

HEALTH AND WELL-BEING OF PHYSICAL TRAUMA SURVIVORS:  
WHO FOLLOWS UP?

by

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Given the growing number of physical trauma survivors, it is imperative that mental health clinicians, medical providers, researchers, and policy makers are aware of their unique biological, psychological, and social health concerns, as well as the role of their primary support persons. Resiliency theory proposes that within each individual there are protective factors and negative outcomes. This dissertation was written to help identify the protective factors and negative outcomes that impact physical trauma survivors' biological, psychological, and social health, an area of the literature that is underexplored. This dissertation includes three articles: (a) a systematic review of literature published on the protective factors and negative outcomes of traumatic musculoskeletal injury survivors, (b) a research study on the health and well-being of physical trauma survivors, and (c) a policy brief synthesizing the findings from a systematic review of the literature and descriptive quantitative study to offer policy-, programmatic-, and screening recommendations to best support physical trauma patients' BPS recovery. The research question that guided the systematic review was, "What are the biopsychosocial-spiritual (BPS-S) protective factors that impact negative health outcomes among adult survivors of traumatic musculoskeletal injuries?" According to the studies reviewed, the biological factors that impacted negative outcomes included patients who underwent longer hospitalizations and whose perceptions of their injuries were more severe reported poorer physical functioning during follow-ups. The connection between biological health and psychological health was found

among physical trauma patients' whose injuries were worse (measured by hospitalization) or perceptions of injuries was worse reported higher PTSD symptom severity. Additionally, patients with psychiatric histories had a higher likelihood of worse physical functioning. A positive correlation was found between depression and PTSD at baseline and during multiple follow-up time points with higher depression scores predicting greater likelihood for manifesting PTSD. It was surprising and unfortunate that there were no studies admitted to the systematic review that evaluated social or spiritual factors of physical trauma patients. In general, the systematic review pointed to the need for more studies looking at the biopsychosocial-spiritual health factors of traumatic musculoskeletal injury survivors, particularly within the United States. Specifically, researchers reported the importance of age and time passed after the injury on negative recovery outcomes and the utilization of pharmacological interventions as a protective factor for physical trauma patients. Additional research with larger sample sizes and more diverse demographic samples are needed to further these findings. The research question that guided the dissertation research study was, "What are the health and well-being factors that impact physical trauma survivor patients' adherence to follow up appointments?" The dissertation research study found older and self-pay/uninsured patients were less likely to attend follow-up appointments. Whereas patients who experienced motor vehicle accidents or motorcycle crashes (whether it was the vehicle or pedestrian) were more likely to attend the follow-up appointments than any other modality of injury (e.g., gunshot wounds, stabbings, assaults, falls, or others), as well as patients who reported higher levels of PTSD symptoms or higher levels of general health and well-being. Upon completion of a binary logistic regression on studies' independent variables, which controlled for other factors, including patients' health insurance type (e.g., Medicaid/Medicare, private insurance, and self-pay/uninsured), race, the

presence of any substances (e.g., ethanol alcohol or legal/illegal substances), the distance from the patient home to the follow-up clinic, or the injury severity score of the patient. The systematic review and dissertation research study were the inspiration for the final chapter's policy brief advocating for mandatory mental health screening, brief intervention, referral, and treatment in outpatient and inpatient trauma care facilities.



HEALTH AND WELL-BEING OF PHYSICAL TRAUMA SURVIVORS:  
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Presented To the Faculty of the Department of Human Development & Family Science

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Doctor of Philosophy in Medical Family Therapy

By

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March, 2018

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## DEDICATION

For the providers and staff of Trauma Services at Grant Medical Center. Without the love and support you provided me in my greatest time of need, I would not be the person and professional I am today. For my partner and the love of my life, Josh Moran, you are my greatest inspiration. I aspire to be more like you in every way. While it is always me in the spotlight, you are the true unsung hero of the story. Without your unconditional love, I would not be as strong as I am.

## ACKNOWLEDGEMENTS

The gratitude that I have for my mentor and dissertation chair, Dr. Jennifer Hodgson, will never truly be expressed through words. The faith that Dr. Hodgson had in me became clear to me during my first semester of the Medical Family Therapy program, when I experienced additional medical struggles. Throughout the program, Dr. Hodgson helped me to develop skills as an integrated behavioral healthcare professional, researcher, supervisor, and always had confidence in me, even when I did not always have it in myself. The greatest gift that Dr. Hodgson helped me to achieve was the dissertation experience. She saw my relentless passion for conducting my dissertation at Grant Medical Center, my second home, and helped me to accomplish the goal. However, this was more than merely a goal. I can remember numerous times during different phases of my recovery where I was able to get through by focusing on the idea of addressing both mental and physical health for physical trauma patients. At this point, I had no clue that integrated behavioral healthcare already existed. Dr. Hodgson helped to guide me in the most challenging and rewarding experience of my life thus far, she believed in me enough to help make my dreams come true.

While my relationship with Dr. Hodgson encompasses every professional role that I have experienced, Dr. Jakob Jensen helped me to become the supervisor and researcher that I am today. Dr. Jensen's support always had the ability to decrease my dissertation-related tension, from the planning through the completion of my dissertation. Dr. Jensen allowed me to co-facilitate many different teams with him. Watching Dr. Jensen supervise students was incredibly inspiring. He is the largest inspiration of who I am as a supervisor and is responsible for shaping me into the supervisor that I am today. While completing the dissertation was my greatest accomplishment, providing supervision and mentorship to numerous master's students was the

most meaningful role to me. Dr. Alexander Schoemann helped me in the fine tuning of my methods and guided me through the statistical analysis of my dissertation. Without his gentle direction and belief that I could grasp and resolve the issues I was having, I would not have the confidence that I do today regarding the statistical analyses I conducted.

I have to thank everyone at Grant Medical Center in Trauma Services. Dr. Pandya, who was the first provider to lay hands on me upon my arrival at Grant, and for Dr. O'Mara, for allowing me to conduct my study at his trauma center. A special thank you goes out to Dr. Sanjay Mehta who is the medical provider who means the most to me and my family. Dr. Mehta put me back together and allowed me to have the life that I do today. Dr. Mehta never treated me as just a patient, but as a person, I always felt the love and respect that Dr. Mehta had for me. Mr. Josh Burton was one of my nurses while I was a trauma patient at Grant Medical Center who transitioned into a Trauma Manager before I began my dissertation data collection. He has truly been involved in my process from recovering as a patient to earning my doctorate as a professional. While he may not remember being one of my providers, I definitely remember his caring nature as a nurse, which transitioned into helping me to care for my data collection. I will always feel a duty to care for medical providers as part of the indebtedness that I have for the treatment I received as a patient through OhioHealth. Dr. Teresa Wood was instrumental in the Internal Review Board process and success of my data collection at Grant Medical Center. Without her support as a staff member of OhioHealth I would not have been able to complete my dissertation.

To my family, Josh, Natalie, Rocky, and Jeremiah thank you for walking beside me; you never felt like you needed to walk ahead to lead me or so far behind that you got lost. You have always been here for me, through the dark days and the ones filled with light. Thank you for

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## PREFACE

On February 6, 2012 I drove into the back of a stopped semi-tractor trailer at around 55 miles an hour. I was seriously injured and life flighted to one of the best Level I Trauma Centers in the country, Grant Medical Center in Columbus. This began a long and rigorous recovery journey. Throughout my journey, it became clear to me that the field of medicine was not incorporating both physical, mental, and social health in the treatment of trauma patients. This disparity in patient healthcare is what lead me to pursue a doctoral degree in Medical Family Therapy and inspired my dissertation. This dissertation is really a story about the intersection of my personal experience with the healthcare system as a patient, knowledge about integrated behavioral healthcare (IBHC) as a clinician, and study of the biopsychosocial (BPS) factors and their influence on patients' follow-up care attendance. The theories that guided my research included both resiliency theory (Fergus & Zimmerman, 2005) and BPS framework (Engel, 1977, 1980).

