic and Clinical Data Sheets, the SF-36v1, and the CIQ (Appendix A).

PROTECTION OF HUMAN SUBJECTS

Privacy and confidentiality of participants

As previously mentioned, three IRBs reviewed and approved the "parent study" to ensure the protection of human subjects. Participants were told there would be no direct benefit to them for participation. However, information gained from the study might benefit military service members and civilians treated in the USAISR in the future.

Confidentiality of the research data

In the "parent study," completed survey booklets were maintained by the research team at all times. Participants were identified with code numbers; no personal health information was stored in the research record. The participant code book containing the code numbers was stored in a locked cabinet within a locked office at all times. Only the Principle Investigator (PI) and the Project Director had access to the data records; electronic records were password protected. Because each participant was identified only by a code number in the data set, participant identities were separate from the data. For ongoing analyses, data were coded and identified only with code numbers assigned to participants for tracking because of the longitudinal study design. The "parent study" was closed in 2013 and all data were de-identified in the database from the "parent study." For this study, the PI granted access to the data dictionary from the "parent study" to allow the student to identify the variables required to support the study design and determine appropriate research questions. All study results will be reported as aggregate

data when they are published. It is no longer possible to identify any participant within the de-identified database.

INSTRUMENTS

Demographic and Clinical Data Sheets

The Demographic and Clinical Data Sheets were developed by the PI of the "parent study." Personal socio-demographic and clinical information about the participants that were considered essential to answer the research questions was recorded on these forms. For example, relevant demographic data included: (a) age and (b) gender. Relevant clinical data collected included: (a) total body surface area (TBSA) burned; (b) full-thickness (FT) burn; (c) partial thickness (PT) burn; and, (d) length of stay (LOS).

The Medical Outcomes Short Form-36 (SF-36) Health Assessment

The Medical Outcomes Short Form Health Assessment (SF-36v1) was constructed to fulfill the minimum psychometric standards essential for group comparisons regarding the physical and mental health aspects of QOL. The SF-36v1 is a generic, multipurpose, short-form health survey with only 36-questions that measures QOL. It was constructed to achieve two well-accepted standards of comprehensiveness: (a) exemplification of multidimensional health concepts and (b) measurement of the full range of health states, including levels of well-being and individual evaluations of health (McHorney et al., 1993; Ware & Gandek, 1998). The SF-36v1 was derived from a larger

battery of health status instruments with the eight health concepts selected from 40-concepts included in the Medical Outcomes Study (MOS) (McHorney et al., 1993; McHorney et al., 1994; Ware & Sherbourne, 1992). The eight health concepts are: (a) physical function, (b) role-physical limitations, (c) bodily pain, (d) general health perceptions, (e) vitality (f) social functioning, (g) role-emotional limitations, and (g) mental health (McHorney et al., 1993).

The SF-36v1 was designed for use in clinical practice, research, health policy evaluations, and population surveys. Furthermore, the SF-36v1 was designed for self-administration and/or administration by a trained interviewer in person or by telephone. In the SF-36v1 Measurement Model, the taxonomy consists of three levels: (a) items; (b) eight subscales that consists of two to 10 items each; and (c) two summary measures that consist of the two major scales, Physical Component Score (PCS) and Mental Component Score MCS) (Ware, 2000). Each item is used in scoring only one subscale. The number of response choices on the instrument range from two to six. The SF-36v1 produces an eight-dimensional profile that consist of two distinct higher order clusters based on the physical and mental health variance they have in common. Raw scores are linearly transformed to a scale ranging from 0 (lowest possible health status scores) to 100 (highest possible health status score) with higher scores indicating better QOL (Ware, 2000). Nine items are reversed scored so that higher scores always indicate better health states (McHorney et al., 1994)

Based on a scoring algorithm, two sets of scores are obtained from the SF-36: the scores for the eight sub-scales and two summary scores, one for the PCS and one for the MCS (Ware & Gandek, 1998). Ware and colleagues (1994) used norm-based scoring methods for the summary measures, the PCS and MCS scales, of the SF-36. A linear *T* score transformation was used so that both PCS and MCS had a mean of 50 and a standard deviation of 10 in the general U.S. population (Ware et al., 1994). This is in contrast to the current 0-100 scoring used for the eight SF-36v1 subscales, which have means ranging from 61 to 84 and standard deviations that range from 18 to 34 within the U.S general population (Ware et al., 1994). In norm-based scoring methods, each the individual SF-36 scales are standardized using a z-score transformation and SF-36scale means and standard deviations from the U.S general population available in the SF-36 Physical & Mental Health Summary Scales: A User's Manual (Ware et al., 1994). Following the computation of the z-score for each subscale, the aggregate scores for the PCS and MCS are computed using the score coefficients from the U.S general population. The final step is transforming each component to norm-based scoring by multiplying each aggregate component scale score by 10 and adding the result to 50 (Ware et al., 1994). The advantage to using norm-based scoring and standardization for the PCS and the MCS is results may be compared with each other in a meaningful way and the scores have a direct interpretation with those of the U.S. general population (Ware et al., 1994).

In relation to psychometric validity, McHorney et al. (1993) reported that a substantial general health dimension was associated with each of the eight sub-scales of the SF-36v1. The researchers reported a strong association ($r \geq 0.70$) between the physical functioning, role physical limitation, and bodily pain sub-scales and the physical principal component. The researchers also found a strong association ($r \geq 0.70$) between the SF-36v1 sub-scales social functioning, role emotional limitations, and mental health and the mental principal component. In the first of two principal component analyses, the correlation between each scale and the rotated principal component accounted for 55% of the total variance and was highly correlated with all eight scales (range was $r = 0.67$ for role-emotional to $r = 0.82$ for vitality) (McHorney et al., 1994).

McHorney and colleagues (1994) reported internal consistency of the SF-36v1 ranging from a low of 0.63 (general health) to a high of 0.79 (mental health). Internal consistency reliability coefficients, Cronbach's alpha, ranged from a low of $\alpha = 0.78$ (general health perceptions) to a high of $\alpha = 0.93$ (physical health) among the sub-scales. However, reliability coefficients varied somewhat among patient subgroups (range: 0.65 to 0.94). The SF-36 is the most extensively used generic measure of QOL; it has been comprehensively researched, and the versions are well validated, and have norms stratified by age groups and several comorbid conditions (McHorney et al., 1993; McHorney et al., 1994; Ware & Sherbourne, 1992).

The Community Integration Questionnaire (CIQ)

The initial CIQ was developed during a consensus conference of experts and consisted of 47-items (Willer et al., 1994). The pilot study was conducted with information from three samples combined into one data set (N = 49). The three samples were comprised of: (a) the Family Studies project at the Rehabilitation, Research, and Training Center on Community Integration with Traumatic Brain Injury at the State University of New York at Buffalo (N = 22), (b) the Model Systems project at the Rehabilitation Institute of Michigan (N = 16), and (c) the Model Systems project at the Santa Clara Valley Medical Center (N = 11) (Willer et al., 1994).

The final CIQ consisted of 15-items comprising three subs-scales labeled: (a) home integration, (b) social integration, and (c) productive activity. Each sub-scale has a different number of items and sub-scale scores (Willer et al., 1994; Sander et al., 1999). The home integration subscale consists of five-items, each scored on a scale from 0 to 2, where 2 represents the greatest degree of integration. The Social Integration subscale consists of six-items. Four-items have weighted responses providing a total of 7-points. The primary frequency of performing activities and/or roles with secondary weight are based on whether or not activities are performed together with others, and how the other persons are characterized (participant versus proxy) (Dijkers, 1997; Willer et al., 1994). Subscale scores are summed in order to achieve an overall or total CIQ score. The maximum possible score is 29, which indicates complete community integration (Dijkers, 1997; Willer et al., 1994).

In relation to the content of the 15-item CIQ, 12-items are scored using a three-point Likert type scale whereas three items related to employment, school, and volunteer activities are scored on a six-point Likert type scale (Willer et al., 1994). Specifically, the home integration sub-score is derived from the sum of items one through five (range 0 to 10); the Social Integration sub-score is derived from the sum of items six through 11 (range 0 to 12); the Productive Activities sub-score is obtained from the sum of item 12 and a jobschool variable that is based on the responses to questions 13 and 15 (range 0 to 7). The total CIQ score is calculated by adding the three sub-scores (range 0 to 29) (Dijkers, 1997; Willer et al., 1994).

The CIQ was compared to the Craig Handicap Assessment and Reporting Technique (CHART) for evaluation of concurrent validity. Correlations between the total scales of the two instruments were moderate (r = 0.62 to 0.70) however greater variability was demonstrated between the subscales (Corrigan, Smith-Knapp, & Granger, 1998). Discriminant validity concerning all three subscales was documented for persons with traumatic brain injury (TBI) (Willer, Linn, & Allen, 1993; Willer et al., 1994), for persons with TBI who lived with their parents, lived independently, and lived in a variety of situations such as with siblings, in foster care, supervised communities, or developmental communities (Willer et al., 1994).

The reliability of the CIQ was assessed on a sample of 16 individuals with acquired brain injury (ABI). Initially, the CIQ was administered to the participant and a family member or caregiver familiar with the person's socio-demographic and clinical

status. To determine test-retest reliability the instrument was re-administered to all participants and family members and/or caregivers within seven to 10 days (Willer, Linn, et al., 1993; Willer et al., 1994). The test-retest reliability coefficient for the overall CIQ for the individual was (r = 0.91), home integration (r = 0.93), Social Integration (r = 0.86), and productive activity (r = 0.83) (Willer, Rosenthal, et al., 1993). In a study of participant-proxy reliability, Cusick and colleagues (2000) reported interclass correlation coefficients (ICC) for proxies that were lower than the test-retest reliability coefficients for the total CIQ scores for the participants (r= 0.86), home integration (r = 0.88), social integration (r = 0.74), and productive activity (r = 0.80).

The CIQ reliably distinguished between participants with TBI compared to a group of non-disabled people. Participants with TBI had lower community integration scores than the non-disabled comparison group. Sander and colleagues (1997) demonstrated evidence of "moderate" to "almost perfect" agreement between persons with TBI and their relatives regarding psychosocial outcomes using the CIQ. Patient scores were higher than family members on the home integration subscale (t = 3.51, p < .01) because of two items that were determined to not be clinically meaningful. Total CIQ scores also differed, with patients reporting significantly higher levels of integration compared to family members (t = 2.30, p <.05) also because of two items on the home integration subscale (Sander et al., 1997).

There are variations in the acceptable values of alpha ranging from 0.70 to 0.95 with a traditional cut-point for acceptable internal consistency being $\alpha = 0.80$ (Dijkers,

1997; Streiner, 2003; Tavakol & Dennick, 2011). In the initial 15-item version of the CIQ, Willer and colleagues (1993) reported an internal consistency of $\alpha = 0.76$. In a follow-up study of 59-participants, Willer, Rosenthal, et al. (1993) reported internal consistency for the total CIQ ($\alpha = 0.89$), home integration ($\alpha = 0.81$), Social Integration ($\alpha = 0.74$), and productive activity ($\alpha = 0.96$). In a study to investigate the psychometric properties of the CIQ with community-dwelling adults with spinal cord injuries ($n = 146$, multiple sclerosis ($n = 174$), muscular dystrophy ($n = 273$), or limb loss ($n = 158$), Hirsh and colleagues (2011) reported the home integration ($\alpha = .84$) sub-scale and the CIQ total ($\alpha = .75$) demonstrated adequate to good reliability whereas the reliability indices for the social integration ($\alpha = .51$) and productive activity ($\alpha = .45$) sub-scales were suboptimal. Furthermore, the researchers found a significantly strong association between the CIQ total score and the home integration ($r = 0.77$), social integration ($r = 0.78$), and productive activity ($r = 0.69$) sub-scales of the CIQ.

Zhang and colleagues (2002) demonstrated that although the CIQ was appropriate for evaluating the effect of rehabilitation on handicap, the instrument does not assess integration of skills or deficits of skill, but rather integration outcomes. Corrigan et al. (1998) showed the CIQ can capture trends of improvement in scores over time. In their study, the CIQ total mean scores ranged from 16.08 to 18.97, home integration mean subscale scores were 4.42 to 5.78, Social Integration mean subscale scores ranged from 7.94 to 8.44, and productive activity mean subscale scores were 3.72 to 4.75. As previously stated, because the CIQ was used in the NIDRR Burns Model System of

patients treated in civilian burn centers, it seemed most appropriate to use the CIQ in the "parent study" so that findings from the literature could be compared to findings from patients treated in the USAISR.

DATA ANALYSIS

Data analyses were performed using SPSS Advanced Statistics software for Windows (Version 24.0). Non-parametric and parametric data analysis strategies were used as needed for the study. The socio-demographic (i.e. age, gender, education level) and injury-related or clinical (i.e. TBSA burned, TBSA-FT burned, LOS) characteristics for each participant were considered independent variables for the examination of QOL and community integration. For all analyses in this study, the level of significance will be set at $p \leq 0.05$. The effect of the independent variables on QOL or community integration dependent variables were examined using multilevel modeling (MLM) to examine change over time via a 2-Level Model analysis with repeated measures within individuals (Level 1) and differences between individuals (Level 2) (Heck, Thomas, & Tabata, 2010).

Multilevel models (MLM) were chosen for use in this study because of their effectiveness in the statistical analyses of data that have a hierarchical or clustered structure such as longitudinal designs, which are a series of repeated measures nested within individual participants and commonly have missing data and unbalanced designs (Glaser & Hastings, 2011; Hox, 1998). Multilevel models are extensions of regression

wherein data organized in groups and coefficients may vary by group (Gelman & Hill, 2007). Conceptually, multilevel models are similar to multiple regression because an outcome (dependent) variable is linearly predicted from multiple covariates or predictors (independent variables) (McNeish & Stapleton, 2014).

As previously discussed, the "parent study" consisted of a longitudinal descriptive design, with data collected at Burn Center discharge, three, six, 12, and 18-months post-discharge. Therefore, a multilevel data structure that involved repeated measurements of participants was needed. Measurements (Level-1 units) were clustered or nested within individuals (Level-2 units) (Gelman & Hill, 2007; Peugh, 2010). Furthermore, an issue of concern with nested data structures is the violation of the independence assumption, which is required by statistical analyses such as ANOVA and ordinary least-squares (OLS) multiple regression (Peugh, 2010). Multilevel modeling is an option to avoid the Type I errors associated with more traditional analysis models (Peugh, 2010).

The data from the "parent study" were collected at regular time intervals with an overall time pattern over 18-months however, there are irregular patterns within the data because some participants were not available at those time intervals. The advantage of using MLM is that it is an "advanced" or "modern" missing data technique (Glaser & Hastings, 2011) and in mixed linear modeling for longitudinal design, the listwise deletion default used in traditional repeated measures is not used. Therefore, all the available data can be used in the fixed and/or random effects portion of the model.

The results from the MLM were used to address two of the four research questions. There were six independent (predictor) variables chosen for inclusion in the multilevel model. The six-predictor variables were chosen following a thorough review of the literature of studies indicating these variables to be predictive of QOL and community integration outcomes following a burn injury. These variables included: (a) group status; (b) age, (c) marital status, (d) TBSA burned, (e) FT burned, and (f) LOS. The Level 1 variable in this study was time, which consisted of five time-points (discharge, three, six, 12, and 18-months). The Level 2 (time invariant) variables consisted of the six predictor variables that were previously identified. Three unconditional models were examined. The unconditional means models are equivalent to a one-way ANOVA with random effects and are useful in computing the proportion of variability in outcome scores (Peugh & Enders, 2005). The unconditional means model averages the outcome variable for the Level 1 units across the Level 2 units and separates or divides the variance between level 1 and level 2 (Glaser & Hastings, 2011). In this study, the unconditional means model averages the outcome variable(s) for the level 2 units (SF-36 PCS score, SF-36 MCS score, and CIQ Total score) across the level 1 units (time) and partitions the variance between level 1 and level 2.

The key aspects that were considered in each 2-Level Model include the model dimension, which provides information on the total number of parameters and the number of random and fixed effects. Examples of random effects are variances between intercept and time slopes and covariance between the intercept and slope (Heck et al.,

2010). The fixed effect in this study is time. In relation to comparing alternative models, information criteria such as the -2 Log Likelihood (-2LL) is used to compare similar models that differ in one parameter by testing the difference in -2LL compared to the *df* =1 considering only one parameter is changed (Field, 2009). The Akaike's information criterion (AIC) and Schwarz's Bayesian information criterion (BIC) are useful statistics for the evaluation of different models containing various combinations of predictors (Glaser & Hastings, 2011). The AIC and BIC may be compared for any pair of models if fitted to the exact data (Singer & Willett, 2003). Although there are few standards for comparing information criteria (Singer & Willett, 2003), lower values for both statistics indicate a good fit (Field, 2009).

The Estimates of Fixed Effects output provides information on whether the growth functions entered into the model significantly predict the outcome (Field, 2009). The Estimates of Covariance Parameters provides information on any random effects present in the model. The residual parameter estimates indicate latent effects that were not accounted for by the effect on the primary variables. Additionally, the variance component provides information in the amount of variability that remains in the outcome at each level (Field, 2009; Heck et al., 2010).

In this study, the participants were described using demographic and clinical characteristics data. Frequencies and measures of central tendency and dispersion (e.g. SD) were used to report information such as age, education level, and LOS. Graphs and/or figures were included for clarification. Because this is the first time these data

have been examined in this longitudinal fashion, MLM was used to perform longitudinal analyses to examine linear differences over time in perceptions of QOL and community integration in civilian and military participants. Based on the research questions for this study the analyses conducted were as follows:

1. *What is the variation in military and civilian burn patients' perceptions of quality of life in the first 18-months post-discharge from the United States Army Institute of Surgical Research (USAISR) Military Burn Center?*

   The SF-36 PCS and MCS summary and sub-scale scores were calculated at five time-points: discharge, three, six, 12, and 18-months. The SF-36 PCS and MCS scores for the military service members and civilian participants were analyzed using descriptive statistics.

2. *What is the variation in military and civilian burn patients' perceptions of community integration in the first 18-months post-discharge from the USAISR Military Burn Center?*

   The total score for the CIQ instrument were calculated at each time-point: discharge, 3-months, 6-months, 12-months, and 18-months. Additionally, a score for the home integration, social integration, and productive activity sub-scales of the CIQ instrument were calculated for each time point. The CIQ total and sub-scale scores were analyzed using descriptive statistics.

3. *What is the relationship between individual characteristics and QOL among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?*

   Because this is individual-time period data, MLM was used to develop a two-Level Model of change. The Level 1 Model examines the relationships over time within individuals' perceptions of QOL based on an individual growth trajectory. A Level 2 Model allows for the examination of differences in trajectories between groups of individuals.

4. *What is the relationship between individual characteristics and community integration among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?*

   Multilevel modeling was used to develop a two-Level Model of change. The Level 1 Model examines the relationships over time within individuals' perceptions of community integration based on an individual growth trajectory. A Level 2 Model allows for the examination of differences in trajectories between groups of individuals.