As a doctoral student, I learned how to incorporate the biopsychosocial framework (BPS; Engel, 1977, 1980) into just about every aspect of my studies. In my review of the literature, I noticed that while the BPS framework (Engel, 1977, 1980) was limited in its application with physical trauma patients. I wondered what factors were protective and what factors resulted in negative outcomes of recovery for physical trauma patients? Did social support matter to patients as much as it mattered to me during my own recovery? Did the presence of substances, injury severity, or distance from the patients' home to the follow-up clinic matter regarding patients' adherence to follow-up appointments? This curiosity led me to the research questions that guided both my systematic review and dissertation study. However, I knew that to make sense of what was happening for physical trauma patients I needed more than just an

understanding about the BPS factors that impacted their journey to health. I needed to be able to explain the results using a strong theoretical foundation.

Resiliency Theory (Fergus & Zimmerman, 2005) was the theory that helped to guide and conceptualize this research study. Prior to this study, Resiliency Theory (Fergus & Zimmerman, 2005) had largely been studied with the adolescent population. I have worked with patients who experienced many traumas, some psychological, some physical, but many patients had histories of both. Additionally, in my own recovery, I was told over and over that my story was incredible and that I was resilient. I started to wonder if there was a theory that captured the resiliency of patients, because people who have faced trauma are resilient. After searching, I found resiliency theory (Fergus & Zimmerman, 2005) and I knew that I wanted to use the protective model. It included the risk factor (which was the traumatic event), protective factors (which could be internal, assets, or external, resources), and negative outcomes. I also knew that there were aspects of the BPS (Engel, 1977, 1980) framework that fit into each of the protective model (Fergus & Zimmerman, 2005) categories.

While IBHC has gained traction in the recent years, it is not extensively implemented in trauma centers. I remember being a patient in a trauma center who came from a stable life filled with resources (housing, transportation, food, and a job), I did not have a history of mental health concerns, trauma, or substance use issues, and I also experienced constant love and support from my husband, family and friends while in the trauma center and throughout my recovery. However, it crossed my mind frequently what would happen if only one of those factors had been deficient and how it would impact the recovery for a patient? In my experience, trauma centers are doing a marvelous job managing the physical health of patients and addressing substance use for patients. However, the psychological and social health of patients is all but

ignored amongst the chaotic environment within the tertiary care setting. If patients' psychological and social health factors are addressed with equal fervor as the physical health, patients may experience better health outcomes during and after recovery. Without addressing the biological, psychological, and social aspects of a physical trauma patients' health using the BPS (Engel, 1977, 1980) framework, attempts to provide whole person treatment fall short. This passion as a researcher has fueled my intent to translate the findings into mental health screening and intervention protocols that will lift some stress from trauma patients and families.

My passion for IBHC, trauma centers, and my personal experience as a physical trauma survivor patient led me to this dissertation research project. My hope is that my research will translate into policies that positively impact the health and well-being of physical trauma patients. This dissertation will explore the health and well-being of physical trauma patients and promote policies that help to improve their BPS health and outpatient follow-up attendance.

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## CHAPTER 1: INTRODUCTION

The number of physical trauma patients and the injury severity of these patients have increased at alarming rates from 2009 to 2014 (American College of Surgeons; ACS, 2010, 2015). From 2009 to 2014, the rates of adolescent and adult physical trauma survivors in the United States increased from 600,174 to 768,045 respectfully, which is a 27.97% increase in five years (ACS, 2010, 2015). To accommodate the higher rates of physical trauma patients, additional trauma centers were opened nationally. There has been a 12.9% increase in Level I trauma centers, 17.7% increase in Level II trauma centers, 34.9% increase in Level III trauma centers, and a 69.3% decrease in Level IV trauma centers (ACS, 2010, 2015). The proliferation of additional higher level trauma centers (e.g., Level I, Level II, and Level III) and reduction in lower level trauma centers (e.g., Level IV) indicates trauma centers are caring for higher severity injuries and providing more extensive services than previously needed (American Trauma Society, 2015).

Trauma centers are not only responsible for the treatment of physical injuries, but also include screening procedures of mental health conditions. Unfortunately, the consistency of screening for mental health conditions is dependent upon the condition. For example, in 2007 the American College of Surgeons Committee on Trauma (2006) passed a mandate for Level I trauma centers to screen patients for alcohol use disorders; if positive results were discovered, the trauma center was required to provide brief interventions and/or referrals. This has led to researchers discovering over 90% of Level I and Level II trauma centers screening for alcohol with lab tests or questionnaires (Love & Zatzick, 2014). However, Love and Zatzick (2014) found depression and posttraumatic stress disorder (PTSD) were not screened as consistently as alcohol due to the lack of a mandated protocol. Depression screenings occurred in only 23% of

trauma centers and seven percent of trauma centers screened for PTSD. These screening protocols are extremely low considering the prevalence of depression is 12.35% at six weeks and 12.24% at six months post motor vehicle accident (Irish et al., 2011); the prevalence of PTSD is 18-24% six months post-injury and 2-36% for 12 months post-injury (O'Donnell, Creamer, Bryandt, Schnyder, & Shaley, 2003; Steel, Dunlavy, Stillman, & Pape, 2011). Unfortunately, there are no prevalence rates on the incidence of anxiety or the use of screening protocols for anxiety symptoms for physical trauma survivors post-injury. However, researchers found that approximately 18.1% of the US adult population reported symptoms that met the criteria for any DSM-IV anxiety diagnosis within a 12 month period (Kessler, Chiu, Demler, & Walters, 2005). By screening for mental health conditions there is a higher chance of identification, which has been proven to impact treatment.

Many patients challenged with physical ailments have been impacted by mental health conditions, significantly affecting their participation and progress in treatment. Cardiac rehabilitation (CR) patients who reported higher levels of anxiety and depression had poorer attendance or complete absence from CR appointments (Whitmarsh, Koutantji, & Sidell, 2003). Older women undergoing treatment for musculoskeletal injuries who reported higher depressive symptoms attended fewer follow-up exercise group visits (Resnick et al., 2008). In addition, the coping scores of the women who attended the exercise intervention were higher than those who had poor attendance or absence. These studies extend evidence that failing to attend to psychological comorbidities impacts treatment participation. Unfortunately, biological health related outcomes were not measured in these studies. While this research is helpful in understanding the challenges associated with follow-up attendance, physical trauma survivors experience unique factors that may be contributing to this phenomenon.

Available data highlights that there is a problem with a lack of post discharge contact between the patient and the health care system. A study conducted over a 13 month time period, which included 1,353 patients who were released from a Level I trauma center to home, found that only 51% (n = 692) were reachable via phone within the first four weeks post-discharge (Malhorta et al., 2009). Of that sample, additional medical complications arose for 17%, uncontrollable pain occurred for 6.5%, missed injuries were discovered for 2.5%, wound infections found among 2.5%, other infections accounted for 2.5%, deep venous thrombosis (DVT) occurred in 1.4%, and 0.9% required treatment for suicidal ideation. Of the 115 patients who experienced post-discharge complications, 34% of these patients were found in outpatient settings, 45% in the emergency department (ED), and 21% resulted in hospitalization. Unfortunately, when patients sought post-discharge treatment through the ED, 75% returned to the trauma center and of those patients, who required hospitalization, 67% were readmitted to the trauma center. However, patients who were treated through outpatient care only had a significantly lower rate of readmission (15%). This confirms that the average length of stay (LOS) for physical trauma patients is not long enough to properly treat the complexity of the injuries patients have sustained (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016; Overton, Shafi, & Gandhi, 2014; Staudenmayer, Weiser, Maggio, Spain, & Hsia, 2016).

The average LOS for trauma patients treated in the United States has remained consistent, while injury severity scores have increased from 23.1% up to 104.9% depending on the injury severity score (ISS; Baker, O'Neill, Haddon, & Long, 1974) group from 2009 to 2014 (ACS, 2010, 2015). While patients' injuries are more severe, clinicians are not admitting them for a longer period of time, which can result in missing injuries that should have been detected;

therefore, negatively impacting patient recovery time, functional outcomes, and financial stability (Malhorta et al., 2009).

Researchers found readmission rates for trauma centers ranged from 3% to 38% (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016; Overton et al., 2014; Staudenmayer et al., 2016). There may be a number of reasons for the variety of readmission rates, which include the length of time since the initial hospital admission and same-hospital readmissions compared to being readmitted to a different hospital (Olufajo et al., 2016).

Researchers who found lower readmission rates ranging from 2.3% to 7.6% studied readmission rates 30 days post initial hospitalization (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016). Whereas, Staudenmayer and colleagues (2016) found that 38% of patients experienced at least one readmission within a year post-discharge of the initial hospitalization. Researchers have begun to study the connection between trauma survivors and their experiences with multiple physical traumas diagnosed over an extended period of time.

Multiple research teams have identified risk factors associated with physical trauma patients treated for unrelated physical traumas at different time points (McCoy, Como, Greene, Laskey, & Claridge, 2013; Stewart & Chen, 1997). One research study found that risk factors included: age, marital status, employment status, educational level, hospital admission of the patient (Stewart & Chen, 1997). An additional research team found that 25.2% of 4,971 Level I physical trauma survivors reported receiving hospital treatment for separate injuries within the past five years (McCoy, Como, Greene, Laskey, & Claridge, 2013). There were a number of risk factors identified within the study (i.e., being male, white, unmarried, unemployed, and uninsured). While there were similar risk factors in both studies (i.e., marital status and employment status), there were some changes in the 16 years that occurred between the studies.

It would appear that the risk factor of race, gender, and insurance status became more important in the later study, while age, educational level, and hospitalization of the patient were risk factors in the earlier study. Unfortunately, when patients are presented with physical traumas, there is a high likelihood of hospitalization, which can be a financial burden for many patients.

While it is difficult to truly understand the financial impact of readmissions, Hemmila and colleagues (2008) found that trauma patients who experienced major complications within their hospitalization increased the average total hospital cost from \$17,618 to \$71,658. One year healthcare costs per patient were nearly three times more for patients who had been readmitted compared to those who had not been (\$49,501 and \$17,040 respectively; Staudenmayer et al., 2016). In addition, LOS for patients experiencing major complications increased from five days without respiratory complications to 20 days with respiratory complications, significantly impacting patients and families' financial burden (Hemmila et al., 2008). When one faces a traumatic physical injury, there are some aspects of the treatment and recovery that are unavoidable such as: (a) increased risk due to the high financial cost of treatment, (b) lengthy recovery times, and (c) potential for missed injuries. However, protective factors can help to minimize the risk of negative outcomes.

### **Resiliency Theory**

Resiliency theory (Fergus & Zimmerman, 2005) is based on resilience as a means of overcoming the negative effects of exposure (or risk factors associated with exposure) by focusing on the protective factors to help either avoid or minimize risks. Protective factors “represent resources that have the potential to counterbalance adversity in an additive model of resilience in which assets outweigh risks” (Matensen & Powell, 2003, p. 13). There are three major models that comprise the Resiliency theory: (a) compensatory, (b) challenge, and (c)

protective. The compensatory model is when a promotive factor, labeled a compensatory factor in this model, acts simultaneously against a risk factor to influence the outcome. The challenge model's focus is on the exposure of lower risk events to help mitigate the outcomes of larger risk events in the future. This dissertation utilizes the protective model as a way to guide the research. The main concept of resiliency theory's protective model (Fergus & Zimmerman, 2005) is that within each individual there are both protective factors that can be assets (e.g., internal) or resources (e.g., external). These protective factors can moderate the negative outcomes (e.g., presence of mental health concerns, physical disability, missed follow-up appointments, etc.) of a risk factor (e.g., a traumatic event). To further explain, assets can be internal to individuals and may be representative of coping skills, competence, spirituality, or self-efficacy. Resources can be external to individuals and may be representative of social support, community organizations, financial stability, or medical interventions. Research has supported resiliency theory in studying family as a means of social support for providing better health outcomes (Caldwell, Sellers, Bernat, & Zimmerman, 2004; Zimmerman, 2013), which included better driving skills, Latino youth's utilization of condoms for safe sex practice (Malcom et al., 2013), healthy eating and physical activity (Shneyderman & Schwartz, 2013), the use of mentorship for adolescent mothers which defended against negative effects of stress on their mental health (Hurd & Zimmerman, 2010), as well as the use of self-esteem and cultural identity of Native American youth to mitigate the use of alcohol (Zimmerman, Ramirez, Washienko, Walter, & Dyer, 1995). At this time, resiliency theory (Fergus & Zimmerman, 2005) has not been applied to an adult physical trauma survivor population.

There is no research to suggest that the risk event, the protective factors, or the negative outcomes are exclusive constructs specific to an adolescent population. Therefore, the

application of resiliency theory to the adult population we plan to examine appears to be warranted. Resiliency theory (Fergus & Zimmerman, 2005) provides a theoretical framework to help organize protective factors and negative outcomes associated with the patient's recovery process. However, resiliency theory does not attend to all domains of health. Therefore, the biopsychosocial (BPS) framework (Engel, 1977, 1980) was added to help broaden its reach.

### **Biopsychosocial Framework**

In the past, western medicine has exclusively used the biomedical model to conceptualize illness. The biomedical model has a firm root in biological science with an emphasis on symptomology and epistemology with clear cures or disease treatments (Engel, 1977, 1980). It generally excludes the importance of psychological and social aspects of health, as well as the intersectionality of each of these concepts with one's biological health. Over the past 40 years, holistic medicine has been increasingly emphasized, which provides another perspective on health, the biopsychosocial framework (Engel, 1977, 1980). The biopsychosocial framework allows for the biological, psychological, and social aspects of each patient to be equally important and addressed in the patient's treatment plan (Engel, 1977, 1980).