CHAPTER SUMMARY

This chapter detailed the methodology that was used in this descriptive longitudinal study to determine the changes in perceptions of QOL and community integration in burn survivors in the first 18-months following discharge from the Military

Burn Center. This study consisted of a secondary data analysis using data from a "parent study" examining QOL, community integration, satisfaction with life, and demographic characteristics among burn survivors treated in the Military Burn Center. The research design, sample selection, inclusion and exclusion criteria for sample selection, and power analysis for the "parent study" were presented. Additionally, procedures for data collection, methods for protecting both the identity and confidentiality of the participants and the data were described. The four instruments that were analyzed in this study, which were used in the "parent study," along with their psychometric properties also were described. Lastly, the data analyses that were used to provide answers to the four research questions were described.

CHAPTER 4

FINDINGS

The quantitative results of the secondary data analyses performed in this study are presented in this chapter. The purpose of this study was to examine perceptions of QOL and community integration among military and civilian burn survivors over time to better understand adaptation in the two groups. Data were analyzed using SPSS, Version 24 (IBM, 2015). This chapter is comprised of three sections. The first section contains the demographic characteristics and descriptive statistics of the major study variables for the sample of 137 military service members/retirees and civilian participants. The second section presents the results of the four research questions. In the third and final section a presentation of the instrument reliability coefficients is presented.

SAMPLE DESCRIPTION

A convenience sample of active duty military service members/retirees and civilian burn patients treated at the Military Burn Center were recruited to participate in the "parent study" from which the data for this secondary analysis were previously collected. In the data collection period, from January 2000 through October 2006, a total of 137 military service member/retirees and civilian burn patients were enrolled in the study. There were twice as many civilians (n = 88) compared to military service members/retirees (n = 49) that participated in the study. A total of 137 participants'

records were examined for all five time-periods. Nine of the first 32 participants enrolled in the study were lost to follow-up because of the suspension of human-use research at the Military Burn Center, which was unrelated to this study. There also were at least two missing time-points in the data from 17 of the first 32 patients enrolled in the study. Upon resumption of the study, there were six participant attritions and three deaths (unrelated to the study), which resulted in a total attrition rate of 13% for the study. The demographic characteristics for the military service member/retirees and civilian groups are presented in Table 1. The clinical characteristics for the military service member/retirees and civilian groups are represented in Table 2.

Consistent with the "parent study," the data from the military retirees that participated in the study were analyzed with the active duty military service member data rather than with the civilian burn patient data. Following a thorough examination, demographic data from the military retirees were determined to be comparable to the active duty military personnel. Furthermore, the retirees had access to the same military healthcare and rehabilitative resources within the Military Burn Center as active duty military personnel. However, civilian participants received subsequent rehabilitative care in the civilian sector following discharge from the Military Burn Center if they were insured; otherwise they received minimal to no rehabilitative follow-up based on their ability to pay for these services.

Demographic Characteristics of the Military Group (*n* = 49)

Even with the inclusion of seven retirees, the demographic data in Table 1 revealed that the military service members were younger than the civilians. There were significant differences in age between the military service members (M = 30.84, SD = 14.18) and the civilians (M = 40.86, SD =14.01); $t(129) = 6.22$, $p = .000$). Most of the military participants were male (94%) and Caucasian (61%). Fifty-one percent of the military service members were single, while 39% of military participants were married. Most of the service members (79%) reported having two or less dependents. Forty-three percent of the military participants indicated they were high school graduates and 43% attended college or had a college degree. The majority (81%) of military participants earned less than $40,000 per year

Demographic Characteristics of the Civilian Group (*n* = 88)

Most civilian participants were older with 27% in the 41 to 50 age range. In the civilian group, 85% were male. Most of the civilian participants (48%) were Hispanic and 43% identified themselves as Caucasian. There were statistically significant differences in race between the civilian participants and the military service members X^2 (2, N = 137) = 26.15, p = .004. Most civilian participants (56%) were married and 71% indicated having two or less dependents. There also were statistically significant differences in the level of education between the civilian and military participants, X^2 (2, N = 137) = 18.94, p = .004. Fourteen percent of the civilians had less than a high school

education and 27% indicated they were high school graduates. There were statistically significant differences in levels of income between the two groups, X^2 (2, N = 137), 23.77, p = .000. Fifty percent of the civilian participants indicated an annual income level of less than $20,000.

Clinical Characteristics of the Military Group (*n* = 49)

Among the military service members (Table 2), the mean percentage of TBSA burned was 13.23. Most military participants (47%) suffered .01-10% TBSA burned and 25% had a TBSA burned of 21% or greater. Most of the military participants (71%) experienced .01 to 10% FT burn and 82% sustained .01-10% partial thickness (PT) burn. The majority of the military participants (25%) experienced a LOS greater than 20 days. Ninety-two percent of the military service members indicated pressure garments were required post burn center discharge and 53% received follow-up rehabilitation in the outpatient setting.

Clinical Characteristics of the Civilian Group (*n* = 88)

The clinical characteristics of the civilian participants also are depicted in Table 2. The majority of the civilian participants, (39%) suffered a TBSA burned of 21% or greater and 35% had a TBSA burned of .01 to 10%. Seventy-eight percent experienced a FT burn of .01 to 10% and 53% experienced a PT burn of .01 to 10%. The civilian and military groups also differed significantly in the percent TBSA burned (t(135) = 2.47,

p = .004) and in partial thickness (PT) burn (t(135) = 3.45, p = .000). Twelve (14%) of the civilian participants suffered inhalation injuries. The majority of civilian participants (56%) had a LOS of $\leq$ 20 days. There also were significant differences in LOS between the civilian and military groups (t(128) = -2.90, p = .000). Ninety-seven percent of the civilian participants required pressure garments and the majority of civilian participants (82%) received outpatient rehabilitation. Only 18% received inpatient rehabilitation.

RESEARCH QUESTION 1

Research Question #1: *What is the variation in military and civilian burn patients' perceptions of quality of life in the first 18-months post-discharge from the United States Army Institute of Surgical Research (USAISR) Military Burn Center?* The Medical Outcomes Study: 36-Item Short Form Survey (SF-36) was used to measure QOL in this study. As a generic health profile instrument, the SF-36 was designed as a measure of the contrast between physical and psychological dimensions. As previously stated in chapter 3, the SF-36 is comprised of multi-item sub-scales that measure eight dimensions of QOL. These include: (a) physical functioning, (b) role-physical limitations, (c) bodily pain, (d) general health, (e) vitality, (f) social functioning, (g) role-emotional limitations, and (h) mental health.

Table 1. Demographic Characteristics of the Military/Retirees (n = 49) and Civilian (n = 88) Groups

	Military				Civilian			
	Mean	30.84	Frequency	%	Mean	40.86	Frequency	%
Age*	(SD)	14.18	49	100	(SD)	14.01	88	100
18-25			28	57			16	18
26-30			5	10			11	13
31-40			6	12			18	21
41-50			5	10			24	27
51-60			3	6			10	11
61-83			2	4			9	10
Gender								
Male			46	94			75	85
Female			3	6			13	15
Race/Ethnicity*								
Caucasian			30	61			38	43
African American			10	20			7	8
Hispanic			7	14			42	48
Asian			0	0			1	1
American Indian			1	2			0	0
Other			1	2			0	0
Marital Status								
Married			19	39			49	56
Single			25	51			28	32
Widowed/Other			5	10			11	12
Number of Dependents								
0			27	55			24	27
1			7	14			22	25
2			5	10			16	18
3			6	12			12	13
4			2	4			7	8
5-8			2	4			7	8
Level of Education*								
Some High School			1	2			12	14
High School Graduate			21	43			16	18
Vocational/Technical			6	12			24	27
Some College			13	27			7	8
College Graduate			7	14			19	22
Graduate School			1	2			6	7
Income Level*								
19,999 or Less			7	14			44	50
20K-39,999			33	67			27	31
40K-59,999			8	16			9	10
60K or Greater			1	2			8	9

† Percentages may not equal 100% due to rounding; * Statistically significant differences between the military service members and the civilian participants

Table 2. Clinical Characteristics of the Military/Retirees (n = 49) and Civilian (n = 88) Groups

	Military				**Civilian**			
	Mean	13.23	Frequency	%	Mean	19.26	Frequency	%
TBSA Burned*	(SD)	10.23	49	100	(SD)	15.26	88	100
.01-10%			23	47	31	35	31	35
11-20%			14	29	23	26	23	26
21% or greater			12	25	34	39	34	39
FT Burn	Mean	7.10	49	100	Mean	7.80	88	100
	(SD)	9.60			(SD)	12.96		
.01-10%			35	71			69	78
11-20%			8	16			8	9
21% or greater			6	12			11	13
PT Burn*	Mean	6.13	49	100	Mean	11.46	88	100
	(SD)	5.57			(SD)	9.96		
.01-10%			40	82			47	53
11-20%			7	14			27	31
21% or greater			2	4			14	16
Inhalation Injury								
Yes			5	10			12	14
No			44	90			76	86
Length of Stay*	Mean Median	45.69 25.00	49	100	Mean Median	28.10 17.00	88	100
	(SD)	51.95			(SD)	24.94		
9 to 12 days			7	14			15	18
13 to 15 days			10	20			19	21
16 to 20 days			5	10			14	17
21 to 50 days			12	25			22	27
51 to 100 days			10	20			10	12
101 to 247 days			5	10			3	4
Were Pressure Garments Required								
Yes			45	92			85	97
No			4	8			3	3
Was Follow-up Rehab Received								
Yes			26	53			34	39
No			23	47			54	61

†Percentages may not equal 100% due to rounding; *Statistically significant differences between the military service members and the civilian participant**s**

The SF-36 also yields physical (PCS) and mental (MCS) health composite scores or summary measures (Haywood et al., 2005; McHorney et al., 1994; McHorney et al., 1993; Ware, 2000; Ware & Sherbourne, 1992).

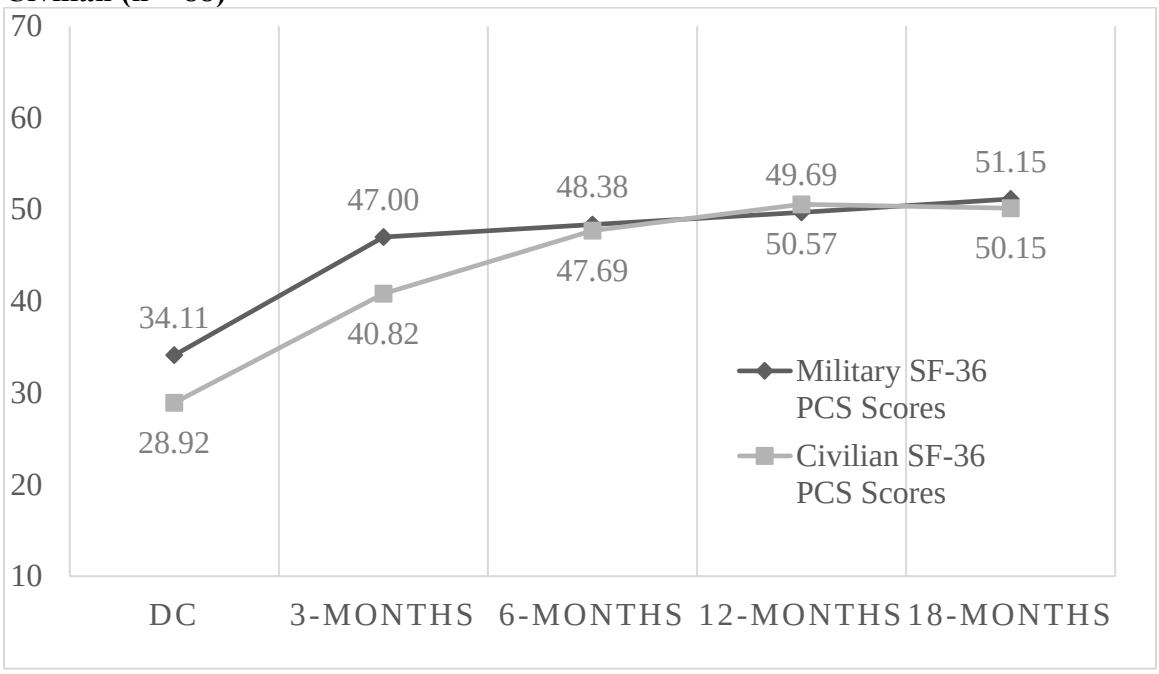
Table 3 and Figures 2 & 3 depict the mean SF-36 PCS and MCS scores and standard deviations (SDs) for the military and civilian groups. Overall, there was consistent improvement in the military burn survivors' perceptions of physical QOL over time. Military participants' mean SF-36 MCS summary scores fluctuated over 18-months. The MCS scores improved between discharge and three-months, but decreased slightly at six-months; at 18-months, the mental health scores were slightly lower than at burn center discharge (Table 3) (Figure 2).

Table 3. Mean SF-36 PCS and MCS Summary Scores

Scale	Status	DC	3-Months	6-Months	12-Months	18-Months
SF-36 PCS Scores	Military (SD)	34.11 (9.73)	47.00 (9.72)	48.38 (9.24)	49.69 (9.78)	51.15 (9.92)
SF-36 MCS Scores	Military (SD)	54.84 (10.16)	55.10 (7.55)	54.60 (6.56)	54.89 (6.96)	54.41 (8.87)
SF-36 PCS Scores	Civilian (SD)	28.92 (8.67)	40.82 (10.42)	47.69 (10.54)	50.57 (8.18)	50.15 (9.67)
SF-36 MCS Scores	Civilian (SD)	51.21 (10.16)	54.06 (8.75)	54.42 (6.43)	55.60 (5.51)	54.71 (6.30)

Highest Possible Score = 100

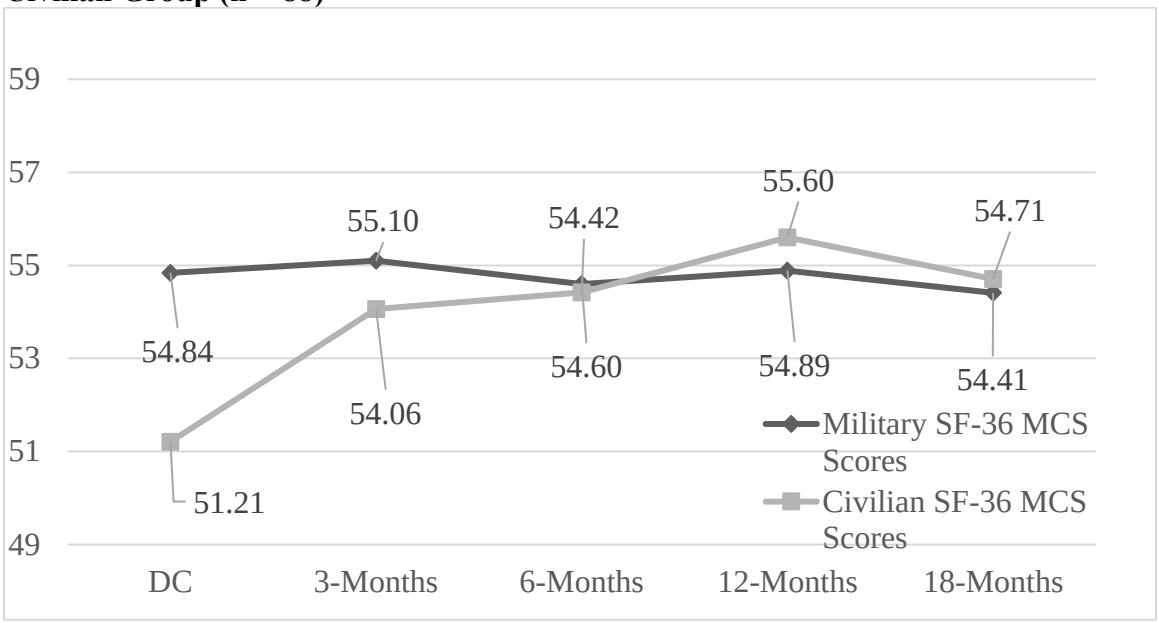
Figure 2. Mean SF-36 PCS Summary Scores: Military Group (n = 49) & Civilian (n = 88)



Highest Possible Score = 100

Civilian burn survivors reported the lowest mean SF-36 PCS scores at discharge however, their PCS scores consistently improved from discharge through 12-months post burn center discharge (Table 3) (Figure 2). At 18-months, scores were slightly lower however, they were higher than at discharge. In the civilian group, SF-36 MCS scores steadily increased between discharge and 12-months and were slightly lower at 18-months. By 12-months post-discharge, civilian participants' SF-36 MCS scores were slightly higher than those of military service members and remained slightly higher at 18-months (Table 3) (Figure 3).

Figure 3. Mean SF-36 MCS Summary Scores: Military (n = 49) & Civilian Group (n = 88)



Highest Possible Score = 100

Norm-based scoring (Ware & Gandek, 1998) was used for the scoring algorithm of the SF-36 to simplify the interpretation of the results from the PCS, MCS, and sub-scale scores. Norm-based scoring and a linear *T* score transformation was used so that both the PCS and MCS scales had a mean (and median) of 50 and a standard deviation of 10 in the general U.S. population. Using norm-based scoring and standardization for the PCS and the MCS is advantageous because it is possible to compare scores with each other in a meaningful way. Furthermore, the scores have a direct interpretation with those of the U.S. general population (Ware et al., 1994).

Table 4 depicts the military and civilian norm-based mean SF-36 PCS scores for the U.S. "healthy" population. Table 5 depicts the military and civilian norm-based mean

SF-36 MCS scores. The highest mean SF-36 PCS score (Table 3) in the military group was 51.15, which is below the norm-based mean SF-36 PCS score for the U.S. "healthy" population. The mean SF-36 PCS score for the military service members also was below the mean scores for the 25th percentile. In the civilian group, the highest mean SF-36 PCS score was 50.57. This also is below the U.S. "healthy" populations' mean SF-36 PCS score and below the mean score for the 25th percentile in the U.S. "healthy" population.

Table 4. Military and Civilian Participants' SF-36 PCS Scores with Norm-Based Mean SF-36 PCS Scores for the U.S. Healthy Population

	Military SF-36 PCS Scores	Civilian SF-36 PCS Scores	NBM PCS	
DC	34.11	28.92	Mean	55.26
3-Months	47.00	40.82	25th Percentile	53.69
6-Months	48.38	47.69	50th Percentile	55.82
12-Months	49.69	50.57	75th Percentile	58.44
18-Months	51.15	50.15		

*NBM = Norm-based Mean for the U.S Healthy Population

Table 5. Military and Civilian Participants' SF-36 MCS Scores with Norm-Based Mean SF-36MCS Scores for the U.S. Healthy Population

	Military SF-36 MCS Scores	Civilian SF-36 MCS Scores	NBM MCS	
DC	54.84	51.21	Mean	53.43
3-Months	55.10	54.06	25th Percentile	50.33
6-Months	54.60	54.42	50th Percentile	54.74
12-Months	54.89	55.60	75th Percentile	57.74
18-Months	54.41	54.71		

*NBM = Norm-based Mean for the U.S. Healthy Population

The highest mean SF-36 MCS score in the military group was 55.10, which is above the mean SF-36 MCS score for the U.S. "healthy" population. This mean score is between the 50th and 75th percentile. In the civilian group, the highest mean SF-36 MCS score was 55.60. This also is above the mean SF-36 MCS score for the U.S. "healthy" population and between the 50th and 75th percentile for the U.S. healthy population.