### **Biological Factors**

Traumatic musculoskeletal injuries encompass a large number of injuries, which consequently have varying recovery times. The most common injury is orthopedic (Canadian Institute for Health Information, 2003), which can be isolated to one region of the body (e.g., head and neck, face, chest, abdomen, extremity, or external; Neugebauer, Bouillon, Bullinger, & Wood-Dauphinée, 2002) or multiple areas (e.g., any combination of the previously stated body regions; Rivara et al., 2008; Rosenbloom, Khan, McCartney, & Katz, 2013). Whiplash Associated Disorders (WAD) are the highest reported soft tissue injuries related to motor vehicle

accidents; additional injuries include lower back, shoulder, hip, and knee (Littleton et al., 2011). Some researchers reported WAD symptoms (e.g., pain and headaches) can take seven to ten days to disappear/heal (Obelieniene, Schrader, Bovim, Misevičiene, & Sand, 1999; Partheni et al., 2000) while others can take years (Berglund, Alfredsson, Cassidy, Jensen, & Nygren, 2000; Bylund & Bjornstig, 1998; Obelieniene et al., 1999). Neck pain following whiplash injuries can lead to disability and chronic neck pain for trauma patients who sustained motor vehicle accidents 20 years prior (Bunketorp, Steiner-Victorin, & Carlsson, 2005).

Once trauma survivors are in stable physical condition, it is important that the treatment team assess the psychological consequences from the physical trauma. Less than half of surgeons at a Level I trauma center indicated that the psychosocial needs of patients were addressed adequately within the tertiary setting of the hospital. Additionally, 94.7% of the surgeons believed an aftercare program to address psychosocial needs would assist in compliance and reduce the risk of re-injury (Zazzali et al., 2007).

### **Psychological Factors**

Research related to the psychological factors of physical trauma survivors includes primarily depression and PTSD conditions (Holbrook et al., 2005; Michaels et al., 1998; O'Donnell et al., 2003; Steel et al., 2011; Zatzick et al., 1997; Zatzick et al., 2001). While the prevalence rates of screening for mental health conditions and alcohol or substance use were discussed earlier as co-morbid with biological matters, there is also research that supports the co-morbidity of numerous psychological factors. Researchers found that 21% of physical trauma survivors met criteria for both depression and PTSD six months post traumatic event and 19% met criteria for both co-occurring mental health concerns (Shih, Schell, Hambarsoomian, Marshall, & Belzberg, 2010). Among physical trauma survivors there is also a risk for

problematic alcohol use (25% had symptoms and behaviors that indicated problem drinking) and a 6% prevalence rate of comorbidity for both PTSD and alcohol abuse together 12 months post injury (Zatzick Jurkovitch, Gentilello, Wisner & Rivara, 2002). Even with physical trauma survivors' increased risk of negative psychological outcomes, the presence of support can assist in mitigating these psychological challenges.

### **Social Support Factors**

Social support received during the acute injury phase from friends, family, etc., results in improved psychological outcomes (Lubomirsky et al., 2014). The American Association of Critical-Care Nurses (2012) recommended an increase in family visitation, specifically in the intensive care unit (ICU), which can assist with communication between patients and ED staff, as well as provide cultural and spiritual supports (Davidson et al., 2007; Hepworth, Hendrickson, & Lopez, 1994; Lubomirsky et al., 2014). While social support has been recommended to assist with communication, there is evidence to suggest a positive relationship between social support and patients' better mental health.

Additionally, researchers found social support lessened the presence of PTSD symptoms (demonstrating a negative correlation) for physical trauma survivors. Price and colleagues (2014) utilized automated text messages as a way to provide social support for physical trauma survivors' post-discharge, which was positively correlated with PTSD symptoms at baseline. However, the baseline text messages were the only ones that were associated to PTSD symptom, suggesting the use of social support from the automated text messages assisted in decreasing patient PTSD symptoms over time. Furthermore, higher severity of PTSD symptoms reported by physical trauma survivors predicted an increased prevalence of perceived negative social support at three months, 12 months, 24 months, and six years post traumatic event (Nickerson et al.,

2017). In addition, physical trauma survivors of motor vehicle accidents who reported availability of social support or group membership did not present with symptoms of PTSD compared to the survivors who had PTSD symptoms and reported seeking less social supports (Dougall, Ursano, Polsluszny, Fullerton, & Baum, 2001). The role of social supports can impact physical trauma survivors' mental health concerns and their ability to make meaning out of their traumatic event.

### **Purpose and Design**

Based on the previous research, there are clearly gaps in the literature regarding the various health factors of physical trauma survivors. Research has provided information on the biological concerns of physical trauma survivors (e.g., pain/discomfort and mobility limitations; Holtslag, van Beeck, Lindeman, & Leenen, 2007), but often neglects potential mental health concerns. In addition, social support has been studied with PTSD (Dougall et al., 2011; Nickerson et al., 2017; Price et al., 2014), but that does not encompass all mental health concerns of physical trauma survivors or its relationship with the biological factors of patient recovery. In order to more comprehensively address health factors and related outcomes of physical trauma survivors, the use of resiliency theory (Fergus & Zimmerman, 2005) and the biopsychosocial framework (Engel, 1977, 1980) are applied in this dissertation study.

The research question guiding this study is, "What are the health and well-being factors that impact physical trauma survivor patients' adherence to follow up appointments?" This study is a descriptive, quantitative study utilizing self-report surveys (accessible via RedCAP on wireless electronic tablets) from adult physical trauma survivors and, if available, their identified primary support person while the patient is admitted to the trauma unit post-injury. The surveys include demographic information, as well as validated and reliable measures to provide

information on the variables measured in this study. The variables in this study included: (a) anxiety symptoms using the General Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), (b) depressive symptoms using the Patient Health Questionnaire (PHQ-8; Kroenke et al., 2009), (c) Posttraumatic Stress Disorder (PTSD) symptoms using the Primary Care PTSD Screen (PC-PTSD-5; Prins et al., 2016), (d) perceived social support using the Medical Outcome Scale Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991), (e) health and well-being using the Health and Well-Being Questionnaire (HWB; Mills, 2005), (f) pain using the Brief Pain Inventory (BPI; Cleeland, 1991), (g) substance use using the Opioid Risk Tool (ORT; Webster & Webster, 2005) and data obtained from information in the EHR (e.g., urinalysis, toxicology, and screening tools). All of the aforementioned variables will be studied to determine the relationship they each have on patients' follow up attendance at an outpatient trauma care clinic.

### **Summary**

This chapter introduced the background knowledge and gaps in the literature on adult physical trauma survivors and follow-up attendance. Through the lens of the resiliency theory (Fergus & Zimmerman, 2005) and BPS framework (Engel, 1977, 1980), the health and well-being of physical trauma survivors and their primary support persons (who may impact follow-up clinic attendance) will be studied. This examination will aid clinicians in the development/implementation of future interventions for physical trauma survivors. The following chapters will include information regarding the rationale, methodology, results, and recommendations for research, clinical practice, and policy for the field of Medical Family Therapy as related to physical trauma survivors' care.

The second chapter is a systematic review of the literature as it relates to the protective factors and negative outcomes of physical trauma survivors in the United States. The research question guiding the systematic review was: “What are the biopsychosocial-spiritual (BPS-S) protective factors that impact negative health outcomes among adult survivors of traumatic musculoskeletal injuries?” This review was conducted by the lead investigator and three sub-investigators, which resulted in seven studies that met the inclusion criteria. These seven studies demonstrated many inconsistencies in the methodologies and samples of physical trauma survivors. Among these studies, the biological and psychological were the only protective factors of negative outcomes that were studied. There was a complete absence of social and spiritual protective factors or negative outcomes. Although there were inconsistencies regarding the sample size and population, variables measured, and measurement tools used, future longitudinal studies that capture relevant variables over multiple time points will likely clarify existing inconsistencies in the literature.

The third chapter presents the details of the methodology of this descriptive quantitative dissertation study. The study consists of a self-report survey provided to both the physical trauma survivor patients, as well as their identified primary support persons. The lead researcher recruited utilizing convenience sampling and standardized measurement tools were provided on a wireless tablet. The guiding research question is: “What are the health and well-being factors that impact physical trauma survivor patients’ adherence to follow up appointments?”

The fourth chapter includes findings from the dissertation research study. Initially, the study was guided by the following research question, “What are the health and well-being factors of primary support persons and physical trauma patients that impact physical trauma survivor patients’ adherence to follow up appointments?” Unfortunately, lack of participation from

physical trauma patients' primary social support persons, despite several attempts to increase their enrollment, led to the exclusion of the limited amount of primary social support person data that was collected in the study. Therefore, the adjusted research question became: "What are the health and well-being factors that impact physical trauma survivor patients' adherence to follow up appointments?" While the initial hypotheses did not result in statistically significant models, there was an additional complex model tested that produced variables with statistical significance (i.e., self-pay/uninsured, PTSD symptoms, and health and well-being of patients). This information provides evidence to suggest the importance of screening protocols for patients in trauma centers, which could lead to additional clinical services for patients and additional research for better understanding how to improve trauma centers.

The fifth chapter utilized the results from chapters two and four to create recommendations in the form of a policy brief. While trauma centers are utilizing mental health screening tools for substance use (due to mandates), the prevalence of other mental health screening tools are much less frequent. Of the seven studies admitted to the systematic review in chapter two, five of the studies included depression and PTSD as variables. While it appears that there is importance placed upon depression and PTSD as factors that may impact patients short and long-term recovery of both mental and physical health, the policies within trauma centers do not reflect the need to screen and address depression and PTSD clinically. Unfortunately, the rates of trauma centers that reported using mental health screening tools, beyond substance use, were very low. If trauma centers engaged in screening protocols for a wider range of mental health symptoms there may be a higher likelihood of patients receiving brief interventions or referrals (similar to established substance use screening, brief intervention, referral, and treatment; SBIRT utilized within trauma centers). Addressing psychosocial traumas in

conjunction with physical trauma treatment may assist in decreasing the risk for additional physical or psychosocial traumas in the future.

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## CHAPTER 2: TREATMENT AND RESILIENCY FACTORS IMPACTING HEALTH OUTCOMES OF MUSCULOSKELETAL INJURY SURVIVORS: A SYSTEMATIC REVIEW

The most commonly reported causes of traumatic musculoskeletal injuries (TMsIs) include traffic related incidents, physical assaults, falls, and machinery accidents (American College of Surgeons; ACS, 2010, 2015). Despite advances in modern medicine, prevention programs, and safety the rates of TMsIs in the United States continue to rise (ACS, 2015). In 2014, TMsIs in the United States accounted for approximately 91% of all trauma center injuries (ACS, 2015); of those 91%, 85% were adults.

There are five levels of trauma centers within the American College of Surgeons, with each level offering a higher level of resources for admitted patients (American Trauma Society, 2015). In order to meet the rising rates of trauma patients, there were increases in Level I-III trauma centers ranging from 12.9% to 34.9% from 2009 to 2014 and a 69.3% decrease in Level IV trauma centers, due to less severely injured patients that needed treatment (ACS, 2010, 2015). The American College of Surgeons, the accrediting body for trauma centers, predicts the number of trauma patients will continue to increase based on the continuous rise in TMsIs patients served through trauma centers each year resulting in the need for additional accredited trauma centers.

Even with the increase in the number of trauma patients and trauma centers, the median length of stay (LOS) for patients in trauma centers has not changed with the rates of patients being discharged to home increasing (ACS, 2010, 2015). Patients are left in the care of their support systems with less than half of Level I trauma surgeons reporting that patients' psychosocial needs were addressed during their initial hospitalization. In fact, 94.7% of the same surgeons believed addressing psychosocial needs would assist in risk reduction of reinjury and increase treatment compliance overall (Zazzali et al., 2007).

Survivors of TMsIs have reported decreases in psychosocial functioning due to symptoms of depression and posttraumatic stress disorder for decades (PTSD; e.g., Holbrook et al., 2005; O'Donnell, Creamer, Bryandt, Schnyder, & Shaley, 2003; Steel, Dunlavy, Stillman, & Pape, 2011; Zatzick et al., 2001). These decreases lead to loss of work productivity, work attendance, and alterations in psychological affect (Holbrook et al., 2005; Michaels et al., 1998; Zatzick et al., 1997; Zatzick et al., 2001). However, social support from friends or family during the acute injury phase has been associated with improved psychological outcomes (Lubomirsky et al., 2014). In fact, patients with TMsIs due to motor vehicle accidents (MVA) were less likely to report PTSD symptoms if they reported having social support (Dougall, Ursano, Polsluszny, Fullerton, & Baum, 2001).

In addition to social support, the use of spiritual affirmation (from religious or existential sources) may also help mitigate the negative effects of trauma. Researchers have found that religious well-being was significantly correlated with existential well-being, life satisfaction, physical health, mental health, social health, general health, mobility, and social integration of physical trauma survivors who experienced limb amputations (Peirano & Franz, 2012). Furthermore, physical trauma survivors who experienced traumatic brain injuries reported spirituality is a positive coping strategy (Mahalik, Johnstone, Glass, & Yoon, 2007) and life satisfaction post-injury (Waldron-Perrine et al., 2011). Psychological and spiritual changes may influence health outcomes; however, it is unclear how researchers are studying these biological, psychological, social, and spiritual domains of health as it relates to resilience among survivors of TMsIs. There are no systematic reviews currently available that address the resiliency outcomes of TMsIs using the biopsychosocial-spiritual (BPS-S) framework (Engel, 1977, 1980; Wright, Watson, & Bell, 1996).

## Theoretical Framework

This systematic review utilizes both the BPS-S framework (Engel, 1977, 1980; Wright et al., 1996) and resiliency theory (Fergus & Zimmerman, 2005) to understand possible outcomes of TMsIs (see Figure 1). The BPS-S framework directs researchers to consider health horizontally across all dimensions (i.e., biological, psychological, social and spiritual) as opposed to the more traditional approach of vertically focusing on one or two. Given that health is a combination of all domains experienced at the same time in patients' lives, examining them individually is less valid.

Proponents of resiliency theory add to this understanding by focusing on healthy development or coping techniques used after the traumatic event (Fergus & Zimmerman, 2005). Resiliency theory was derived from research focusing on the assets and resources of people who transcended the negative effects of risk exposure compared to earlier research that focused on the risks. One risk factor associated with the resiliency theory can be an acute traumatic event, such as a TMsI. Researchers found survivors who apply resilience strategies, subsequent to experiencing a traumatic physical event, reduce its negative impact.

Resiliency theory offers different models, which include: compensatory, protective, protective-stabilizing, protective-reactive, challenging, and inoculation (Fergus & Zimmerman, 2005). Protective factors assist in mitigating negative effects of the traumatic event (which include assets and resources; Beauvais & Oetting, 1999; Fergus & Zimmerman, 2005). Assets are positive factors that are internal to each person (e.g., coping skills, competence, spirituality, or self-efficacy) and resources are positive, external factors that can assist each person through their traumatic event and the aftermath (e.g., social support, community organizations, financial stability, medical interventions, etc.).