Short Form 36 Sub-scale Scores

As stated in chapter 3, the SF-36 also yields physical and mental health composite sub-scale scores (McHorney et al., 1993; Ware, 2000; Ware & Sherbourne, 1992). The SF-36 PCS sub-scales consist of physical function (PF), role-physical limitations (RP), bodily pain (BP), and general health (GH). The SF-36 MCS sub-scales are comprised of vitality (VT), social function (SF), role-emotional limitations (RE), and mental health (MH). The SF-36 sub-scale scores also were normed against the U.S. population because it makes it possible to compare scores for groups of respondents to scores of other groups of interest (Ware et al., 1993). Table 6 depicts the average SF-36 physical sub-scale scores within the U.S. general population.

Table 6. Norm-based Mean SF-36 Physical Sub-Scale Scores for the U.S. Healthy Population

	PF	RP	BP	GH
Mean	84.15	80.96	75.15	71.95
25th Percentile	70.00	50.00	61.00	57.00
50th Percentile	90.00	100.00	74.00	72.00
75th Percentile	100.00	100.00	100.00	85.00

Table 7. Mean SF-36 Physical Sub-Scale Scores: Military (n = 49) and Civilian (n = 88) Groups

Sub-scale	Status	DC	3-Months	6-Months	12-Months	18-Months
SF-36 Physical Function	Military (SD)	56.51 (26.06)	79.00 (21.54)	82.19 (17.14)	86.09 (18.32)	87.09 (18.58)
	Civilian (SD)	37.12 (24.93)	66.06 (25.12)	80.00 (21.90)	85.00 (18.14)	86.08 (19.43)
SF-36 Role Physical	Military (SD)	29.65 (39.43)	66.87 (40.97)	70.73 (36.18)	68.90 (40.99)	78.48 (33.44)
	Civilian (SD)	14.65 (29.42)	39.77 (44.50)	61.66 (45.20)	79.22 (34.06)	71.01 (41.70)
SF-36 Bodily Pain	Military (SD)	34.39 (28.97)	75.07 (25.19)	79.02 (24.61)	85.39 (19.01)	84.62 (19.85)
	Civilian (SD)	27.18 (24.64)	65.42 (27.79)	80.35 (27.00)	88.07 (19.14)	85.47 (24.22)
SF-36 General Health	Military (SD)	78.44 (15.53)	79.02 (19.91)	81.63 (14.33)	79.78 (23.19)	81.97 (17.24)
	Civilian (SD)	75.45 (16.30)	78.28 (16.65)	82.16 (16.24)	82.83 (14.61)	83.78 (16.07)

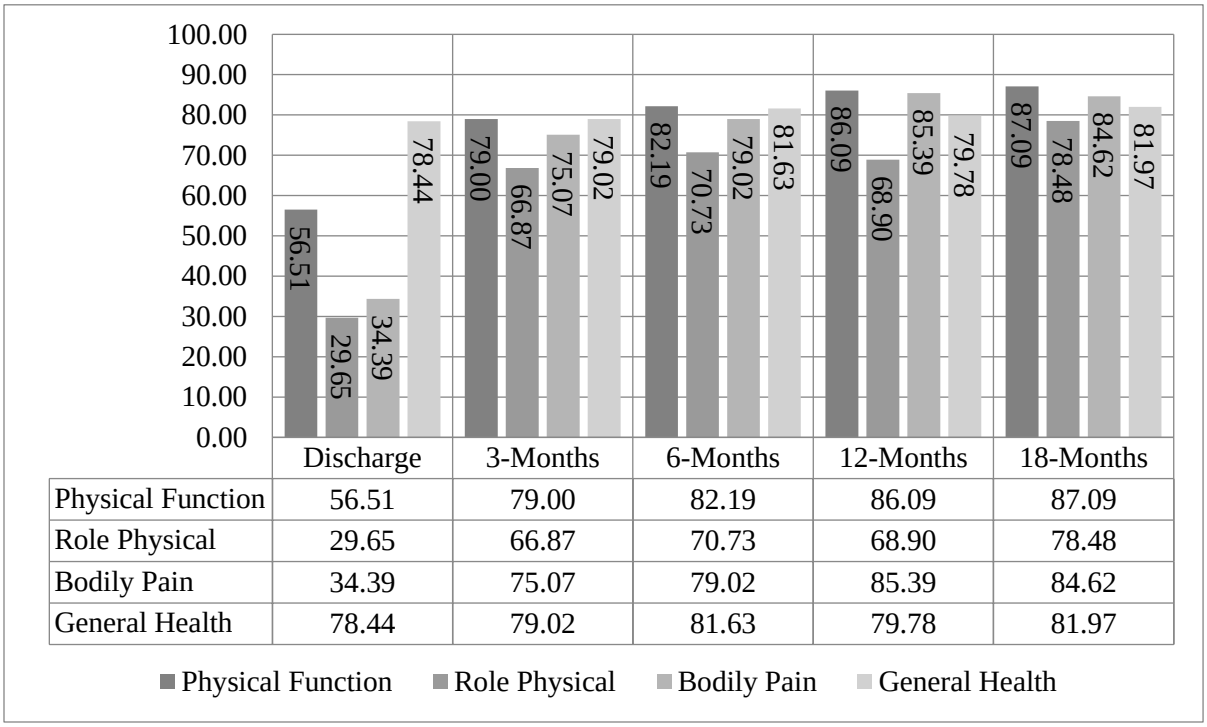
Highest score possible = 100

Table 7 depicts the mean SF-36 physical sub-scale scores for the military and civilian groups. Figures 4 and 5 provide graphs of the SF-36 PCS sub-scale scores for the military and civilian participants. Higher SF-36 sub-scale scores are indicative of better QOL indices. Compared to the U.S. general population, military participants' highest mean PF score was above the norm-based mean PF score. Among the military service

members, there was consistent improvement in mean PF scores over time. However, the other mean subscale scores fluctuated slightly over time. The RP score in the military group was below the norm-based mean RP score for the U.S. "healthy" population. The highest mean PF and RP scores in the military group were between the 25th and 50th percentile. The highest mean BP score was 85.39 at 12-months, which is above the norm-based mean BP score for the U.S. "healthy" population and was between the 50th and 75th percentile. The highest perceptions of GH in military participants were at 18-months, which was above the mean GH score for the U.S. "healthy" population and was between the 50th and 75th percentile.

Although both groups reported consistent improvement in SF-36 PF scores between discharge and 18-months; the military participants' PF scores were consistently higher than the civilian participants at all time-points with the lowest PF scores for the military (M = 56.51, SD = 26.06) and civilian (M = 37.12, SD = 24.93) participants reported at discharge. Furthermore, the lowest RP scores in the military (M = 29.65, SD = 39.43) and civilian (M = 14.65, SD = 29.42) groups also were reported at discharge. All participants' RP scores improved the most between discharge and six-months.

Figure 4. Mean SF-36 Physical Composite Scores: Military (*n* = 49) Group

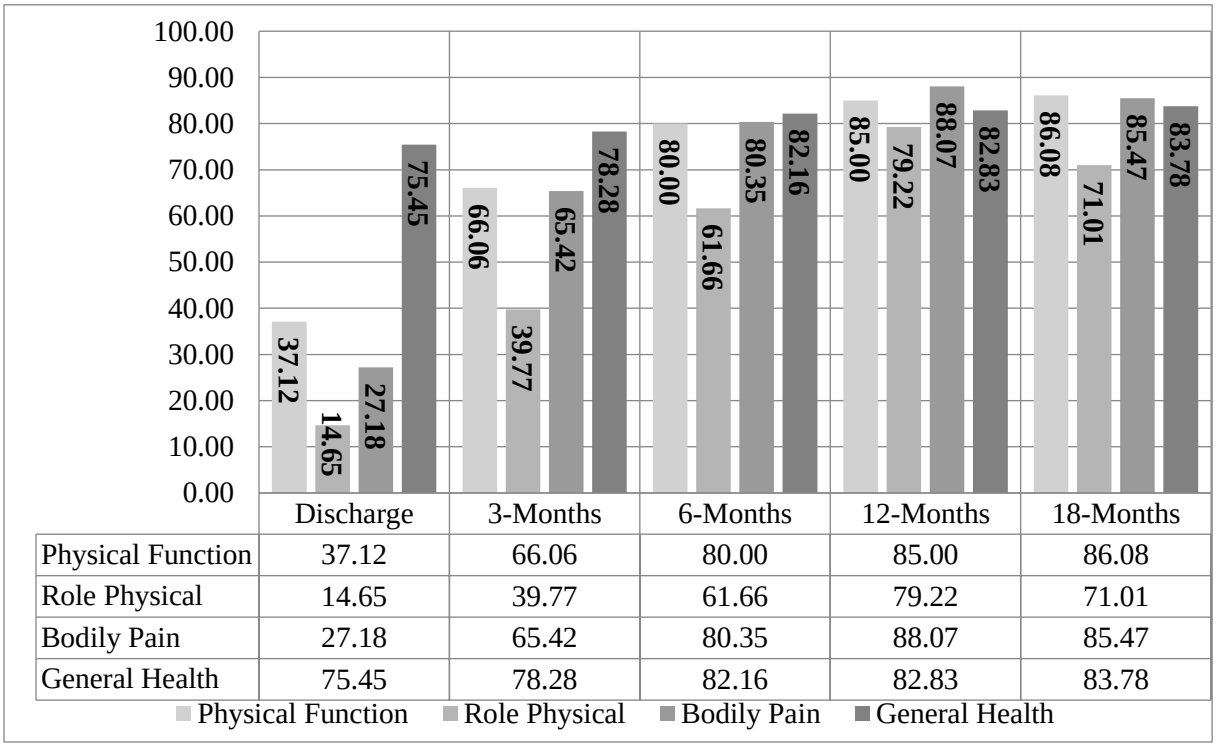


	Discharge	3-Months	6-Months	12-Months	18-Months
Physical Function	56.51	79.00	82.19	86.09	87.09
Role Physical	29.65	66.87	70.73	68.90	78.48
Bodily Pain	34.39	75.07	79.02	85.39	84.62
General Health	78.44	79.02	81.63	79.78	81.97

Highest Possible Score = 100

The highest mean PF score among the civilians was at 18-months and it was above the mean norm-based score for the U.S. population. The highest mean RP score for the civilians was at 12-months post burn center discharge and was below the norm-based mean RP score. The highest mean score for PF and RP were between the 25th and 50th percentiles for norm-based U.S. population scores. The highest mean SF-36 BP sub-scale score in the civilian group also was at 12-months and was above the U.S. population mean score. The civilian participants' 12 and 18- month mean BP scores were between the 50th and 75th percentile. In the civilian group, the highest GH score was at 18-months post burn center discharge and was higher than the mean U.S population score. The highest GH score was between the 50th and 75th percentile.

Figure 5. Mean SF-36 Physical Composite Scores: Civilian (*n* = 88) Group



	Discharge	3-Months	6-Months	12-Months	18-Months
Physical Function	37.12	66.06	80.00	85.00	86.08
Role Physical	14.65	39.77	61.66	79.22	71.01
Bodily Pain	27.18	65.42	80.35	88.07	85.47
General Health	75.45	78.28	82.16	82.83	83.78

Highest Possible Score = 100

Similar to the service members, the civilians' perceptions of physical functioning consistently improved over time from burn center discharge. The same was evident in the mean general health score of the civilians. The civilians also reported improved perceptions in RP and BP from discharge through 12-months however; there was a decrease in mean RP and BP scores at 18-months post-discharge from the Military Burn Center. The mean norm-based SF-36 MCS sub-scale scores within the U.S. general population are depicted in Table 8. Table 9 depicts the mean SF-36 mental sub-scale scores for the military and civilian groups. Figures 6 and 7 graphically represent the SF-36 MCS sub-scale scores for both groups.

Table 8. Norm-Based Mean SF-36 Mental Sub-Scale Scores for the U.S. Healthy Population

	VT	SF	RE	MH
Mean	60.86	83.28	81.26	74.74
25th Percentile	45.00	75.00	66.67	64.00
50th Percentile	65.00	100.00	100.00	80.00
75th Percentile	75.00	100.00	100.00	88.00

In the military group, vitality (VT) sub-scale scores fluctuated over time and the highest score occurred at three-months post burn center discharge. The military VT score was higher than the mean norm-based U.S. population VT score and fell between the 25th and 50th percentile. The lowest mean social function (SF) scores in the military group were reported at discharge (M = 63.66, SD = 28.32). The SF scores in the military group consistently improved at each time-point with the highest score at 18-months. Role emotional (RE) scores improved from discharge to six-months followed by a slight decrease in scores at both 12 and 18-months. In military service members, mental health (MH) scores improved from discharge to three-months however, mean scores decreased beginning at six-months and continued to slightly decrease through 18-months. The highest mean VT, SF, and RE scores were all between the 25th and 50th percentiles for the mean norm-based scores in the U.S. population. The highest mean MH scores, at three-months, were above the U.S. population mean and between the 50th and 75th percentiles. It is evident that there were small changes in perception of vitality over time among the

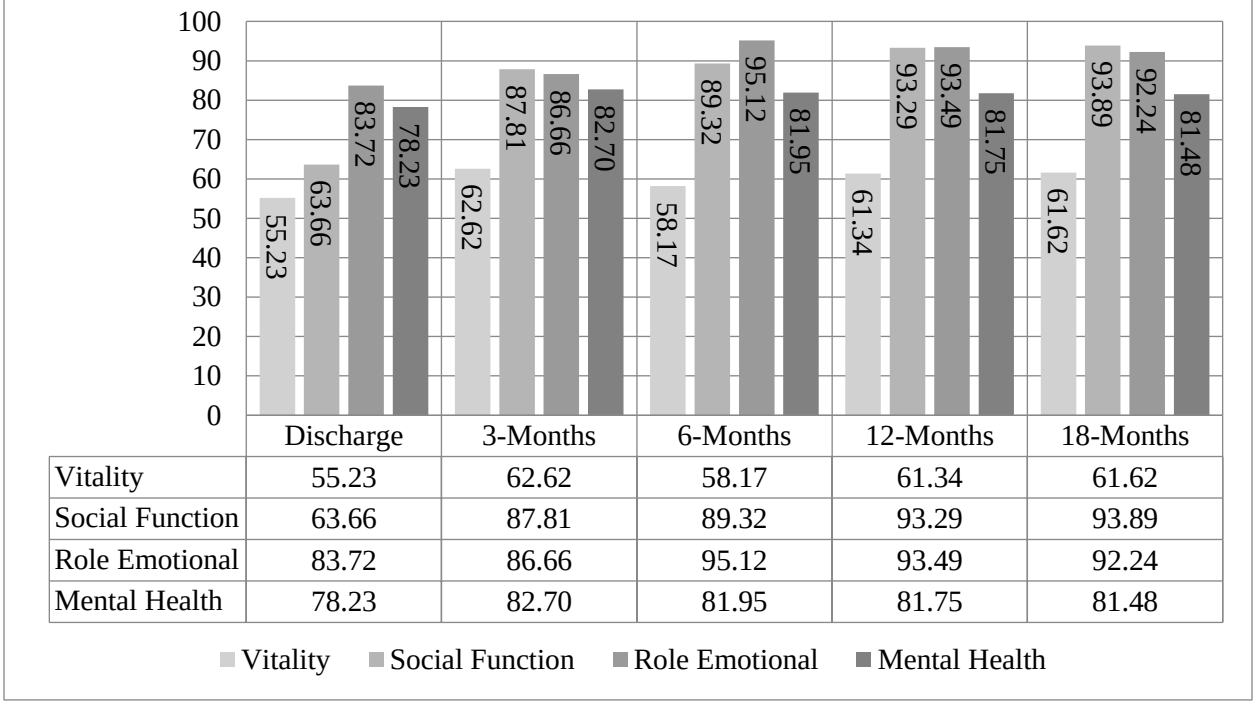
military service members. Military participants' mean SF scores consistently improved over time and their RE mean scores improved between burn center discharge and six-months followed by a slight decrease at 12 and 18-months. At 18-months the RE and SF mean scores were better than those of the normed U.S. healthy population and between the 25th and 50th percentile.

Table 9. Mean SF-36 Mental Sub-Scale Scores: Military and Civilian Groups

Sub-scale	Status	DC	3-Months	6-Months	12-Months	18-Months
SF-36 Vitality	Military (SD)	55.23 (19.24)	62.62 (22.92)	58.17 (20.33)	61.34 (19.93)	61.62 (18.85)
	Civilian (SD)	52.24 (19.77)	58.71 (18.97)	60.83 (16.42)	64.22 (18.31)	62.97 (19.35)
SF-36 Social Function	Military (SD)	63.66 (28.32)	87.81 (18.45)	89.32 (17.13)	93.29 (11.89)	93.89 (10.69)
	Civilian (SD)	39.65 (32.02)	75.56 (25.79)	89.16 (21.76)	93.66 (15.93)	90.21 (18.04)
SF-36 Role Emotional	Military (SD)	83.72 (31.17)	86.66 (28.04)	95.12 (19.09)	93.49 (21.36)	92.24 (25.02)
	Civilian (SD)	74.32 (38.61)	83.83 (33.71)	88.88 (28.56)	95.30 (18.93)	91.78 (25.82)
SF-36 Mental Health	Military (SD)	78.23 (15.91)	82.70 (13.10)	81.95 (13.62)	81.75 (14.22)	81.48 (16.44)
	Civilian (SD)	72.36 (17.26)	78.78 (17.10)	81.86 (13.72)	84.56 (11.38)	84.46 (13.50)

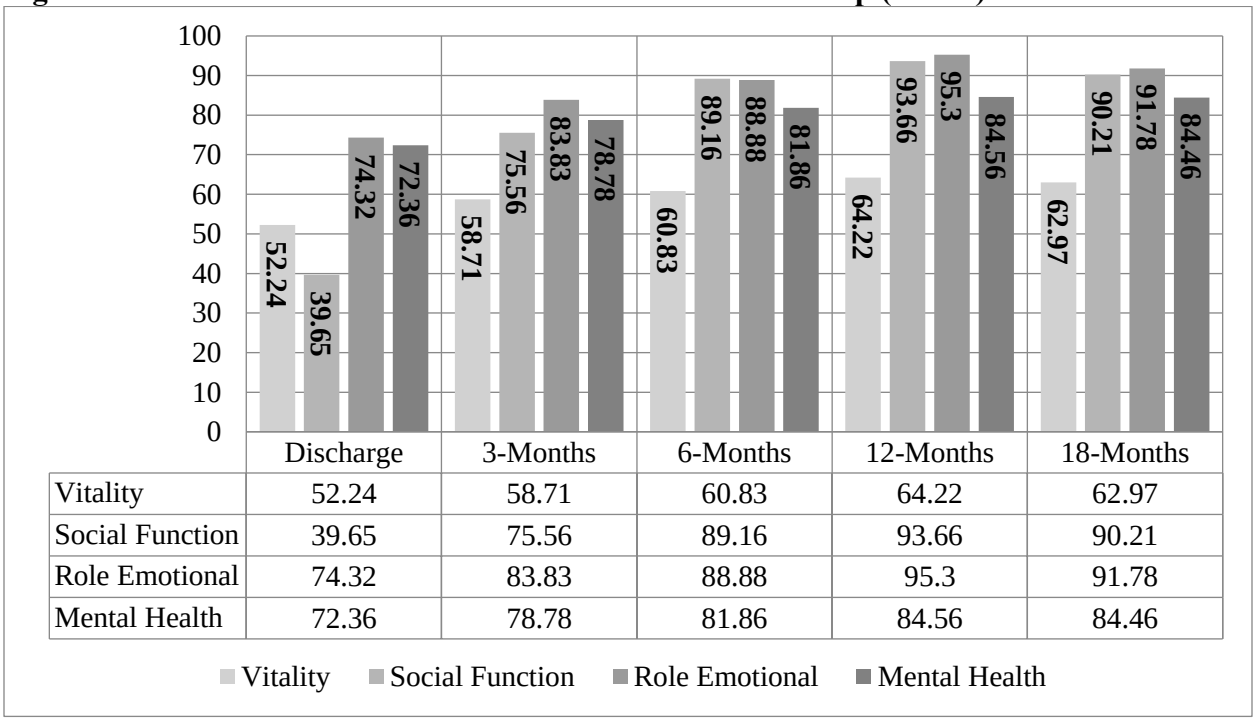
Highest Possible Score = 100

Figure 6. Mean SF-36 Mental Sub-Scale Scores: Military Group (*n* = 49)



	Discharge	3-Months	6-Months	12-Months	18-Months
Vitality	55.23	62.62	58.17	61.34	61.62
Social Function	63.66	87.81	89.32	93.29	93.89
Role Emotional	83.72	86.66	95.12	93.49	92.24
Mental Health	78.23	82.70	81.95	81.75	81.48

Figure 7. Mean SF-36 Mental Sub-Scale Scores: Civilian Group (*n* = 88)



	Discharge	3-Months	6-Months	12-Months	18-Months
Vitality	52.24	58.71	60.83	64.22	62.97
Social Function	39.65	75.56	89.16	93.66	90.21
Role Emotional	74.32	83.83	88.88	95.3	91.78
Mental Health	72.36	78.78	81.86	84.56	84.46

Civilian participants' perceptions of VT improved from discharge through 12-months followed by a slightly lower mean score at 18-months. However, VT scores at 18-months were higher than at discharge. The highest VT scores were above the U.S. population mean and between the 25th and 50th percentiles. In the civilian group, the lowest mean SF score was reported at discharge (M = 39.65, SD = 32.02) however, mean scores in the SF, RE, and MH sub-scales all improved from discharge through 12-months followed by a slight decline in perceptions of SF, RE, and MH at 18-months. The highest SF and RE scores were above the mean norm-based SF and RE scores for the U.S. population and between the 25th and 50th percentiles. In the civilian group, the highest MH mean score was above U.S. population mean score and was between the 50th and 75th percentiles. Civilian participants' mean SF-36 VT and MH sub-scale scores were slightly higher than those of the military service members by 18-months post burn center discharge. However, the SF and RE sub-scale scores in the civilian group were slightly lower than those in the military group by 18-months post-discharge.

RESEARCH QUESTION 2

Research Question #2: *What is the variation in military and civilian burn patients' perceptions of community integration in the first 18-months post-discharge from the USAISR Military Burn Center?* As previously described, the CIQ is a 15-item scale that may be used to assess the extent of community integration. The CIQ is comprised of three subscales: (a) home integration; (b) social integration; and (c) productive activity.

The CIQ home integration sub-scale assesses active participation in the activities associated with the operation of the home and/or household. Social integration refers to participation in a variety of activities outside the home, among these are shopping, leisure activities, and visiting friends (Willer et al., 1993). In developing the CIQ, Willer and colleagues (1993) sought to develop a measure of rehabilitation outcomes for individuals with disabilities. Unlike the SF-36 PCS and MCS summary and sub-scales, the total CIQ and sub-scale scores were not normed against the U.S. population. Therefore, it is not possible to compare CIQ scores from burn survivors with those of the U.S. general population.

Table 10 depicts the mean total CIQ scores and standard deviations (SD) for the military and civilian groups. Figure 8 (pg. 120) is a graphic representation of service members' and civilians' mean total CIQ scores. In this study, at the time of Burn Center discharge, the participants had not performed the home, social integration and productive activities being assessed on the CIQ since suffering their burn injuries. At discharge, participants were instructed to "please check the best answer for each question as it applied to your situation *before* your burn injury."

In the military group, the highest mean total CIQ score was prior to the burn injury. Military participants had slightly lower perceptions of community integration at the three and six-month time points. However, the mean total CIQ scores for service members rose slightly at 12 and 18-months. Military participants' perceptions of

community integration were slightly lower at 18-months than the mean score prior to sustaining a burn injury.

Table 10. Mean CIQ Total Scores for the Military (n = 49) and Civilian (n = 88) Groups

Scale	Status	DC*	3-Months	6-Months	12-Months	18-Months
CIQ Total Scores	Military (SD)	20.53 (3.31)	19.65 (3.54)	19.41 (4.00)	19.66 (3.68)	19.90 (3.21)
CIQ Total Scores	Civilian (SD)	18.04 (3.64)	16.78 (4.23)	16.75 (4.20)	17.21 (4.56)	17.79 (5.09)

*DC = Best answer as it applied to pre-burn injury

The civilian participants' highest mean total CIQ score also was reported before the burn injury. Like the military group, civilian participants' perceptions of community integration were lower at three and six months with slightly improved perceptions at 12 and 18-months. Overall, civilian participants' perceptions of community integration were lower compared to those among the military service members. Table 11 depicts the CIQ

Figure 8. Mean Total CIQ Scores for the Military (*n* = 49) and Civilian (*n* = 88) Groups

sub-scale mean scores and SDs for the military and civilian groups. Figure 9 graphically shows the mean scores for the CIQ home integration sub-scale for the military and civilian groups. Within the military group, it is evident that the highest perceptions of home integration were reported at discharge, which reflects their perceptions before the burn injury. Following discharge, the average home integration sub-scale score was consistently lower at each of the prospective data collection points. These results are indicative of slightly decreased perceptions of home integration in military participants over time following discharge from the Military Burn Center. Civilian participants' perceptions of home integration were good at discharge but were followed by a drop in mean scores at three and six-months. However, by 18-months, participants' perceptions of home integration were higher than at the time of discharge (before the burn injury) and were only slightly lower than the mean score of the military service members.

Table 11. Mean CIQ Sub-Scale Scores: Military (*n* = 49) and Civilian Groups (*n* = 88)

Sub-scale	Status	DC	3-Months	6-Months	12-Months	18-Months
CIQ Home Integration	Military (SD)	5.32 (2.21)	5.00 (2.07)	5.02 (2.24)	5.00 (2.16)	4.78 (2.03)
	Civilian (SD)	4.44 (2.49)	3.89 (2.37)	3.68 (2.29)	4.20 (2.47)	4.52 (2.68)
CIQ Social Integration	Military (SD)	9.38 (1.70)	9.28 (1.84)	9.13 (2.46)	9.28 (2.01)	9.40 (1.83)
	Civilian (SD)	8.22 (1.76)	8.53 (1.69)	8.43 (1.90)	8.25 (2.13)	8.55 (2.13)
CIQ Productive Activity	Military (SD)	5.81 (1.26)	5.36 (1.58)	5.26 (1.63)	5.37 (1.70)	5.72 (1.57)
	Civilian (SD)	5.37 (1.51)	4.35 (2.05)	4.63 (2.02)	4.76 (2.01)	4.71 (2.04)

Figure 9. Mean CIQ Home Integration Sub-Scale Scores for the Military (*n* = 49) and Civilian Groups (*n* = 88)

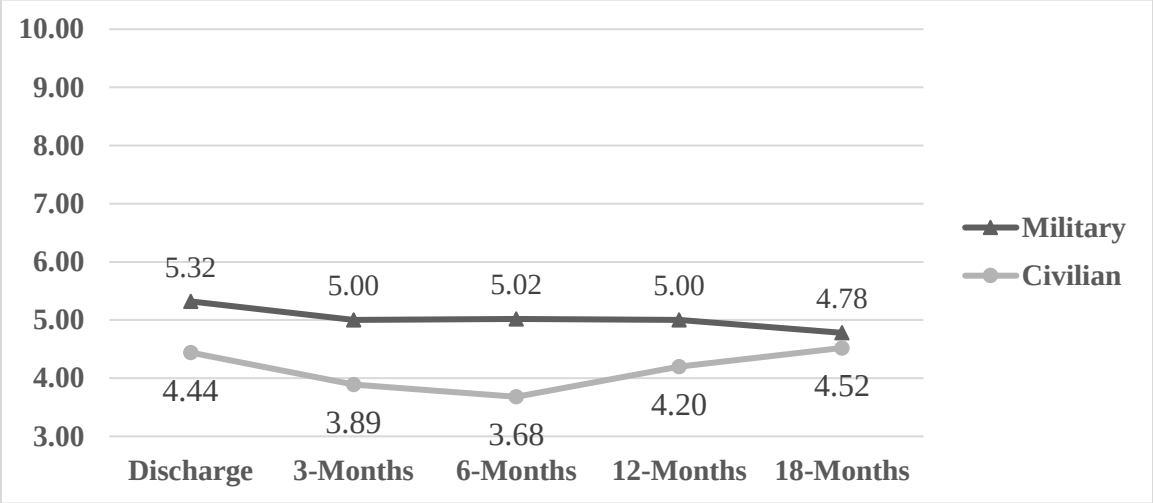


Table 11 and Figure 10 depict the mean CIQ social integration sub-scale scores in both groups. Military participants' perceptions of social integration decreased slightly and then increased at 12-months. The social integration score at 18-months was similar to their reported pre-burn social integration perceptions before the burn injury. In the civilian group, the lowest social integration scores were at discharge and at 12-months. By 18-months, the civilians reported slightly higher social integration scores than prior to the burn injury.

Table 11 and Figure 11 provide the mean CIQ productive activity sub-scale scores for the military service members. Military participants reported slightly higher perceptions of productive activity prior to the burn injury than at 18-months post discharge. The lowest reported scores were at six-months following burn injury with improved scores at 12 and 18-months.

Figure 10. Mean CIQ Social Integration Sub-Scale Scores for the Military (n = 49) and Civilian Groups (n = 88)

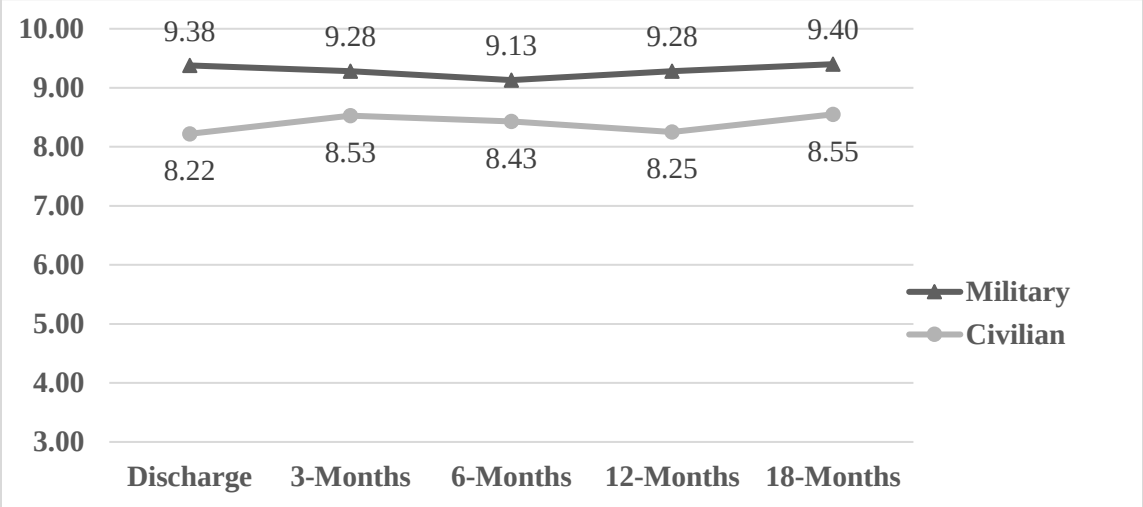
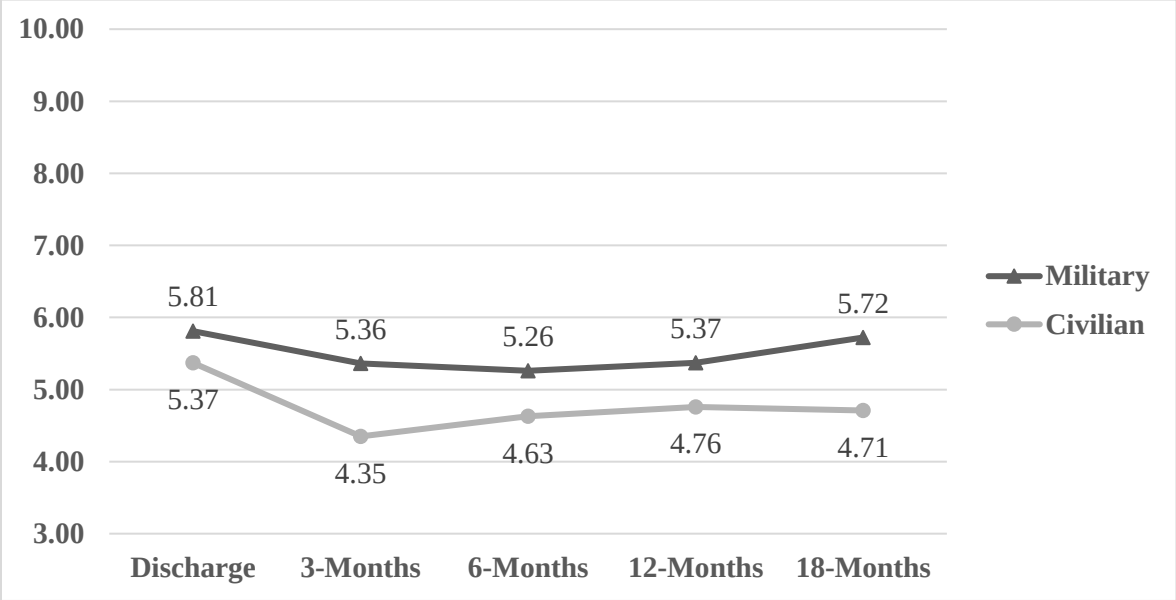


Figure 11 also depicts the CIQ productive activity sub-scale scores for the civilian participants. Civilian participants' mean score at discharge was the highest, which represents their perceptions of pre-burn productive activity. In the civilian group, the lowest self-reported productive activity was at three months. Civilian participants' productive activity scores improved at six and 12-months post burn center discharge with a slight drop in scores at 18-months. Overall, the civilian participants had lower productivity sub-scale scores than the service members.

Figure 11. Mean CIQ Productivity Sub-Scale Scores for the Military (*n* = 49) and Civilian (*n* = 88) Groups



Research questions one and two examined the variation in perceptions of physical and mental QOL and community integration in military service member and civilian burn survivors in the first 18-monts following discharge from the Military Burn Center. In this study, military service members' perceptions of physical QOL consistently improved over time whereas civilian burn survivors' perceptions of physical QOL improved between discharge and 12-months followed by a slight decrease at 18-months post-discharge. Military service members' perceptions of mental QOL improved between discharge and three-months and were lower at 18-months than scores at discharge. Civilian participants' mean SF-36 MCS scores were only slightly lower than those of military service members at discharge through six-months. Moreover, they were higher than those of military participants at both 12 and 18-months following discharge. In this study, military service members consistently had slightly higher community integration

scores than the civilian burn survivors. However, by 18-months post-discharge, there were minimal differences in perceptions of community integration among military service member and civilian burn survivors. The effect of the independent variables on QOL and community integration was analyzed using Multilevel Linear Modeling (MLM) to examine differences over time via a 2-Level Model analysis. These results are presented in the following sections.

INFLUENCE OF PREDICTORS ON QUALITY OF LIFE AND COMMUNITY INTEGRATION

Unconditional Means Models

Because MLM was used to answer two of the four research questions in this study, preliminary analyses needed to be conducted. Although 'time' may be presented as a continuous time-based component or variable, in this study time was modeled as a fixed component because of comparing the various time points. Time, modeled as a fixed effect was the time variant Level 1 (*within-individual*) predictor in this study. Following a thorough review of the literature, variables that were identified to be predictive of QOL and community integration outcomes in burn survivors were selected. These six predictor variables were time invariant Level 2 (*between-individuals*) predictors. The predictor variables are: (a) group status; (b) age; (c) marital status; (d) TBSA burned; (e) FT burn; and (f) LOS.

When conducting MLM, creating a sequence of multilevel models is recommended (Glaser & Hastings, 2011; Singer & Willet, 2003) to examine fit. Initially,

at the simplest level, the data in this study were fit to an unconditional means model (Glaser & Hastings, 2011; Peugh, 2010; Singer & Willet, 2003) that omits predictors. The unconditional means model is not used to examine change in the outcome variable over time, but to describe and partition the outcome variation (Singer & Willet, 2003). Therefore, the variance estimates for the dependent/outcome variable(s) (SF-36 PCS, SF-36 MCS, and CIQ total scores) are not affected by specific factors (i.e. demographic or clinical characteristics).

When using MLM with longitudinal data, perceptions of QOL and community integration can be expected to vary across military and civilian participants. Glaser and Hastings (2011) reported that unconditional means models are beneficial in confirming this because the model can be estimated to determine the inter-class coefficient (ICC). The ICC is a measurement of how well the data within the individual correlate with each other compared with between individuals. There is no established rule as to what constitutes a high ICC however; an ICC of five percent has been indicated to be substantive evidence of a clustering effect (Glaser & Hastings, 2011).

In evaluating and/or comparing alternative models, information criteria such as the -2 Log Likelihood (-2LL) may be used to compare similar models that differ in one parameter by testing the difference in -2LL compared to the $df = 1$ considering only one parameter is changed (Field, 2009). Information criteria such as the Akaike's information criterion (AIC) and Schwarz's Bayesian information criterion (BIC) also are useful statistics for the evaluation of different models containing various combinations of

predictors (Glaser & Hastings, 2011). The AIC and BIC may be compared for any pair of models if fitted to the exact data (Singer & Willett, 2003). Although there are few standards for comparing information criteria (Singer & Willett, 2003), lower values for both statistics indicate a good fit (Field, 2009). As previously discussed (Chapter 3), in this study restricted maximum likelihood (REML) was the estimation method chosen because it has been shown to produce more robust effects in relation to studies with smaller sample sizes (Glaser & Hastings, 2011; Hox, 1998). An examination of the results from the unconditional models is presented in the following section. The results of all modeling processes are depicted in Table 24.

The first unconditional means model (Model 1A) was for the SF-36 PCS score, which examines the total variation across all participants' perceptions of physical QOL without including Level 1 or Level 2 predictors. The overall intercept for the outcome variable (total PCS scores) across all study participants was 43.57 (SE = .640; p = .000). The variance components (τ_{00} = 24.57 [p = .001] and σ^2 = 130.68 [p = .000]) suggested statistically significant variability within-individuals. From the variance components, the conditional ICC can be computed. Therefore, 15.82% [(24.57/(24.57+130.68)] = 0.1582] of the variability in SF-36 PCS scores was attributed to within-individual differences. The results of the AIC and BIC are beneficial as a measure of fit in choosing the best predictive model. In the first unconditional means model, the AIC was 4631.48 and the BIC was 4640.23. The second unconditional means model (Model 1B) was fit to the data for the SF-36 MCS. The overall intercept across the study sample for the SF-36 MCS

scores was 54.07 (*SE* = .50; *p* = .000). The variance components suggested statistically significant variability within-individual levels. In this study, 36.75% [(23.89/(23.89+41.11)] = 0.3675] of the variability in the SF-36 MCS scores was attributed to within-individual differences. In the second unconditional means model the AIC decreased to 4037.81 and the BIC decreased to 4046.56, which represents an improved model fit.