Enhancing the reach of resiliency theory, the BPS-S framework encourages researchers to study the relationship between risk factors and health outcomes across all four health domains. Outcomes such as biological (e.g., overall physical health, physical disability, etc.), psychological (e.g., depression, PTSD, anxiety, substance use, pain, general well-being etc.), and spiritual (e.g., challenges with meaning-making, loss of faith, decrease in involvement with church/community) concerns. A thorough systematic review would help to understand the extent to which BPS-S factors are protective which ones pose greater risk for negative health outcomes.

Within the protective model there are three concepts: (a) risk, which can be exposure to a traumatic event or sociodemographic factors that put people at risk for negative outcomes; (b) protective factors, which are both assets and resources (see previous examples) that moderate the effects of the risk; and (c) negative outcomes (e.g., more symptoms of mental health concerns or physical disability), which are a result of the risk factor (Fergus & Zimmerman, 2005). The literature related to the resiliency theory's protective model and health has been researched primarily with youth who have not experienced TMsIs. Studies of youth have focused on family as a means of social support for assisting in better health outcomes (e.g., Caldwell, Sellers, Bernat, & Zimmerman, 2004; Zimmerman, 2013); however, this has not been studied among adult populations to date.

The research question guiding the systematic review was: "What are the BPS-S protective factors that impact negative health outcomes among adult survivors of traumatic musculoskeletal injuries?" More specifically, the aim of this review was to: (a) conduct a systematic review of available peer-reviewed literature where two or more components of TMsI survivors' BPS-S health outcomes were studied, (b) identify themes for risk factors and

resiliency factors related to BPS-S health outcomes for TMsI survivors; and (c) provide clinical and research recommendations to help address and understand risk and resiliency factors related to TMsI survivors' BPS-S health outcomes.

### **Method**

This systematic review was guided by Cooper's (2010) seven step model. Step one of the review was to formulate the problem outlined in the research question provided above. Step two included searching the literature using three academic search engines (i.e., Medline via PubMed and OVID and PsychINFO via EBSCO) and identifying titles and abstracts for possible admission into the review. Medical subject headings (MeSH) and key terms were applied during this step of the process (see Appendix A). During step two, the lead author consulted with health science and information services' librarians to help optimize MeSH and keyword search term strategies for each search engine.

Initially, the lead investigator utilized MeSH or keyword search terms to conduct the searches within each search engine (i.e., Medline via PubMed and OVID and PsychINFO via EBSCO). To reduce the risk of bias, the lead investigator trained two sub-investigators to assist with searches. Each co-investigator was responsible for the article identification step in one search engine (i.e., Medline via PubMed and OVID and PsychINFO via EBSCO). The sub-investigators cross checked the number of articles within each individual's MeSH or keyword search when conducting their own individual searches. This step ensured the same articles were found during each search. An additional post-hoc search engine (Cinahl via EBSCO) was run by the lead investigator to ensure that all applicable articles were found due to the small number of articles that met the criteria (See Appendix B for the MeSH or keyword searches used).

Step three involved applying inclusion and exclusion criteria to studies identified in step two. The inclusion criteria were as follows: (a) traumatic musculoskeletal injury patients or survivors, (b) conducted in the United States (to account for similar treatment protocols), (c) participants aged 18 to 65 years old (to account for patients who are treated in adult Level I trauma centers and to reduce the risk of the presence of age-related neurological disorders), (d) a combination of at least two biological, psychological, social, or spiritual outcome factors studied with TMsI participants, (e) original empirical research using qualitative or quantitative methodologies, (f) peer-reviewed journal articles, (g) published in English, and (h) published within the past 10 years. The following exclusion criteria were applied: (a) research that was conducted outside of the United States (due to international differences in healthcare systems), (b) traumatic musculoskeletal injuries from mechanisms of injury that included sexual trauma, intimate partner violence, traumatic brain injuries, or were self-inflicted (due to additional factors involved in such cases), and (c) traumatic musculoskeletal injuries from military or veteran related-service.

Any discrepancies or uncertainties experienced during the review process were resolved through investigator discussion. If a concern was unable to be resolved with the review team, the lead researcher would contact a fourth member of the research team to help resolve it. In this review there were five articles that the investigators were unsure should be included and they met with the fourth investigator to make that determination. In the end, there was 100% agreement on the final articles admitted into the review. This search strategy yielded a total of 1,003 articles after removing duplicates. After reviewing titles and abstracts, a total of 237 articles remained for full text review. Of those 237 articles, seven met the inclusion criteria (see Figure 2 for the review process).

Step four involved evaluating the quality of the studies. This process was guided by Hall, Ferreira, Maher, Latimer, and Ferreira's (2010) seven criteria, which consequently was adapted from the original criteria developed by Sanderson, Tatt, and Higgins (2007), as well as from the work of von Elm and colleagues (2007). The lead investigator collaborated with another investigator to establish the quality evaluation criteria to be applied to each of the seven articles; each article was subsequently evaluated by two investigators. If there were differences between the two ratings of the quality evaluation criteria, a third investigator (e.g., a sub-investigator not involved in the article's quality evaluation criteria) was presented with the criteria of disagreement and made a decision. This decreased the risk of bias of this systematic review analysis (see Table 1 for the criteria and summary of article quality). All of the articles were admitted to the study and utilized due to the limited number of articles that met all of the inclusion criteria. While not some studies did not score high on the quality evaluation criteria, the decision to include them in the results of the systematic review was made, because there may still be value to the results (e.g., non-representative samples may provide useful information to clinicians).

During step five, the investigators analyzed and integrated the studies' outcomes, which are summarized in Table 1. Within step six, the evidence was interpreted, and placed into Tables 1 and 2. Step seven involved presenting the results, and Figure 3 displays the results of the final seven articles in relation to the resiliency theory concept map.

## **Results**

Seven articles met the inclusion criteria for this review. The results were organized in accordance with the protective factors and negative outcomes described within resiliency

theory's protective model. Three protective factors and three negative health outcomes emerged from the analysis.

### **Protective Factors**

According to Fergus and Zimmerman's (2005) resiliency theory model, protective factors are independent variables that impact negative health outcomes. They "represent resources that have the potential to counterbalance adversity in an additive model of resilience in which assets outweigh risks" (Matensen & Powell, 2003, p. 13). The three protective factors found in the studies meeting the review criteria included: (a) Hydrocortisone treatment (Delahanty et al., 2013), (b) virtual reality treatment intervention (Hoffman et al., 2009), and (c) younger age of the patient (Norman et al., 2011; Shields et al., 2015).

**Hydrocortisone treatment.** Hydrocortisone therapy is used to impair retrieval and declarative memory functioning, as well as protect against the development of PTSD symptoms (Delahanty et al., 2013) making this a resource, since it is an external positive factor (Fergus & Zimmerman, 2005). Delahanty et al. administered Hydrocortisone 12 hours post traumatic event for 10 days, followed by a six day titration period. They found Hydrocortisone treatment decreased the risk of PTSD and depressive symptoms, and increased patients' quality of life, at one and three months post-traumatic event. Unfortunately, a small sample size (n= 31 patients in treatment condition; n=33 in the placebo group), significant participant attrition (12 lost from the Hydrocortisone treatment group and 9 from the placebo group), and other possible sources of confounding not studied (e.g., social support, spirituality, prior PTSD symptoms, mental health treatment), limit the study's generalizability.