The final unconditional means model (Model 1C) was fit to the data for the CIQ total scores for the study sample. The overall intercept for the CIQ total score was 18.19 (*SE* = .295; *p* = .000). The variance components suggested statistically significant within-individual variation. In this model, 52.66% [(9.70/(9.70+8.72)] = 0.5266] of the variability in the total CIQ score was attributed to within-individual differences. In this final unconditional means model, the AIC decreased to 3191.50 and the BIC decreased to 3200.26. Although the -2 Restricted Log Likelihood has been indicated to be useful in comparing two successive models, it is recommended for use only with maximum likelihood (ML) estimations and not restricted maximum likelihood estimations (REML), which was used in this study. The unconditional means models support a 2-Level MLM. The relationships between the individual characteristics and differences in perceptions of QOL among military service members and civilians are discussed in the following section.

RESEARCH QUESTION 3

Research Question #3. *What is the relationship between individual characteristics and QOL among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?* Singer and Willett (2003) indicated that the next step in building a MLM is the introduction the Level 1 fixed effects of time as a predictor. Time is a key factor in understanding potential relationships between variables in a longitudinal study. A more thorough examination of the potential differences between variables over time can be achieved with the addition of measurement occasions (Heck et al., 2014). The results of this model are indicative of the relationships between the Level 1 predictor(s) and the dependent variable. As previously discussed, in MLM "time" may be presented as a continuous time-based component or variable. Because of the interest in differences over time in this study, time was modeled as a fixed component to compare the differences between the various time-points.

Predictors of Physical Quality of Life

Time. In this study, the overall effect of time on SF-36 PCS scores was significant. Table 12 depicts the regression coefficient where the intercept is equal to the overall average SF-36 PCS scores, which was statistically significant. There also was statistical significance for time at discharge, three, and six-months following discharge. Eighteen months post-discharge was used as a reference. Table 13 represents the variance components for model 2A. There was statistically significant variation in SF-36 PCS

scores within-individuals (σ^2 = 54.75, p = .000) and between-individuals (τ_{00} = 41.43, p = .000) over time.

Table 12. Model 2A: SF-36 Physical Composite Scores by Time
Estimate of Fixed Effects (*n* = 137)

Parameter	*Estimate*	*SE*	*df*	*t*	*p*
Intercept (Time)	50.51	.888	391.95	56.86	.000
Discharge	-20.08	.942	460.41	-21.31	.000
3-Months	-7.64	.987	456.10	-7.73	.000
6-Months	-3.10	1.00	456.89	-3.08	.002
12-Months	-.404	.972	450.35	-.416	.677
18-Months	0[b]	0	.	.	.

Reference Point: 18-Months

Table 13. Model 2A: SF-36 Physical Composite Scores by Time
Estimates of Covariance Parameters (n = 137)

Parameter	*Estimate*	*SE*	*Wald Z*	*p*
Residual	54.75	3.66	14.95	.000
Intercept (Patient ID)	41.13	6.80	6.04	.000

In this model (2A), there was an increase in the variance component of the intercept compared to the unconditional means model. However, with the inclusion of time as a Level 1 predictor, there was a reduction in the estimated residual variance between the unconditional means model (1A) and the current model (2A). Therefore,

based on the reduction, it is possible to calculate the reduction in residual variance; determining the amount of variance explained by model 2A. This estimation of effect size was calculated using a pseudo R^2 statistic (Glaser & Hastings, 2011; Roberts, Monaco, Stovall, & Foster, 2011). Roberts and colleagues (2011) defined the formula for the pseudo R^2 as: (130.68 – 54.75)/130.68 = 0.5810). Therefore, incorporating the Level 1 predictor of time resulted in a 58.12% reduction in error. Furthermore, a reduction in AIC from 4631.50 to 4221.80 and a reduction in the BIC from 4640.23 to 4230.55 supports an improved model fit.

Time Invariant Predictors. To determine which predictors influenced perceptions of physical QOL each variable was modeled separately to estimate the amount of variance explained by each predictor. These variables represented the Level 2, time invariant predictor variables among which were: (a) group status (military vs. civilian); (b) age; (c) marital status; (d) TBSA burned; (e) FT burn, and (f) LOS. The results are presented in Table 14. Based on the parameter estimates, group status, marital status, and LOS did not have a statistically significant effect on perceptions of physical QOL. Although age, TBSA burned, and FT burn did have a statistically significant effect on SF-36 PCS scores over time; these predictors also did not account for a significant increase in the amount of variance being explained in the SF-36 PCS scores. There was a minimal reduction in the AIC and BIC, which indicated a minimal improvement in model fit. Because none of the Level 2 predictors explained a significant increase in the amount

of the variance in SF-36 PCS scores, a final model with time and all six predictor variables included was modeled. The results are depicted in Table 15.

Table 14. Model 3A: Effects of Level 2 Time Invariant Predictors (Individually) on SF-36 Physical Component Scores

Parameter	*Estimate*	*SE*	*p*	*Residual Variance*	*Between Participant Variance*	R^2
Group Status	1.70	1.30	.19	54.77	40.78	0.5808
Age	-.092	.042	.03	54.80	39.46	0.5806
Marital Status	1.93	1.26	.12	54.77	40.50	0.5808
TBSA Burned	-13.19	4.40	.00	54.77	38.00	0.5808
FT Burn	-14.98	5.17	.00	54.77	38.23	0.5808
LOS	-.020	.016	.20	55.03	38.02	0.5788

Note: The individual predictors were modeled separately.

The Level 1 predictor of time remained statistically significant and there were statistically significant differences among SF-36 PCS scores at discharge, three-months, and six-months in relation to the reference time point of 18 months. However, based on the fixed effects, none of the Level 2 predictor variables were statistically significant in this model. There was a minimal increase in the variance component (33.79) in this model compared to the unconditional means model (24.57) and the residual decreased (55.05).

Table 15. Model 4A: Effects of Level 2 Time Invariant Predictors (All) by Time on SF-36 Physical Composite Scores

Parameter	*Estimate*	*SE*	*p*
Fixed Effects			
Intercept (Time)	55.98	2.91	.000
Group Status	.434	1.58	.784
Age	-.100	.054	.066
Marital Status	.356	1.32	.789
TBSA Burned	-5.56	7.07	.433
FT Burn	-12.30	8.57	.154
LOS	.000	.019	.991

	Estimate	*SE*	*p*	R^2
Random Effects				
Residual	55.05	3.77	.000	0.5787
Variance (Pt ID)	33.79	6.20	.000	

Note: All predictors were modeled together. The parameter estimates represent the relationship between the predictor and the SF-36 PCS mean scores.

Although there was no significant increase in the amount of variance (57.87%) being explained by the predictor variables compared to model 2A and 3A, there was a significant increase in the amount of variance explained by this model reflected by a reduction in the AIC to 3986.22 and the BIC to 3994.84 indicating improved model fit.

Perceptions of Mental Quality of Life

Time. Model 2B was fit to the SF-36 MCS scores to examine the effect of time as a predictor of mental QOL. The intercept and overall mean SF-36 MCS scores are depicted in Table 16. The effect of time on the perceptions of mental QOL was statistically significant. There also was statistical significance for time at discharge, but not for the subsequent time-points in this study. The variance components and random effects for model 2B are depicted in Table 17. There was statistically significant variation in SF-36 MCS scores within-individuals ($\sigma^2 = 40.47$, $p = .000$) and between-individuals ($\tau_{00} = 23.82$, $p = .000$) over time.

Table 16. Model 2B: SF-36 Mental Composite Scores by Time
Estimate of Fixed Effects (n = 137)

Parameter	*Estimate*	*SE*	*df*	*t*	*p*
Intercept (Time)	54.44	.730	424.38	74.52	.000
Discharge	-1.92	.809	457.14	-2.38	.018
3-Months	-.102	.848	453.35	-.121	.904
6-Months	.068	.864	454.42	.079	.937
12-Months	.643	.835	446.68	.770	.442
18-Months	0[b]	0	.	.	.

Reference Point: 18-Months

Table 17. Model 2B: SF-36 Mental Composite Scores by Time Estimates of Covariance Parameters (n = 137)

Parameter	*Estimate*	*SE*	*Wald Z*	*p*
Residual	40.47	2.71	14.88	.000
Intercept (Patient ID)	23.82	4.29	5.54	.000

In model 2B, there was a minimal decrease in the variance component of the intercept (23.82) compared to the unconditional means model (1B), which was 23.89. Including time as a Level 1 predictor in this model resulted in a slight reduction in the residual variance. With this reduction in error, the estimated effect size can be determined. In this study, the amount of variance explained, with the addition of time to the model, 1.5% [(41.11 – 40.47)/ 41.11 = 0.015], was minimal. There was a reduction in the AIC from the unconditional means model from 4037.81 to 4021.12 and in the BIC from 4046.56 to 4029.87, which indicated improved model fit.

Time Invariant Predictors. To examine which predictors influenced perceptions of mental QOL each variable was modeled separately to estimate the amount of variance explained by each predictor. These variables represented the Level 2, time invariant predictors and were previously listed on page 30. The results are depicted in Table 18. Based on the fixed effect parameter estimates, none of these predictors had a statistically significant effect on perceptions of mental QOL. Although there was a decrease in the AIC and BIC from the unconditional means model, each of these predictor variables explained a minimal amount of the variance in SF-36 MCS scores over time. Since none of the Level 2 predictor variables explained an increase in the amount of variance

accounted for in SF-36 MCS scores, a final model with time and all six predictor variables was fit to the data. The results are presented in Table 19.

Table 18. Model 3B: Effects of Level 2 Time Invariant Predictors (Individually) on SF-36 Mental Composite Scores

Parameter	*Estimate*	*SE*	*p*	*Residual Variance*	*Between Participant Variance*	R^2
Group Status	.750	1.03	.469	40.48	23.93	0.015
Age	.037	.033	.268	40.46	23.79	0.015
Marital Status	-.821	1.00	.413	40.44	24.01	0.016
TBSA Burned	1.09	3.57	.761	40.47	24.06	0.015
FT Burn	.758	4.19	.857	40.47	24.08	0.015
LOS	.017	.012	.169	41.52	22.73	-9.99

Note: The individual predictors were modeled separately.

In this model (4B), time remained a statistically significant predictor and there was a statistically significant difference between MCS scores at discharge and the reference time point of 18 months. Based on the fixed effects and the parameter estimates; when placed in the model together, none of the Level 2 predictor variables had a statistically significant effect on SF-36 MCS scores over time. Furthermore, there was a minimal decrease in the variance component (23.80) with an increase in the residual variance from 41.11 to 41.47 that resulted in a negative R^2 (-8.75), which is uninterpretable. This could be a result of the addition of all the predictor variables together increasing the magnitude of the variance component (Holden, Kelley, & Agarwal, 2008; Singer & Willett, 2003). However, there was a decrease in the AIC from

4037.81 to 3824.63 and in the BIC from 4046.56 to 3833.25 indicating an improved model fit.

Table 19. Model 4B: Effects of Level 2 Time Invariant Predictors (All) by Time on SF-36 Mental Composite Scores

Parameter	***Estimate***	***SE***	***p***	
Fixed Effects				
Intercept (Time)	52.40	2.47	.000	
Group Status	.602	1.34	.654	
Age	.027	.046	.549	
Marital Status	-.503	1.12	.656	
TBSA Burned	3.09	5.99	.607	
FT Burn	-5.44	7.26	.455	
LOS	.023	.016	.169	
	Estimate	***SE***	***p***	***R^2***
Random Effects				
Residual	41.47	2.85	.000	-8.75
Variance (Pt ID)	23.80	4.55	.000	

RESEARCH QUESTION 4

Research Question #4. *What is the relationship between individual characteristics and community integration among military and civilian burn patients' in the first 18-months post-discharge from the USAISR Military Burn Center?* Initially, an unconditional means model was fit to the CIQ data in this study. In that model (1C) 52.66% of the variation in CIQ total scores was related to within-individual differences. In this baseline model, the AIC was 3187.50 and the BIC was 3200.26. The next step in MLM building was the addition of time.

Predictors of Community Integration

Time. In this study, the overall effect of time on CIQ total scores was statistically significant and there was statistical significance for time at three-months and six- months post discharge from the Military Burn Center. Also, in Table 20, the mean CIQ total scores (intercept) across all participants was statistically significant. Table 21 depicts the variance components for model 2C. There was statistically significant variation in CIQ total scores within-individuals ($\sigma^2 = 8.35$, $p = .000$) and between-individuals ($\tau_{00} = 10.11$, $p = .000$) over time.

In model 2C, there was a slight increase in the variance component (10.11) from the unconditional means model (9.70). With the inclusion of the Level 1 predictor time; there also was a slight reduction in the estimated residual variance between the unconditional means model (8.72) and the current model (8.35). In this model, the residual variance is (8.72 – 8.35)/8.72 = 0.042; therefore, incorporating time into the

model resulted in a 4.2% reduction in error. There was a decrease in the AIC to 3173.09 and BIC to 3181.84 because of the addition of time to the model, indicating improved model fit.

Table 20. Model 2C: CIQ Total Scores by Time Estimate of Fixed Effects (n = 137)

Parameter	*Estimate*	*SE*	*df*	*t*	*p*
Intercept (Time)	18.51	.386	317.57	47.93	.000
Discharge	.418	.369	456.77	1.13	.257
3-Months	-.980	.386	451.85	-2.53	.011
6-Months	-.912	.393	452.28	-2.31	.021
12-Months	-.529	.380	447.52	-1.39	.164
18-Months	0[b]	0	.	.	.

Reference Point: 18-Months

Table 21. Model 2C: CIQ Total Scores by Time Estimates of Covariance Parameters (n = 137)

Parameter	***Estimate***	***SE***	***Wald Z***	***p***	***R^2***
Residual	8.35	.559	14.92	.000	0.042
Intercept (Patient ID	10.11	1.52	6.65	.000	

Time Invariant Predictors. In the next model (3C), the Level 2 time invariant predictor variables were each entered into the model with time to examine the influence of these predictors on perceptions of community integration. These predictors were previously identified on page 31. Each of the predictor variables were entered into the model separately. The results are presented in Table 22. Time remained a statistically significant predictor and there were statistically significant differences in community integration scores at three and six months post burn center discharge in relation to the reference time point of 18 months. Total body surface area burned, FT burn, and LOS did not have a statistically significant effect on perceptions of community integration. Although group status, age, and marital status had statistically significant effects on

Table 22. Model 3C: Effects of Level 2 Time Invariant Predictors (Individually) on CIQ Total Scores

Parameter	*Estimate*	*SE*	*p*	*Residual Variance*	*Between Participant Variance*	R^2
Group Status	2.65	.580	.000	8.34	8.57	0.043
Age	-.062	.019	.002	8.36	9.32	0.041
Marital Status	2.55	.555	.000	8.38	8.40	0.038
TBSA Burned	-2.44	2.14	.255	8.35	10.08	0.042
FT Burn	-1.55	2.52	.539	8.35	10.16	0.042
LOS	.003	.007	.691	8.55	10.10	0.019

Note: The individual predictors were modeled separately.

perceptions of community integration, these predictors did not account for a significant increase in error reduction. Furthermore, with the addition of each of these predictors into the model, there was minimal improvement in the AIC and BIC for each of these models. Because none of these predictors accounted for a significant increase in error reduction or model fit, a final model with time and all six predictor variables included was modeled. The results are presented in Table 23.

The Level 1 predictor of time remained statistically significant and there were statistically significant differences at three and six-months in relation to the reference time point of 18- months. The average CIQ total score (intercept) also remained statistically significant. Based on the results of the fixed effect parameter estimates; group status and marital status remained statistically significant. There was a slight decrease in the variance component from 9.07 in the unconditional means model to 7.21 in this model. There also was a decrease in the residual to 8.58, but there was an increase in the error (R^2 = 0.016). However, there was a decrease in the AIC to 2992.66 and the BIC to 3001.28 indicating an improved model fit.

Table 23. Model 4C: Effects of Level 2 Time Invariant Predictors (All) by Time on CIQ Total Scores

Parameter	*Estimate*	*SE*	*p*
Fixed Effects			
Intercept (Time)	16.64	1.28	.000
Group Status	2.82	.704	.000
Age	.002	.024	.914
Marital Status	2.09	.590	.001
TBSA Burned	1.40	3.14	.655
FT Burn	-1.65	3.81	.664
LOS	-.007	.008	.378

Random Effects	***Estimate***	***SE***	***p***	R^2
Residual	7.21	1.24	.000	0.016
Variance (Pt ID)	8.58	.592	.000	

Note: All predictors were modeled together.

Table 24. Effects of Predictors on Participants Composite Scores (N = 137)

	Model 1A	Model 1B	Model 1C	Model 2A	Model 2B	Model 2C	Model 4A	Model 4B	Model 4C
Solution for Fixed Effects									
Intercept	43.57** (.64)	54.07** (.50)	18.19** (.29)	50.51** (.88)	54.44** (.73)	18.51** (.38)	55.98** (2.91)	52.40** (2.47)	16.64** (1.28)
Discharge				-20.08** (.94)	-1.92* (.80)	.418 (.36)			
3-Months				-7.64** (.98)	-.102 (.84)	-.980* (.38)			
6-Months				-3.10* (1.00)	.068 (.86)	-.912* (.39)			
12-Months				-.404 (.97)	.643 (.83)	-.529 (.38)			
Group Status							.434 (1.58)	.602 (1.34)	2.82** (.70)
Age							-.100 (.05)	.027 (.04)	.002 (.02)
Marital Status							.356 (1.32)	-.503 (1.12)	2.09** (.59)
%TBSA Burned							-5.56 (7.07)	3.09 (5.99)	1.40 (3.14)
%FT Burn							-12.30 (8.57)	-5.44 (7.26)	-1.65 (3.81)
Length of Stay							.000 (.01)	.023 (.01)	-.007 (.00)
Solution for Random Effects									
Between Participant	24.57** (7.11)	23.89** (4.32)	9.70** (1.47)	41.13** (6.80)	23.82** (2.71)	10.11** (1.52)	33.79** (6.20)	23.80** (4.55)	8.58** (.59)
Residual Variance	130.68** (8.67)	41.11** (2.74)	8.72** (.58)	54.75** (3.66)	40.47** (2.71)	8.35** (.55)	55.05 (3.77)	41.47** (2.85)	7.21** (1.24)
Pseudo R^2				0.5810	0.015	0.042	0.5787	-8.75	0.016
Measure of Model Fit									
AIC	4631.48	4037.81	3191.50	4221.80	4021.12	3173.09	3986.22	3824.63	2992.66
BIC	4640.23	4046.56	3200.26	4230.55	4029.87	3181.84	3994.84	3833.25	3001.28

Note: Values in parentheses are standard errors. AIC = Akaike's Information Criterion; BIC = Schwarz's Bayesian Criterion; * $p \leq .05$; ** $p \leq .001$

Instrument Reliability

Table 25 contains the internal consistency reliability coefficients for the instruments used in this study. Findings for the SF-36 including the sub-scales are consistent with the reliability coefficients reported in the literature for the SF-36v1 (McHorney et al., 1994; Ware, Snow, Kosinski, & Gandek, 1993). Findings for the internal consistency reliability coefficients for the CIQ in this study are consistent with the reliability coefficients and acceptable variations reported in the CIQ literature (Corrigan & Demming, 1995; Dijkers, 1997; Willer, Linn, & Allen, 1993; Willer, Ottenbacher, & Coad, 1994). The results of the reliability studies reported in the literature for the CIQ sub-scales have been have been mixed, specifically for the productive activity sub-scale. In developing the CIQ, Willer et al., (1993) reported a Cronbach's α of .35 for the productive activity sub-scale while Corrigan and Deming (1995) reported a Cronbach's α of .18 to .26.

Table 25. Instrument Reliability Coefficients (N = 137)

Instrument	Cronbach's α
SF-36	.85
Physical Function	.93
Role Physical	.92
Bodily Pain	.91
General Health	.75
Vitality	.70
Social Function	.88
Role Emotional	.86
Mental Health	.74
Community Integration	.54
Home Integration	.55
Social Integration	.43
Productive Activity	.24

CHAPTER SUMMARY

The aim of this study was to examine the differences in perceptions of QOL and community integration among military service members and civilian burn survivors in the first 18-months following discharge from the Military Burn Center. A description of the sample and descriptive statistics regarding the variables of interest were provided. Descriptive statistics were presented for the military and civilian participants separately to describe the findings within each group.

The first research question dealt with the differences and/or variation in military and civilian burn patients' of QOL over time. Military service members' SF-36 PCS scores consistently improved from discharge through 18-months with the highest perceptions of physical QOL reported at 18-months. The SF-36 MCS scores in the military group improved between discharge and three-months following discharge. This was followed by a slight decrease in perceptions of mental QOL at 18-months following discharge, SF-36 MCS scores were the lowest reported by military service members. Civilian participants' SF-36 PCS scores improved between discharge and 12-months with a slight decrease reported at 18-months. Civilian burn survivors' perceptions of physical QOL at 18-months were only slightly lower than SF-36 PCS scores reported by military service members. Perceptions of mental QOL in the civilian group increased between discharge and 12-months after discharge, followed by a slight decrease at 18-months. Civilian participants' mean SF-36 MCS scores surpassed those of the military

participants at 12-months and remained slightly higher at 18-months following discharge from the burn center.

Both groups had SF-36 PCS scores that were below the norm-based mean SF-36 PCS scores and below the 25th percentile for the U.S. "healthy" population. Military participants' highest mean SF-36 MCS scores were above the mean score for the U.S. "healthy" population and between the 50th and 75th percentile scores for the U.S. norm-based scores. The military service members' mean SF-36 sub-scale scores for physical function and general health consistently improved over time whereas their role physical and bodily pain sub-scale scores improved between discharge and 12-months. Civilian participants' highest physical function scores were at 18-months and were higher than the mean norm-based score for the U.S. "healthy" population. Civilian participants' highest mean physical function and role physical sub-scale scores were between the 25th and 50th percentile for the U.S. norm-based population. Their highest bodily pain and general health scores were between the 50th and 75th percentile for the norm-based U.S. population.

Military participants' highest mean vitality, social function, and role emotional scores were between the 25th and 50th percentile for the U.S norm-based population. Their highest mean mental health sub-scale scores were at six-months and they were above the U.S. population mean score and between the 50th and 75th percentile. Civilian participants' highest mean vitality scores were between the 25th and 50th percentile for the

U.S. population. Their social function, role emotion, and mental health mean sub-scale scores were between the 25th and 50th percentile for the U.S. population.

The second research question examined differences and/or variation in military and civilian burn patients' perceptions of community integration in the first 18-months following discharge from the Military Burn Center. Both groups' highest mean CIQ total scores were at discharge (assessment of pre-burn status). For the discharge questionnaire, participants were instructed to check the answer that best described their situation "*before* your burn injury." Scores in both groups were lower at three and six-months and although they improved at both 12 and 18-months; scores at 18-months were lower than at discharge in both groups but they were nearing the patients' pre-burn scores. Regarding the CIQ subscales, military participants' mean social integration scores decreased following discharge but were at their highest reported levels by 18-months, which was slightly above the discharge scores. Civilian participants' home integration scores were lower following discharge at both three and six-months. However, at 18-months their scores were higher than at discharge and only slightly lower than scores from the military group. Civilian participants' mean social integration scores increased following discharge followed by decreases at both six and 12-months but by 18-months social integration was at the highest reported levels. Productive activity scores among the civilian group decreased following discharge and were at their highest levels at 12-months following burn center discharge.

The third research question dealt with examining the relationships between individual characteristics and QOL among military and civilian burn patients' in the first 18-months following discharge from the Military Burn Center. In model 2A, the overall effect of time was a statistically significant predictor of changes in perceptions of physical QOL at discharge, three, and six-months following discharge. In that model, there was statistically significant variation in SF-36 PCS scores within and between-individuals over time. The pseudo R^2 in that model was 58.10, which was a substantial reduction in error and in conjunction with a reduction in the AIC and BIC, this model was an improved fit over the unconditional means model (1A). Model 3A included the Level 2 time invariant predictors. Although age, TBSA burned, and FT burn had a statistically significant fixed effect on perceptions of physical QOL, they did not account for a significant increase in the amount of variance explained in SF-36 PCS scores. Model 4A contained all the predictors in this study. Time continued to explain a statistically significant amount of variance and the addition of all of the predictors together in the same model resulted in a R^2 of 57.87 and the largest reduction in the AIC and BIC.

The fourth research question dealt with examining the relationships between individual characteristics and community integration among military and civilian burn patients' in the first 18-months following discharge from the Military Burn Center. The unconditional means model fit to the CIQ data explained 52.66% of the variation in total CIQ scores. In model 2C, the addition of time into the model accounted for 4.2% of the

amount of variance in CIQ total scores. In model 3B with the addition of the Level 2 predictors, although group status, age, and marital status had a statistically significant fixed effect on CIQ total scores over time; they did not account for a significant amount of variance in CIQ total scores. After examining the model fit for each of the four CIQ models, although model 4C did not account for a significant increase in the amount of variance accounted for the decrease in AIC and BIC indicated it was the best fit.

CHAPTER 5

Summary, Discussion, Implementation, and Recommendations

In this chapter, a discussion about the implications of the findings from this study is provided. The study findings also were placed within the context of the recommendations for future nursing practice, education, research, and policy are discussed.

SUMMARY OF THE STUDY

The purpose of this study was to examine changes in perceptions of QOL and community integration among and between military and civilian burn survivors over time to develop a better understanding of the rehabilitation trajectory (adaptation) following a burn injury. Congruent with the "parent study," the conceptual framework for this study was the Roy Adaptation Model. The Roy Adaptation Model is a foundational conceptual framework that supports the development of scholarly knowledge, the conduct of research, and the guidance of clinical practice (Barone & Roy, 1996).

To fulfill the study purpose and to answer the four research questions, a secondary analysis of data previously collected in the longitudinal "parent study" was conducted. As previously stated, the "parent study" consisted of an examination of QOL outcomes among military and civilian burn patients up to 18 months after they were discharged from the United States Institute of Surgical Research (USAISR) Burn Center located within the San Antonio Military Medical Center (SAMMC), Fort Sam Houston, Texas.

The data in the "parent study" were obtained from a convenience sample of 49 service members/retirees and 88 civilian burn patients (total N = 137). Following a thorough review of the literature, it is believed that this is the first examination of QOL and community integration among patients treated in the Military Burn Center using the SF-36 and the CIQ after burn center discharge. Using SPSS v24, descriptive statistics (measures of central tendency) and multilevel linear modeling (MLM) were conducted to analyze the data and answer the four research questions.

DISCUSSION OF THE STUDY FINDINGS

Burn injuries are catastrophic life-altering injuries that may be associated with long-term alterations in physical and psychosocial QOL and community integration outcomes for burn survivors. Falder and colleagues (2009) defined the goal of burn care and rehabilitation as encompassing treatments that are beneficial in assisting burn survivors to return to their pre-burn lifestyle with unaltered potential. However, little is known about burn survivors' QOL and community integration in the first several years after a burn injury (Anzarut et al., 2005; Cromes et al., 2002; Esselman et al., 2001). The time-point at which burn survivors are assessed during their recovery trajectory may be important in examining the degree of physical and psychosocial recovery. The results from this study are important because they add to the science about QOL and community integration thereby filling a gap in the literature concerning longitudinal outcomes experienced by burn patients. Moreover, the findings explicitly provide information about

the QOL and community integration rehabilitation trajectory of military service members and civilians treated in the Military Burn Center.

Quality of Life

In this study, QOL was measured using the SF-36, which consists of a physical component score and a mental component score. Each component score also consists of a variety of sub-scales. Implications of the findings from the physical (PCS) and mental (MCS) component scores were discussed first and then subscale score implications were addressed.

Physical Component Score (PCS)

There were six studies where QOL was measured using the SF-36 on more than one occasion among patient age groups similar to those in this study (Edwards et al., 2007; Fauerbach et al., 2002; Fauerbach et al, 2005; Orwelius et al., 2013; Wasiak et al., 2013; Wasiak et al., 2014). The findings from these studies are difficult to compare because in some cases the actual SF-36 PCS score was not provided, it was only represented in graphs (Altier et al., 2002; Anzarut et al., 2005; Edwards et al., 2007; Jonsson et al., 1997; Orwelius et al., 2013; Wasiak et al., 2013). Furthermore, in several studies the component score was never presented but the sub-scale scores were provided and discussed (Fauerbach et al., 2002; Edwards et al. 2007; Klein et al., 2007). In other studies, patients were divided into strata based on their ages or TBSA burned (Fauerbach

et al., 2005, Klein et al., 2007; Wasiak et al., 2014). For example, the study by Klein et al. (2007) consisted of patients 55 years or older.

Table 26 provides a comparison of the military and civilian findings from this study as compared to the findings from three other studies in which the PCS was documented. As can be seen in Table 26, the military patients had higher PCS scores at discharge, six months, and 12 months compared to patients from the Fauerbach et al. (2005) study.

Table 26. Studies where SF-36 PCS Scores were Provided

SF-36 PCS	Military	Civilian	Fauerbach et al., 2002	Fauerbach et al., 2005	Wasiak et al., 2014
[NB PCS = 55.26]	DC-34.11 3M-47.00 6M-48.38 12M-49.69 18M-51.15	DC-28.92 3M-40.82 6M-47.69 12M-50.57 18M-50.15	Pre-burn-52.77 2M -42.41	DC-29.80 6M-47.60 12M-48.30	3M-48.66 6M-50.78 12M-52.23

Note: NB = norm-based. DC = burn center discharge. M = months

The military and civilian participants suffered less severe burns compared to the participants in the Fauerbach et al. (2005) however, the PCS scores of the civilian patients in this study were similar to those of the patients in the study by Fauerbach et al. (2005). The clinical outcomes presented by Fauerbach and colleagues (2005) did not include the LOS for the study participants. The Australian patients in the Wasiak et al. (2014) study sustained more severe burn injuries however, they scored higher on the SF-36 PCS than the military and civilian patients in this study at three, six, and 12 months. However, those patients were divided into discrete strata based on their TBSA burned, making direct comparisons difficult. Furthermore, Wasiak and colleagues (2014) found

that regardless of the percentage of TBSA burned, the lowest PCS occurred at three-months with minimal improvement at 12-months post-discharge. When examining the scores of the military patients in this study, the findings are consistent with those of Wasiak et al. (2014) because the scores improved minimally between three months and 18 months, but the civilian patients demonstrated a greater improvement in their SF-36 PCS from three to 12-months. The more participants in the Waskiak et al. (2014) study who sustained more severe burn injuries (greater than 30% TBSA burned) had a similar LOS to the military participants in this study. Similar to the findings from this study, where the mean SF-36 PCS was below the normed mean score for the U.S. healthy population and below the norm-based mean for the 25th percentile, in two of the five studies the mean PCS also was below the norm-based score and below the 25th percentile (Fauerbach et al., 2005; Wasiak et al, 2014).

In only one cross-sectional study of burn patients was the SF-36 PCS reported (Dyster-Aas et al., 2007). The patients in that study were between three to eight years post-burn center discharge and they were divided into two groups based on their Return to Work (RTW) status. Study participants who returned to work had PCS scores only slightly higher (53.2) than the military and civilian participants in this study at 18 months. However, the military and civilian PCSs were markedly better than the non-RTW group in that study (39.6). Similar to the participants in this study, the scores in both the RTW and non-RTW groups were below the normed U. S. healthy population PCS score and the mean score for the 25th percentile. Higher perceptions of physical QOL may be

associated with returning to work. The military and civilian participants in this study had SF-36 PCS scores that were similar to the RTW group. The scores for the military participants may be the result of the patients being assigned to duties as tolerated to keep them physically and psychologically engaged. No RTW information was collected from the civilian participants in this study; therefore, it is impossible to directly link their 18-month SF-36 PCS with RTW.

Predictors of Physical Health Scores (PCS)

Time invariant predictors. In this study, when all the Level-2 predictors were entered, none of these predictor variables had a statistically significant effect on the SF-36 PCS over time. The military and civilian patients had a similar rehabilitation trajectory, which is evidenced by the minor differences between six and 18-months following discharge. These findings differ from the results reported by Fauerbach and colleagues (2005) in that the military and civilian patients in this study had higher scores over time. The higher PCSs among the military and civilian patients may be explained by the fact that they had smaller percentages of TBSA burned than patients in the Fauerbach et al. study.

The lower SF-36 physical component scores at discharge may initially create the perception of poor QOL following burn injury. However, both groups experienced improvements in SF-36 physical component scores over time with an overall similar rehabilitation trajectory. Based on the MLM results, time was a statistically significant

predictor of differences in perceptions of physical QOL. Furthermore, the results from this study, when compared to results from the studies in Table 25, indicate that military and civilian patients treated in the Military Burn Center may have similar physical QOL outcomes as those reported by burn patients treated in civilian burn centers.

SF-36 PCS Sub-Scales

There are four subscales within the PCS; they are physical functioning (PF), role-physical (RP), bodily pain (BP), and general health (GH). Within the literature, there were 11 studies related to QOL outcomes among burn survivors in which the SF-36 PCS sub-scales were used (Cakir et al., 2015; Fauerbach et al., 1999; Gandeolfi et al., 2016; Grisbrook et al., 2012; Leblebici et al., 2006; Li et al., 2014; Meirte et al., 2017; Moi, Haugsmyr, & Heisterkamp, 2016; Moi et al., 2006; Ullrich et al., 2009; Xie et al., 2013). In 9 of the 11 studies, participants resembled the civilian patients in this study on variables such as age (Cakir et al., 2015; Fauerbach et al., 1999; Gandolfi et al.,2016; Grisbrook et al., 2012; Meirte et al., 2017; Moi et al., 2016; Moi et al., 2006; Ullrich et al., 2009; Xie et al., 2013), TBSA burned (Fauerbach et al., 1999; Moi et al., 2006), and FT burn (Moi et al., 2016; Moi et al., 2006). Patients in three of the 11 studies resembled the military service members from this study based on variables such as age (Leblebici et al., 2006; Li et al., 2014) and TBSA burned (Meirte et al., 2017). However, it is difficult to compare the results of these studies to the findings from this study because some of them were conducted 10-15 years ago when some recent advances in burn care were not

part of the care process (Fauerbach et al., 1999; Leblebici et al., 2006; Moi et al., 2006). Also, there is wide variation regarding when the data were collected, ranging from six months after hospital discharge (Fauerbach et al., 2005) to five years after burn treatment (Moi et al., 2016).

Physical Sub-Scale Scores

The military patients in this study initially reported experiencing moderate limitations in most of the SF-36 PCS sub-scales. Over time, their physical sub-scale scores consistently improved and by 18 months following discharge; they reported few limitations in completing personal and physical activities. However, despite reported improvements in completing personal and physical activities, the military patients' role physical sub-scale scores were consistently lower than the reported PF, BP, and GH scores. Although the RP sub-scale scores were lower, the reported scores consistently improved between discharge and six-months and were higher at 18-months that at discharge.

It is interesting to note that the civilian patients also initially reported lower PCS sub-scale scores, yet by 18-months following discharge they had scores similar to the military participants. The civilian patients' RF sub-scale scores also were consistently lower that the PF, BP, and GH scores. However, the scores consistently improved between discharge and 12-months and despite decreased scores between 12 and 18-months; the scores at 18-months were higher than at discharge. The civilian patients were

older and had a higher percentage TBSA burned and FT burn compared to the military service members. This may account for their lower physical function (PF) scores at hospital discharge and three months and their lower role physical (RF) scores at discharge. These lower sub-scale scores may initially create the perception of a poorer QOL following burn injury; however, both PF and RF scores made great improvement by six months post-discharge, which continued through 12 and 18-months.

The military and civilian burn survivors had a similar rehabilitation course and by 18-months post burn center discharge they both had PF scores above the normed mean for the U.S. healthy population. In both groups, the PF scores did not improve much between 12 and 18 months. These findings are consistent with the notion that long-term perceptions of physical health in burn survivors remain stable at a certain point and the greatest perceived improvements in physical health occur during the initial period of the rehabilitation period (Moi et al., 2016).

Andreasen and Norris (1972) found that adjustment in burn survivors may be negatively affected because they see themselves as a "different person," which may alter their "occupational identity and their future occupational role. However, the military and civilian patients in this study reported better physical function, role function (role-physical), less bodily pain, and better general health over time than the participants in several of the studies reported in the literature (Gandolfi, 2016; Li et al., 2014; Ullrich et al., 2009; Wasiak, 2014). These findings may be because there were larger variations in TBSA burned among the patients in those studies. Of importance is the fact that by 12-

months post discharge, the patients in this study had better SF-36 physical function, bodily pain, and general health subscale scores than the normed mean U.S. healthy population scores. However, at 18 months, the role physical (role function) scores in both groups remained lower than the normed mean U.S. healthy population score.

Cheng and Rodgers (1989) found that following a burn injury there were three patterns of occupational role performance: (a) a minimal or no disruption in self-care, home management, work, and leisure roles; (b) a reduction in or loss of work around the home and in competitive employment; and (c) a substantive disruption in self-care, home management, work, and leisure roles. In this study, the lower role physical sub-scale scores for both the military and civilian groups may reflect how the participants viewed their occupational role performance and their ability to work at the job they held prior to the burn and return to a pre-burn level of occupational role performance.

Mental Component Scores (MCS)

The military participants' MCS scores were slightly higher than those of the civilian participants between discharge and six-months. At six-months, the military participants' scores were only slightly higher compared to the civilian participants followed by decreases at both 12 and 18-months. It is possible that beginning at 6-months following discharge, the military service members may have been faced with lower perceptions of mental health because of the possibility that they would not be able to return to their pre-burn duty status and indeed may have to leave the military as a result

of their injuries. At 12 months post discharge, the service members may have had to start coming to terms with disability issues or life changes because of their burns.