**Virtual reality treatment.** A single subject case study, conducted by Hoffman and colleagues (2009), utilized virtual reality technology to help with pain control and improve

health outcomes during physical therapy, which is also a resource (Fergus & Zimmerman, 2005). As a result, the participant reported an improvement of 15 degrees on his lower extremity passive range of motion, as well as a 47% decrease in time spent thinking about pain, 33% decrease in unpleasantness of pain, and a 17% decrease in worst pain experiences as compared to what was reported the previous day. Experimental and mixed method studies with diverse and larger populations, as well as studies incorporating BPS-S perspectives, would help expand virtual treatment science with post-physical trauma patients.

**Younger age.** The final protective factor that emerged in this review was younger age. Within this review, age is considered an asset due to the internal nature of the protective factor (Fergus & Zimmerman, 2005). Two articles that met the inclusion criteria reported younger patients achieved better health outcomes (Norman et al., 2011; Shields et al., 2015). Shields and colleagues (2015) conducted a study of 77 TMSI survivors and divided the sample into two age groups (e.g., under 50 years (n=38) and over 50 years (n=12)). They found that younger participants (<50 years old) reported more physical functionality and lower levels of disability. However, several concerns should be noted about this study. First, age may not be as much of a determining factor as muscle, tendon, and ligament elasticity which decreases with age (Falvo, 2014). Second, investigators reported measuring physical health and mental health outcomes; however, they did not present these findings in the article. Lastly, the small and unevenly distributed sample size limited the reliability and validity of the study's findings.

Next, Norman and colleagues (2011) studied TMSIs experienced at baseline (post-injury), one, four, and eight months post-injury. They found among their diverse sample of 163 patients (which was not separated into different age ranges), lower depressive symptoms and more

significant decreases in PTSD symptoms over time. Unfortunately, they did not expand their study to include social or spiritual covariates that may impact development of PTSD symptoms.

### **Negative Outcomes**

While protective factors may help promote resiliency, negative health outcomes are critical to understanding patients' disparate outcomes. Negative outcomes are dependent variables that represent "the negative effects of risks of adversity" (Matensen & Powell, 2003, p. 10). Within the seven articles that met the criteria for the systematic review, there were three negative health outcomes that emerged: (a) severity of injuries (Norman et al., 2011; Ramchand, Marshall, Schell, & Jaycox, 2008), (b) Opiate treatment (Norman et al., 2011), and (c) mental distress (Norman et al., 2011; Palyo, Clapp, Beck, Grant, & Marques, 2014; Ramchand et al., 2008; Sheilds et al., 2015).

**Severity of injuries.** Severity of injuries were reportedly a negative outcome for both physical and mental health (Ramchand et al., 2008). The study included 413 TMsIs at baseline (post-injury), 3, and 12 months post-injury. Participants were primarily Hispanic men, whose injuries included: gunshot wounds (59%) and penetration by blunt objects (41%). They found patients who perceived their injuries as more severe assumed recovery would be lengthy reported higher levels of mental distress, and reported more negative health outcomes (i.e., general functioning limitations), at the two time points post-injury. Unfortunately, investigators did not operationalize what providers' expectations for physical functioning were as compared to the TMsIs survivors' expectations. The investigators stated the use of single item self-report measures of general physical functioning may be limited due to the absence of objective measures. Additionally, they recognized their limitations with generalizability due to the targeted sample of primarily young, urban, Hispanic males who were victims of community

violence. Additional studies should examine more diverse samples and modalities of injury, and utilize standardized scales for measuring perceived injury severity and physical recovery expectations among TMsIs patients.

Ramchand and colleagues (2008) found that patients who perceived their injuries as being more severe or requiring a longer recovery (measured by a self-report single likert scale question), had measurably worse PTSD symptoms than their counterparts. Furthermore, controlling for early-onset PTSD symptoms (at one week post-injury) and injury severity, patients with poorer negative physical health outcomes at the three month follow-up also reported more severe negative psychological health outcomes at the 12 month follow-up. Investigators acknowledged there are other mental health constructs that may impact health outcomes other than PTSD (e.g., depressive symptoms or overall mental distress), but did not include them in the design.

**Opiate treatment.** One article studied the relationship between prescription opiates and PTSD symptoms among physical trauma survivors. Norman and colleagues (2011) found that prescription opiate use at four and eight month follow-ups resulted in higher depressive symptoms, even after controlling for depression score growth factors and baseline predictors (i.e., being in the observation-only group, female, higher scores on a pain questionnaire, higher scores on the PCL-C scores at one month follow-up). Furthermore, prescription opiate use at four months post-trauma was associated with higher depression and PTSD negative mental health outcome scores. However, the investigators did not study the known bi-directional relationships between opiate use and mental distress (Davis, Lin, Liu, & Sites, 2017), nor opiate use and pain management (Hser et al., 2017).

**Mental distress.** Negative mental health outcomes (i.e., mental distress) for TMSI survivors have been reported in four studies. First, Ramchand and colleagues (2008) found, while controlling for severity of injury and other covariates (i.e., perceived injury severity and perceived physical recovery), high levels of self-reported acute mental distress reported one week post-injury were associated with worse than expected levels of general physical functioning negative outcomes three months later.

Next, Norman and colleagues (2011) conducted a study with TMSIs from different modalities of injury at baseline (post-injury), one, four, and eight months post-injury. They also found patients who reported higher baseline pain level and mental distress also reported higher depressive symptoms at one month follow-up. Posttraumatic stress disorder symptom scores at one month follow-up, positively correlated with depression scores. Unfortunately, the investigators did not measure depressive symptoms at baseline. In addition, demographic variables (e.g., health insurance type, SES, income levels), perceived social support, and spirituality may have made a difference in the presence, absence, or severity of depressive symptoms post-injury.

The third study by Paylo and colleagues (2014) included numerous statistical models which all significantly predicted the presence of mental distress. Mental distress was captured by measuring PTSD and depression. Researchers found that negative outcomes included depression and the PTSD numbing symptom cluster (i.e., loss of interest, detachment, and restricted range of affect). Depression was a significant predictor of the PTSD numbing symptom cluster. Another negative health outcome included the PTSD hyperarousal symptom cluster (i.e., sleep difficulties, irritability, hypervigilance, exaggerated startle response, concentration difficulties). Unfortunately, all TMSIs were from MVAs, which potentially limits

the applicability of the results to other modalities of traumatic physical injury. In addition, participant accidents at the time of the study occurred from one to 215 months prior. Therefore, recency of the traumatic event (i.e., MVA) may have impacted the severity of negative health outcomes. Lastly, illustrating the need for further study, Shields and colleagues (2015) found patients with psychiatric histories (i.e., depression, anxiety, bipolar disorder) were more likely to report unsatisfactory health outcomes particularly around mobility of arms, shoulders, and hands.

### **Discussion**

The seven studies examined in this systematic review proved helpful, but extended limited insights into the protective factors and negative health outcomes for TMsIs survivors. Within this population, researchers have found that time after the TMsIs and age may affect the biological and psychological negative health outcomes of TMsIs survivors. However, this review revealed the limited extent to which researchers explored demographic variables including gender, ethnic/racial identities, employment status, insurance type, and socioeconomic status. Only one article appeared to include a sample population of different genders and racial/ethnic groups (Norman et al., 2011). Among the seven studies included in the review, none addressed the social and spiritual aspects of TMsI survivors and how they impact physical and psychological health outcomes.

Lack of uniformity across the studies made the synthesis of the results difficult. For example, the research studies had great variety in sample size, participant population (e.g., gender, race/ethnicity), type of variables investigated, and method of measuring variables (e.g., different measurement tools). In addition, the included studies varied in terms of their quality (Table 1). The greatest variability was seen in the collection of follow-up data (three of the seven studies had greater than 85% follow-up rate) and multivariate analysis with adjustments

for confounds (three of the seven studies had appropriate analyses to account for confounding variables). Given the methodological shortcomings of existing studies, generalizing their findings would be inappropriate. To enhance this work, researcher should begin collecting longitudinal data after TMsIs to more fully comprehend BPS-S health outcomes.