These findings may indicate the need for ongoing mental health assessment in the outpatient burn clinic and perhaps more intensive psychosocial support (a *mental health booster*) during this time-period to support the military patients during this life reassessment. The civilian participants reported consistently higher MCS scores between discharge and 12-months, with scores remaining stable at 18-months. Although the military patients' MCS scores fluctuated over time and were only slightly higher at 18-months compared to their discharge scores, it appears that their mental health rehabilitation trajectory was essentially flat indicating they experienced minimal improvements in perceptions of mental QOL over time. However, among both the military and civilian groups their mental health scores at three months post burn center discharge were similar or higher than the normed mean SF-36 mental health score for the U.S. healthy population. The military participants' MCS scores continued to improve and were higher than the military participants' scores by 12-months, remaining slightly higher at 18-months post-discharge. The military participants' MCS scores fluctuated between six and 12-months and by 18-months post-discharge military MCS scores were lower than at discharge. Overall, the military participants showed minimal improvement in MCS scores over time. Their highest MSC scores were at three months post-discharge, which may be indicative of an improved mood after being released from the Military Burn Center.

Predictors of Mental Health Scores

Time invariant predictors. When examining the influence of the Level 2 predictors on the SF-36 mental health scores, none had a statistically significant effect on the SF-36 MCS scores over time. Therefore, findings from this study do not support the notion that time, TBSA burned, FT burn, marital status, or group status (civilian vs. military) predict mental health scores using the SF-36 in patients similar to the ones in this study. It must be noted that the patients in this study had what could be categorized as moderate levels of burn injuries based on their TBSA burned, therefore these findings may not be consistent with experiences of patients with severe burns (>30% TBSA).

Mental Health Sub-Scale Scores

The SF-36 MCS is composed of four sub-scales called vitality (VT), social function (SF), role-emotional (RE), and mental health (MH). In this study, the military patients initially had MCS sub-scale scores that were higher than the civilian patients at discharge and three-months but by six months the mental health sub-scale scores were similar in both groups except role-emotional, where the civilians had somewhat lower scores. There was minimal improvement over time in two of the MCS sub-scales, vitality and mental health. Vitality, which measures energy level and fatigue, reflects subjective well-being and the mental health sub-scale is intended to determine issues related to anxiety, depression, and psychological well-being. The lowest mean scores for both the military and civilian participants were reported in the vitality sub-scale. Although

minimal improvement occurred over time in these mental health and vitality subscales, it is important to note that by three months the mental health subscale scores were higher than the normed mean score for the healthy U.S. population. Also, although the vitality scores fluctuated over time, the military service members' scores were at their highest at three, 12, and 18-months while the civilian participants' vitality scores were slightly higher than vitality scores reported by the military participants at six, 12, and 18-months. Furthermore, the civilian participants' scores were just below the normed mean vitality score at six months and higher than the normed mean vitality score for the U.S. healthy population at 12 and 18-months.

The MCS sub-scale scores results indicated that when burn patients are seen by providers on an outpatient basis, they should be asked about issues like fatigue and energy levels, quality of sleep, anxiety, and feelings of depression or sadness. These areas seem to provide the most opportunity for improvement in the mental health scores over time. Additionally, the fluctuation among the vitality scores indicated that patients' feelings in regard to energy levels and subjective well-being may be less stable and require more vigilance by the healthcare team.

COMMUNITY INTEGRATION

There are few studies of the long-term consequences of community integration among people who experienced severe burn injuries. As previously stated, advances in caring for people with burn injuries have resulted in better rates of survival and an

increased need to understand their rehabilitation trajectory as they integrate back into the community. Community integration is described as peoples' ability to be active in their expected community roles, at home in leisure activities, and in productive activities such as work, school, and volunteer activities (Esselman et al., 2001).

The results from this study can only be compared to findings from the two studies in the literature that reported community integration scale or sub-scale scores among burn survivors using the CIQ (Cukor, Wyka, Lehay, Yurt, & Difede, 2015; Esselman et al., 2001). In a pilot study, Cukor and colleagues (2015) reported total CIQ scores among nine burn patients before and after a PTSD intervention. The patients in that study were similar in age to the civilians in this study. However, most of the patients in the Cukor et al. (2015) were women (60%), had a larger burn size (17.65%), and a longer LOS (M = 30.10) than the patients in this study. The CIQ scores of the nine patients prior to the PTSD intervention (pre-treatment) were markedly lower (M = 13.58) than those of the patients in this study (military = 19.65; civilian = 16.78). After the PTSD intervention, the CIQ scores of the patients in the Cukor study also were lower (M =18.94) than those of the military patients in this study (M =19.41) but higher than the civilian scores (M = 16.75).

In a longitudinal study, Esselman and colleagues (2001) used the CIQ to measure community integration outcomes among 370 burn patients at six-months, one year, and two years post-burn. The patients in that study were similar to the civilians in this study regarding age and TBSA burned. No total CIQ scores were reported, however the sub-

scale scores were provided for each time period. Table 27 depicts the CIQ sub-scale scores for the male patients at six and 12-months in comparison to the findings from this study (which contained only two female burn patients). As can be seen in the table, the male participants in the Esselman study reported lower home and social integration as well as productive activity CIQ scores than the military patients in this study. When comparing the civilian patients in this study to the men in the Esselman study, one can see that the home integration scores of the civilian patients are lower, but the social integration and productivity scores are similar at six and 12-months. When comparing the 18-month CIQ scores with the Esselman scores at two years, the patients in this study scored higher on home and social integration; only the military patients scored higher on productive activity.

Table 27.
CIQ Score Comparison Esselman et al., (2001)

CIQ Scale	Male (*n* =307)		Military (*n* = 49)		Civilian (*n* = 88)	
	6 Month	12 Month	6 Month	12 Month	6 Month	12 Month
Home Integration	4.25	4.28	5.02	5.00	3.68	4.20
Social Integration	8.22	8.49	9.19	9.28	8.43	8.25
Productive Activity	4.15	4.81	5.26	5.37	4.63	4.76

The results from this study indicate that patients treated in the Military Burn Center may have better post-discharge community integration scores overall than reported for burn patients treated in the civilian sector. However, all the scores except for the civilians' productive activity scores were similar or better than the Esselman (2001)

patients' perceptions of their community integration prior to their burn injury. This seems to indicate that the burn survivors in this study may have been reintegrating back into their pre-burn lives rather quickly, comparatively.

Because the CIQ productivity score reflects the person's ability to work the civilians in this study may have had lower productive activity scores due the fact that they had a greater percentage of TBSA burned and were unable to work immediately after leaving the burn center. In comparison, the military patients were given a variety of duties based on their functional abilities, which may have resulted in better perceptions of reintegration as reflected by improved productivity scores. Furthermore, the military burn patients in this study were, on average, 10 years younger than the civilians in this study and the patients in the Cukor et al. (2015) and Esselman et al. (2001) studies. Therefore, higher CIQ scores among the military patients at all time-points also could be explained by their younger age and military physical fitness (better functional status).

Predictors of Community Integration

Time Invariant Predictors. In this study, when all the Level 2 predictors were entered, only group status and marital status continued to have a statistically significant effect on the CIQ scores over time. The higher home integration scores up to 12 months among the military participants could be explained by the fact that 51% of them were single males therefore; they had fewer opportunities to share home duties with another person. They had to perform shopping and meal duties on their own compared to married

couples or individuals in a shared living situation where household duties are shared therefore resulting in lower home integration scores. These findings are similar to the results from Esselman and colleagues (2001), where gender, marital status, and living status also were found to be predictors of home integration. The higher social integration scores among the military burn patients can be explained by the fact that the military functions as its own community where members of the person's military unit or social circle provide support.

In summary, this study fills an important gap in the literature by providing community integration information about military and civilians after they were treated in the Military Burn Center. Both groups experienced minimal improvements in their CIQ scores from three to 18 months. However, the CIQ scores at 18 months were only slightly lower than the scores at burn center discharge, which reflected the patients' perceptions of their community integration prior to their burn injury. These findings indicate that patients treated in the Military Burn Center seem to be returning to their pre-burn home, social and productivity states rather quickly. Findings from this study also support results from a previous study (Esselman et al., 2001), where the researchers concluded that improved home integration scores may be related to a person's living situation. For example, single individuals may obtain better home integration scores quicker because they have no one with which to share home activities. This is the first study where the difference in social integration and productive activity among military and civilian burn survivors were explained.

CONCEPTUAL FRAMEWORK

The conceptual framework that guided this study was the Roy Adaptation Model (Roy, 2009; Barone & Roy, 1996). Based on the findings from this study, many of the proposed relationships between the concepts in the Roy Adaptation Model were correct. In the proposed model for this study, the focal stimulus identified for this study was the burn injury. The contextual stimuli encompassed all other stimuli present in a situation. Although they are not the primary focus of the change in the burn survivors' perceptions of QOL and community integration, contextual stimuli influence how the individual responds to the focal stimulus (Barone & Roy, 1996; Roy, 2009; Tolson & McIntosh, 1996). In the proposed model, the contextual stimuli identified in this study consisted of military or civilian status and demographic and clinical characteristics. Based on the results from this study, in the revised model, the focal stimulus is the burn injury and the contextual stimuli are time, group status (military or civilian), and marital status. The other demographic and clinical characteristics considered, such as the percentage TBSA burned, FT burn, and LOS were determined not to affect the perceptions of QOL and community integration outcomes among military or civilian burn survivors.

In this study, time was a statistically significant predictor of physical QOL and community integration outcomes. Although age and the percentage TBSA burned and FT burn had a statistically significant effect on physical QOL outcomes whereas LOS did not; none of these Level 2 predictors accounted for a statistically significant increase in the variance of SF-36 PCS and MCS scores and total CIQ scores. In the final model (4C),

time, group status, and marital status had a statistically significant effect on total CIQ scores. However, there was a slight decrease in the amount of variance accounted for in changes in perception of community integration.

The proposed relationship between physical and mental QOL was not statistically significant within the military service members and although it was statistically significant within the civilian group, the amount of variance (R^2 = .017) accounted for was not clinically significant. Within the military group there also were statistically significant relationships between SF-36 PCS scores, social integration (R^2 =.017), productive activity (R^2 = .046), and total CIQ scores (R^2 = .024) but these relationships do not account for a significant amount of variance and therefore cannot be considered to be clinically significant. Moreover, in the military group there were statistically significant relationships between SF-MCS scores and social integration (R^2 = .105) and total CIQ scores (R^2 = .028), these also are not considered to be clinically significant because of the small amount of variance accounted for in these relationships.

In the civilian group, there were statistically significant relationships between SF-36 PCS scores and social integration (R^2 =.020), productive activity (R^2 = .033), and total CIQ scores (R^2= .019). Also, there was a statistically significant relationship between civilian SF-36 MCS scores and social integration (R^2=.043); however, none of these relationships are considered to be clinically significant. Therefore, the relational propositions regarding functional status, role function, roles in significant relationships, and psychological state were not supported

The reason the relational propositions may appear to be unsupported is that QOL is a multidimensional concept that may be comprised of a constellation of dimensions that include physical health, psychological health, functional abilities, and social relationships. These complex concepts may not be able to be fully classified separately when they are considered as components of QOL. Furthermore, examining components of QOL following a burn injury may be difficult because of the complexity of the injury, the differences in demographic and clinical characteristics of burn survivors, and the negative effects on physical, psychological, and social functioning (Falder et al., 2009; Kool, Greene, Egberts, Wanders, & Van Loey, 2017). In this study, it may have been difficult to fully explain the relationships between each of the variables as proposed in the original conceptual model because of the inherent interrelatedness of the concepts within QOL revised depiction of the conceptual framework based on the Roy Adaptation Model and findings from this study is presented in Figure 12 on page 170.

With advances in burn care, the percentage of people who survive burn injuries has increased. Therefore, developing a better understanding of the social effects of burn injuries on the QOL of burn survivors is crucial (Esselman et al., 2001; Marino et al., 2016). Recently, Marino et al. (2016) developed a conceptual framework to measure the social impact of burns. That framework contains many of the elements of the conceptual framework used in this study. Within the framework developed by Marino and colleagues (2016), the researchers found that the primary social areas most affected by burn injuries were: work and employment, leisure activities, interpersonal relationships (family and

informal), and sexual relationships. The primary construct in the framework was social participation, which was comprised of two major domains: societal role and personal relationships (Marino et al., 2016).

Within the conceptual framework for this study, functional status is reflected within a person's physical response to environmental stimuli while in the Marino et al. framework, functional status is reflected through work and employment. In the Roy Model, interdependence is reflected through roles and relationships or interactions related to giving and receiving of love, respect, and value; while in the Marino et al. framework, the interdependence and self-concept mode are reflected in the subdomains of intimate and interpersonal relationships. Community reintegration is part of a domain labeled as community, social and civic life.

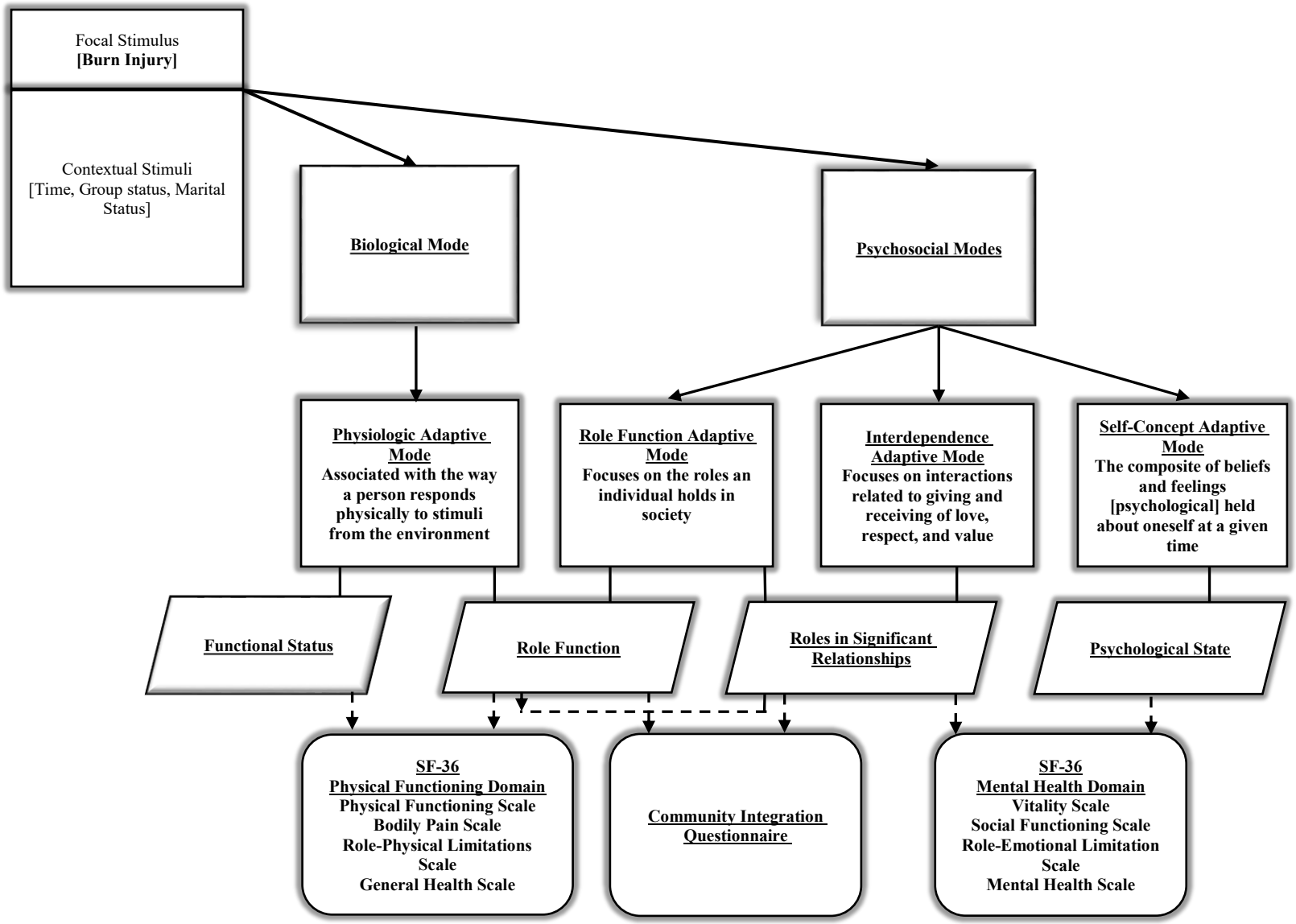


Figure 12. The Roy Model in Longitudinal Outcomes of Adult Burn Survivors: Revised

LIMITATIONS OF THE STUDY

The first limitation of this study is the use of a "parent" data set to conduct a secondary data analysis study. This study consisted of a convenience sample comprised of military service members and civilians who agreed to participate in the "parent study." Patients who declined to participate may have evaluated their QOL and community integration differently. Second, there were participant attritions that did result in negative effects on the sample size. Third, in the "parent study" insurance status was not included in the demographic characteristics examined therefore it is not possible to determine if treatments (i.e. outpatient rehabilitation) would have been beneficial to uninsured study participants. Finally, the use of the CIQ in this study may have been a limitation based on the most recent results reported in the literature when used to measure community integration in burn survivors (Holavanahalli et al., 2017). However, it was the instrument initially used in the BMS multi-center research study but (as previously discussed) has been subsequently replaced.

IMPLICATIONS AND RECOMMENDATIONS

Evidence-based multidisciplinary burn resuscitation and care must begin at the onset of injury and be carefully planned and evaluated for each patient in order to achieve an optimal return to a pre-burn lifestyle and to maximize QOL and community integration outcomes. The implications of these findings affect a variety of levels of the military including but not limited to leaders who create doctrine for military healthcare.

Such doctrine can affect nursing, practice, education, and research as well as policy development.

Nursing Practice

Nurses play a pivotal role in the overall management of care for individuals suffering burn injuries, which encompass not only medical and nursing practice but also psychosocial care and assessment of the burn survivor and their families (Greenfield, 2010). Nursing research has a profound influence on current and future nursing practice. It is imperative that research findings are disseminated to nursing professionals in the practice area because of its importance in nursing, not only in the practice area but to continuing education and enhancing care at the bedside for burn survivors, their families, and their significant others. Knowledge of the demographic and clinical characteristics that influence the outcomes associated with physical and mental QOL and community integration outcomes in military and civilian burn survivors treated in the Military Burn Center can enhance avenues to success in providing post-discharge care to burn survivors and their families and significant others.

Burn injuries are devastating, life-altering injuries that negatively affect physical and psychosocial health. As the results from this study have revealed, knowledge regarding the rehabilitation trajectory and the longitudinal improvements in both physical and mental perceptions of QOL and community integration are beneficial in the care of burn survivors. Furthermore, a practice environment that reinforces the importance of evidence-based patient-centered care protocols that incorporate early QOL and

community integration assessment and planning is essential. Also, an understanding that physical and mental improvements in burn survivors may fluctuate over time is important to be able to provide appropriate interventions when needed. Therefore, it is recommended that patients receive a QOL assessment at the time of burn center discharge and over time when they are seen in the burn outpatient clinic. The QOL assessment can consist of a generic QOL instrument such as the SF-36 or a version of the Burn Specific Health Scale, which is a *disease specific* QOL scale, could be used. Assessments could be completed every six months or more often as determined by the patient's provider or case manager.

Nursing Education

Cleland and colleagues (2016) conducted a review of burn registry data and reported that despite a relatively small number of specialized healthcare providers, considerable variation in patients treated and patient outcomes. Staying abreast of the most recent advances in healthcare technology and advances in burn care are paramount and an integral component to nurses' ongoing commitment to improve patient outcomes related to QOL and community integration. Military service member and civilian burn patients treated in the Military Burn Center are cared for with the same protocols by the same burn center staff. However, the staff at the Military Burn Center is comprised of a military and civilian workforce and the military staff members are rotated on a periodic basis. Therefore, timely orientation and competency education with evidence-based burn protocols that incorporate the nursing process and the management of complex burn care

are essential. Based on the results of this study, military service member and civilian burn patients treated in the Military Burn Center had comparable physical and mental QOL and community integration outcomes by 18-months post-burn. This reflects the ongoing level of orientation and competency education available to the staff at the Military Burn Center. Recently, an evidence-based preceptor program was created for nurses and wound care specialists in the burn center. This standardized program includes clinical coaching and focuses on achieving quality burn outcomes using a team approach (Robbins et al., in press).

The results of this study will be shared with the staff at the Military Burn Center because they have repeatedly expressed a desire to know what happens to their patients once they are discharged. Their desire to know more about patients' QOL after discharge led to the development and execution of the "parent study" from which the data for this analysis were derived. Although portions of the "parent study" were presented at the American Burn Association meetings over the last several years, the findings from this analysis have yet to be presented. Sharing the findings from this study will not only address the gap in the literature about military burn patients' QOL after discharge, it also will place the findings in the context of the scant amount of literature available concerning QOL in burn patients.

Patient, family, and community education concerning the physical and mental aspects that may affect burn survivors' overall physical and mental QOL and community integration is essential in ensuring adaptation and the return to the highest level of QOL possible. The findings from this study can be used to help patients and family members

understand that the rehabilitation period after discharge may consist of fluctuations in the patients' QOL. These fluctuations may be due to the patients' reappraisal of their functional and role abilities over time (Yoder, McFall, & Glaser, in press).

Additionally, community reintegration is being addressed as an important component of the rehabilitation period. However, Holavanahalli and colleagues (2017) recently pointed out that little progress has been made in this area in the last 10 years and burn patients and their families continue to need better support. At a recent State of the Science Meeting, the discussion focused on establishing a systematic approach to prepare and educate burn patients and families for the burn survivor's return to the community (Holavanahalli, Badger, & Acton, 2017). However, such approaches may need to be adapted for military burn survivors because the military community contains challenges and expectations beyond those of the civilian sector. For example, unmarried military burn survivors may be expected to live in the military barracks. Furthermore, some service members may be able to remain in the military but not in their previous role. Job re-training may be required to remain in the military. Military burn survivors must leave the military if they can no longer function in a military role. For some military service members, leaving the military can affect how they view their purpose in life.

Nursing Research

As previously discussed, based on a thorough review of the literature, it is believed that this is the only examination of QOL and community integration of military service members and civilian burn survivors treated in a Military Burn Center using valid

and reliable instruments. Burn researchers continue to desire more information about patients QOL and community reintegration and more studies about QOL among burn survivors are beginning to appear in the literature but they typically do not include patients treated in the Military Burn Center. Recently, burn clinicians and researchers called for more longitudinal research to be conducted and stressed that longitudinal evaluation of burn patients need to extend beyond two years after discharge.

The SF-36 scale and sub-scales were reliable in this study sample however; the reliabilities of the CIQ in this sample were weak. With improved survival rates in burn patients, the utility of a community integration measure is important. The Life Impact Burn Recovery Evaluation (LIBRE-192) is currently under development; this is a computerized questionnaire that measures the broad range of concepts relating to the social impact of burns. LIBRE-192 is supposed to supersede the CIQ in terms of being able to measure change across time (Holavanahalli et al., 2017). It is important to emphasize that such new instruments must also be used with patients treated in the Military Burn Center because, in most cases, they are not included in other national burn studies.

There is a huge gap in burn research regarding qualitative research. More qualitative studies of burn survivors and their families need to be conducted to fully understand the rehabilitation experience over time. Schneider (2017) emphasized that the ultimate goal is to integrally involve burn survivors in all stages of the research process. Mixed methods studies could provide a richness of information that quantitative research such as this study cannot fully provide. Also, there is discussion about involving social

media, blogs, and social networks such as Facebook to gather more data about how to improve burn survivors' QOL and community reintegration (Schneider, 2017)

Replication of this study would substantiate or refute the findings and provide an opportunity to extend data collection beyond 18-months post-burn to further explore the effects of demographic and clinical factors on physical and mental QOL. Also, replicating other civilian burn studies with military burn survivors is important. For example, in a recent study of burn survivors' ratings of post-burn outcomes important to them, resumption of normal function, lack of pain, and lack of itching were the top three priorities identified. These three areas were more important than cosmetics (Sandoval, Relan, Thode, & Singer, 2016).

Policy

The findings from this study have important implications for healthcare leaders. Rehabilitation is an integral part of burn treatment and begins immediately post-burn and continues for months and in some cases years following the initial injury (Procter, 2010). In this study, 58% of military burn survivors and 39% of civilian burn survivors reported receiving follow-up rehabilitation. Within the civilian sample, seven percent of burn survivors participated in inpatient rehabilitation compared to 32% who participated in outpatient rehabilitation. In this study, insurance status was not included in the demographic data collected; therefore, it is impossible to know whether civilian patients that needed further rehabilitation therapies were unable to get them due to a lack of insurance.

A variety of medical and nursing advances have originated from within the military. Among these are advances in burn care and treatments. Military doctrine has direct implications for policy development. Policies supporting efforts to develop advanced burn care and treatment modalities are crucial. The United States Institute of Surgical Research, within which the Military Burn Center resides, is a research command. However, the primary research focus within that command are topics such as acute burn resuscitation on the battlefield, minimization of scar and contracture development, and novel therapies aimed at patient survival and return to the highest pre-burn physical QOL possible. It has been suggested that if survival rates have been maximized in the burn population, future research should focus on QOL outcomes following discharge (Strassle et al., 2017; Tompkins, 2015). The research within the command also should include a greater use of QOL assessment modalities in the outpatient setting that support early interventions regarding physical and psychosocial support for burn survivors and their families. Furthermore, policies that are directed toward ongoing funding for military research opportunities that provide for the longitudinal evaluation of return to work, QOL, and community integration are essential to understand the long-term consequences of burn injuries.

CHAPTER SUMMARY

This is the first study to examine the differences in perceptions of QOL and community integration using the SF-36 and the CIQ among military and civilian burn patients recruited from the USAISR Burn Center, located within the San Antonio

Military Medical Center (SAMMC), Fort Sam Houston, Texas. This study contributed to the science and expanded the current body of knowledge about QOL and community integration in burn survivors over time.

This chapter included a summary of the findings, limitations, implications, and recommendations related to this secondary data analysis. The findings from this study were examined in relation to existing and new studies within the literature. The findings in this study were discussed in relation to findings from earlier burn studies that examined QOL and community integration outcomes.

Additional longitudinal study is warranted to determine and compare changes in perceptions of QOL and community integration in military and civilian burn patients treated at the Military Burn Center. These outcomes could be measured with a variety of QOL instruments, disease-specific and non-disease specific. To date, this is the only study that provided information and comparisons as well as foundational evidence about military and civilian burn survivors treated in the Military Burn Center regarding their changes in perceptions of QOL, using the SF-36, and community integration in the first 18-months following discharge.

Appendix A:

INSTRUMENTS

Demographic Data Collection Sheet

Date:_____ Code#:_____

Age:_____ Gender: Male____ Female:_____

Ethnicity: Caucasian___ African-American___ Hispanic___ Asian___ Other___

Date of Injury: _____ (dd/mm/yr) Date of Hospital Admission:_____

Date of Admission to ISR: _____ Inhalation Injury: No___ Yes___

TBSA %: _____ Full Thickness%: _____ Partial Thickness %: _____
(ISR Burn Diagram Attached)

Cause of burn category: Thermal _____ Electrical _____ Chemical _____

Cause of Burn: _____

Social History: Married: ____ Single: ____ Widow: ____ Other: ____

Number of Dependents: _____

Alcohol Use: Yes____ No____ Amount/ week: _____

Tobacco Use: Yes____ No____ Amount/ week: _____

Other Illnesses/ Comorbidities (specify): _____

_____

Current Medications:_____

Dominant Hand: Left____ Right____ Ambidextrous____

Occupation: _____ Currently Employed: Yes____ No____

Income Level: $19,999 or less _____ $40,000 to $59,000 ____
$20,000 to $39,999____ $60,000 or greater ____

Highest Level of Education: Less than High School ____ Some College____
Some High School _____ College Graduate ____
High School Graduate ____ Graduate School____
Vocational/Technical School _____

Hobbies: _____

CLINICAL DATA SHEET (INFORMATION TO BE COLLECTED AT TIME OF DISCHARGE)

Date _____ Code#_____

LOS ____ days

Follow-up rehabilitation: No _____ Yes____

If yes Inpatient _____ Outpatient ___

Location/Facility: _____

Discharged to home: with assistance _____ without assistance ____

Number of children living at home: _____

Number of individuals living at home assisting in your care: _____

Further reconstructive surgery required: No_____Yes____

If yes, what kind? _____

Pressure garment required: No_____ Yes ___

Amputation: No_____ Yes ___ Site(s)_____

Current Employment Status: Student Unemployed _____
Homemaker_____ Retired_____
Employed Full-time_____ Disabled_
Employed Part-time ____

AMA Disability Score:_____(from EVAL system)

Pertinent information concerning the patient has been collected for follow-up data collection: Address: No _____ Yes _____Telephone#: No___ Yes__

Alternate Point of Contact: No_____ Yes___

Chart Review Completed: No_____ Yes_____

THE SF-36™ HEALTH SURVEY

Instructions for Completing the Questionnaire
Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by filling in the bubble that best represents your response.

EXAMPLE
This is for your review. Do not answer this question. The questionnaire begins with the section ***Your Health in General*** below.

For each question you will be asked to fill in a bubble in each line:

1. How strongly do you agree or disagree with each of the following statements?

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
a) I enjoy listening to music.	0	X	0	0	0
b) I enjoy reading magazines.	X	0	0	0	0

Please begin answering the questions now.

Your Health in General

1. In general, would you say your health is:

Excellent	**Very good**	**Good**	**Fair**	**Poor**
0	0	0	0	0

2. Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago	**Somewhat better now than one year ago**	**Much better now than one year ago**	**About the same as one year ago**	**Much worse than one year ago**
0	0	0	0	0

Please turn the page and continue.

3. The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

		Yes, Limited a lot	**Yes, Limited a little**	**No, not Limited at all**
a)	**Vigorous activities,** such as running, lifting heavy objects, participating in strenuous sports	**0**	**0**	**0**
b)	**Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	**0**	**0**	**0**
c)	Lifting or carrying groceries	**0**	**0**	**0**
d)	Climbing **several** flights of stairs	**0**	**0**	**0**
e)	Climbing **one** flight of stairs	**0**	**0**	**0**
f)	Bending, kneeling, or stooping	**0**	**0**	**0**
g)	Walking **more than a mile**	**0**	**0**	**0**
h)	Walking **several blocks**	**0**	**0**	**0**
i)	Walking **one block**	**0**	**0**	**0**
j)	Bathing or dressing yourself	**0**	**0**	**0**

4. During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

		Yes	**No**
a)	Cut down on the **amount of time** you spent on work or other activities	**0**	**0**
b)	**Accomplished** less than you would like	**0**	**0**
c)	Were limited in the **kind** of work or other activities	**0**	**0**
d)	Had **difficulty** performing the work or other activities (for example, it took extra time)	**0**	**0**

5. During the past **4 weeks,** have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

		Yes	**No**
a)	Cut down on the **amount of time** you spent on work or other activities	**0**	**0**
b)	**Accomplished** less than you would like	**0**	**0**
c)	Didn't do work or other activities as **carefully** as usual	**0**	**0**

6. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

Not at all	**Slightly**	**Moderately**	**Quite a bit**	**Extremely**
0	0	0	0	0

7. How much bodily pain have you had during **the past 4 weeks?**

None	**Very mild**	**Mild**	**Moderate**	**Severe**	**Very severe**
0	0	0	0	0	0

8. During **the past 4 weeks,** how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
0	0	0	0	0

9. These questions are about how you feel and how things have been with you during **the past 4 weeks.** For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during **the past 4 weeks**

		All of the time	**Most of the time**	**A good bit of the time**	**Some of the time**	**A little of the time**	**None of the time**
a)	did you feel full of pep?	**0**	**0**	**0**	**0**	**0**	**0**
b)	have you been a very nervous person?	**0**	**0**	**0**	**0**	**0**	**0**
c)	have you felt so down in the dumps nothing could cheer you up?	**0**	**0**	**0**	**0**	**0**	**0**
d)	have you felt calm and peaceful?	**0**	**0**	**0**	**0**	**0**	**0**
e)	did you have a lot of energy?	**0**	**0**	**0**	**0**	**0**	**0**
f)	have you felt downhearted and blue?	**0**	**0**	**0**	**0**	**0**	**0**
g)	did you feel worn out?	**0**	**0**	**0**	**0**	**0**	**0**
h)	have you been a happy person?	**0**	**0**	**0**	**0**	**0**	**0**
i)	did you feel tired?	**0**	**0**	**0**	**0**	**0**	**0**

10. During **the past 4 weeks,** how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
0	0	0	0	0

11. How TRUE or FALSE is each of the following statements for you?

		Definitely true	**Mostly true**	**Don't know**	**Mostly False**	**Definitely false**
a)	I seem to get sick a little easier than other people	**0**	**0**	**0**	**0**	**0**
b)	I am as healthy as anybody I know	**0**	**0**	**0**	**0**	**0**
c)	I expect my health to get worse	**0**	**0**	**0**	**0**	**0**
d)	My health is excellent	**0**	**0**	**0**	**0**	**0**

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

COMMUNITY INTEGRATION QUESTIONNAIRE (CIQ)

PRE-BURN INJURY

Please check the best answer for each question.

1. Before your burn injury, who usually shopped for groceries or other necessities in your household?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

2. Before your burn injury, who usually prepared meals in your household?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

3. Before your burn injury, who usually did the normal everyday housework in your home?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

4. Before your burn injury, who usually cared for the children in your home?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else
   ____d. not applicable/there are no children under 17 in my home

5. Before your burn injury, who usually planned social arrangements, such as get-togethers with family and friends?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

6. Before your burn injury, who usually looked after your personal finances, such as banking or paying bills?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

Before your burn injury, about how many times a month did you usually participate in the following activities outside your home?

7. Shopping
   ____ never ____ 1-4 times ____ 5 or more

8. Leisure activities such as movies, sports, restaurants
   ____ never ____ 1-4 times ____ 5 or more

9. Visiting friends or relatives
   ____ never ____ 1-4 times ____ 5 or more

10. Before your burn injury, when you participated in leisure activities, did you usually do this alone or with others?
    ____ mostly alone
    ____ mostly with family members
    ____ mostly with friends
    ____ with a combination of family and friends

11. Before your burn injury, did you have a best friend with whom you confide?
    ____ yes
    ____ no

12. Before your burn injury, how often did you travel outside the home?
    ____ almost every day
    ____ almost every week
    ____ seldom/never (less than once a week)

13. Please choose the answer below that best corresponds to your work situation in the month before your burn injury.
    ____ full-time (more than 20 hours per week)
    ____ part-time (less than or equal to 20 hours per week)
    ____ not working, but actively looking for work
    ____ not working, not looking for work
    ____ not applicable, retired due to age

14. Please choose the answer below that best corresponds to your school or training program situation in the month before your burn injury.
    ____ full-time
    ____ part-time
    ____ not attending school or training program

15. In the month before your burn injury, how often did you engage in volunteer activities?
    ____ never
    ____ 1-4 times
    ____ 5 or more

COMMUNITY INTEGRATION QUESTIONNAIRE (CIQ)

POST-BURN INJURY

Please check the best answer for each question.

1. Who usually does shopping for groceries or other necessities in your household?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else
2. Who usually prepares meals in your household?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else
3. In your home, who usually does normal everyday housework?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

4. Who usually cares for the children in your home?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else
   ____d. not applicable/there are no children under 17 in my home

5. Who usually plans social arrangements, such as get-togethers with family and friends?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

6. Who usually looks after your personal finances, such as banking or paying bills?
   ____a. yourself alone
   ____b. yourself and someone else
   ____c. someone else

Can you tell me approximately how many times a month you now usually participate in the following activities outside your home?

7. Shopping
   ____ never ____ 1-4 times ____ 5 or more

8. Leisure activities such as movies, sports, restaurants
____ never ____ 1-4 times ____ 5 or more
9. Visiting friends or relatives
____ never ____ 1-4 times ____ 5 or more

10. When you participate in leisure activities, do you usually do this alone or with others?
____ mostly alone
____ mostly with friends who have burn injuries
____ mostly with family members
____ mostly with friends who do not have burn injuries
____ with a combination of family and friends

11. Do you have a best friend with whom you confide?
____ yes
____ no

12. How often do you travel outside the home?
____ almost every day
____ almost every week
____ seldom/never (less than once a week)

13. Please choose the answer below that best corresponds to your current (during the past month) work
situation.
____ full-time (more than 20 hours per week)
____ part-time (less than or equal to 20 hours per week)
____ not working, but actively looking for work
____ not working, not looking for work
____ not applicable, retired due to age

14. Please choose the answer below that best corresponds to your current (during the past month)
school or training program situation:
____ full-time
____ part-time
____ not attending school or training program

15. In the past month, how often did you engage in volunteer activities?
____ never
____ 1-4 times
____ 5 or more

GLOSSARY

GLOSSARY OF ACRONYMS

Acronyms	Definition of Acronyms
APA	American Psychiatric Association
BAMC	Brook Army Medical Center
IRB	Institutional Review Board
PTSD	Post-traumatic Stress Disorder
QOL	Quality of Life
SAMMC	San Antonio Military Medical Center
SPSS	Statistical Package for Social Sciences
USAISR	United States Army Institute of Surgical Research

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VITA

David Curk McFall was born and raised in Crockett, Texas. He attended grade school and high school at Latexo School, Latexo, Texas. In August 1979, he entered the University of Texas at Austin and completed his freshman and sophomore years of study prior to being accepted in the Brackenridge Hospital School of Nursing in 1981. Mr. McFall began his professional career in 1983 after graduating from the Brackenridge Hospital School of Nursing with a Diploma in Nursing. He completed his Baccalaureate in 2005 at the University of Texas at Austin and in 2007, Curk completed his Master's in Nursing at the University of Texas at Austin School of Nursing.

Currently, Curk is the Director of Integrated Delivery System Implementation and Clinical Protocols for the Community Care Collaborative. Prior to this he was an RN V Project Manager for the University Medical Center Brackenridge Emergency Department. His previous professional experience includes managerial and staff nurse positions in the Emergency Departments at University Medical Center Brackenridge in Austin Texas and Highland General Hospital in Oakland California. Mr. McFall also has worked as a Graduate Research Assistant for the Cain Center at the University of Texas at Austin School of Nursing and as a Research Assistant for the Geneva Foundation.

Email address: scooter36@austin.rr.com

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