### **Implications for Future Research and Practice**

Although researchers have begun investigating protective factors and BPS-S negative physical and psychological outcomes for TMsIs patients, these findings are not comprehensive. This systematic review found existing research regarding social support and spirituality among TMsIs survivors to be lacking. This is surprising as a positive association between PTSD symptoms and perceived negative social support has been found at different time points after the traumatic event (e.g., Nickerson et al., 2017). Unfortunately, this study was not included in the review as was conducted outside of the U.S. Similarly, studies that investigate spirituality are needed considering the relationship between spirituality, positive coping strategies (Mahalik et al., 2007) and life satisfaction (Waldron et al., 2011) for physical trauma survivors who experienced traumatic brain injuries. While traumatic brain injury survivors were not included in this review due to their unique complexity, evidence of a relationship between these variables is important to pursue. Additionally, while military and veteran populations were also excluded from this systematic review, there is strong evidence that the military is incorporating comprehensive treatment of biological, psychological, and social care into the treatment of military personnel post-trauma exposure (Johnson, Robinett, Smith, & Cardin, 2015; Neer, Trachik, Munyan, & Beidel, 2016; Zang et al., 2017). While it remains to be seen if advancements gained from treating military trauma survivors in Iraq and Afghanistan will impact

civilian trauma care in the United States, the military's expansion of BPS trauma treatment points to opportunities for advancement in civilian post-trauma care.

Studies on protective factors and BPS-S negative outcomes of TMsIs survivors have included limited analysis on the interaction between race/ethnicity and other BPS-S outcomes. Therefore, studies utilizing statistical analysis such as multiple regression, path analysis, or structural equation modeling are needed to investigate the mediating or moderating relationship between the demographic variables and protective factors on BPS-S negative outcomes. Lastly, future research should continue to study the use of pharmacological interventions with larger, diverse samples to ensure findings are generalizable. Furthermore, pharmacological intervention studies should take into account other BPS-S health outcomes to determine if these outcomes are affecting accessibility or responses to medications for both the patient and his/her social support systems.

### **Limitations**

This systematic review has two major limitations. First, there is a risk that relevant articles were overlooked or missed (Cooper et al., 1982). Although the research team included three investigators and implemented many safeguards (i.e., combinations of MeSH and keyword terms searched and cross checking searches), these strategies do not eliminate the risk of overlooking or missing relevant articles including conference presentations or non-peer reviewed research reports (Cooper, 2010).

The second limitation was the lack of significant results in the Stein et al. (2007) manuscript. They reported that PTSD symptom scores decreased over time regardless of the treatment group or the control group. While at first glance this appears to be positive information, this may be simple regression to the mean (Campbell & Stanley, 1966).

Unfortunately, the investigators found this information to neither fit as a protective factor or a negative health outcome at this time.

### **Conclusion**

Currently, there is a scarcity of research related to the BPS-S protective factors and negative outcomes of TMsI survivors. It is clear that the rise in TMsI survivors (ACS, 2010, 2015) not only affects the biological outcomes (Hoffman et al., 2009; Ramchand et al., 2008; Shields et al., 2015), but also psychological outcomes (Delahanty et al., 2013; Hoffman et al., 2009; Norman et al., 2011; Palyo et al., 2014; Ramchand et al., 2008). Unfortunately, the absence of the social and spiritual outcomes presents a dearth in the available research at this time. Furthermore, the limited available research in this area that considers social support is problematic as it is a protective factor against negative outcomes in other areas of the literature. Research is needed that contributes to the BPS-S protective factors and negative outcomes related to TMsI survivors. Findings from this research can help to better address the protective factors that mitigate TMsIs survivors' rising negative outcomes (ACS, 2010, 2015), as well as help advocate for more comprehensive inpatient and outpatient treatment protocols for trauma survivors.

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Figure 1

*Protective Model of Resiliency Theory and BPS-S Framework Concept Map*

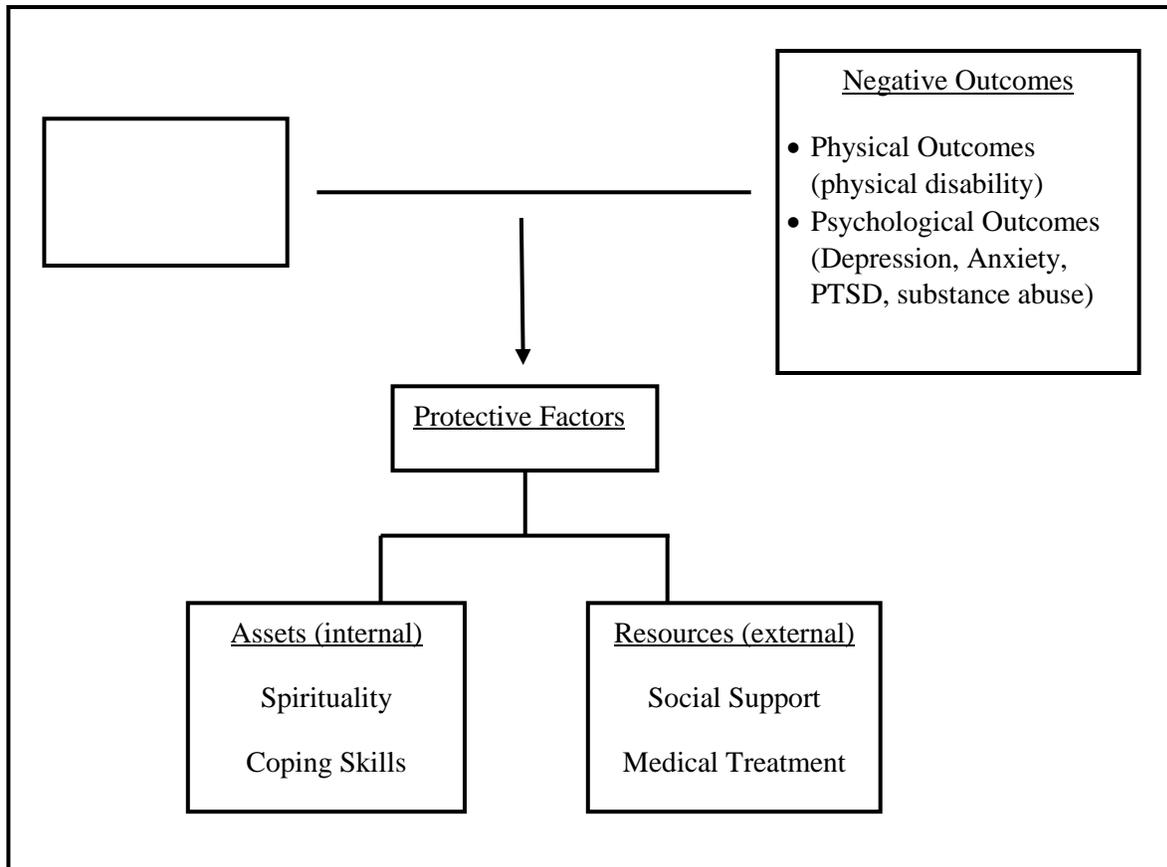


Figure 2

*Flow Chart of Article Search and Review Process*

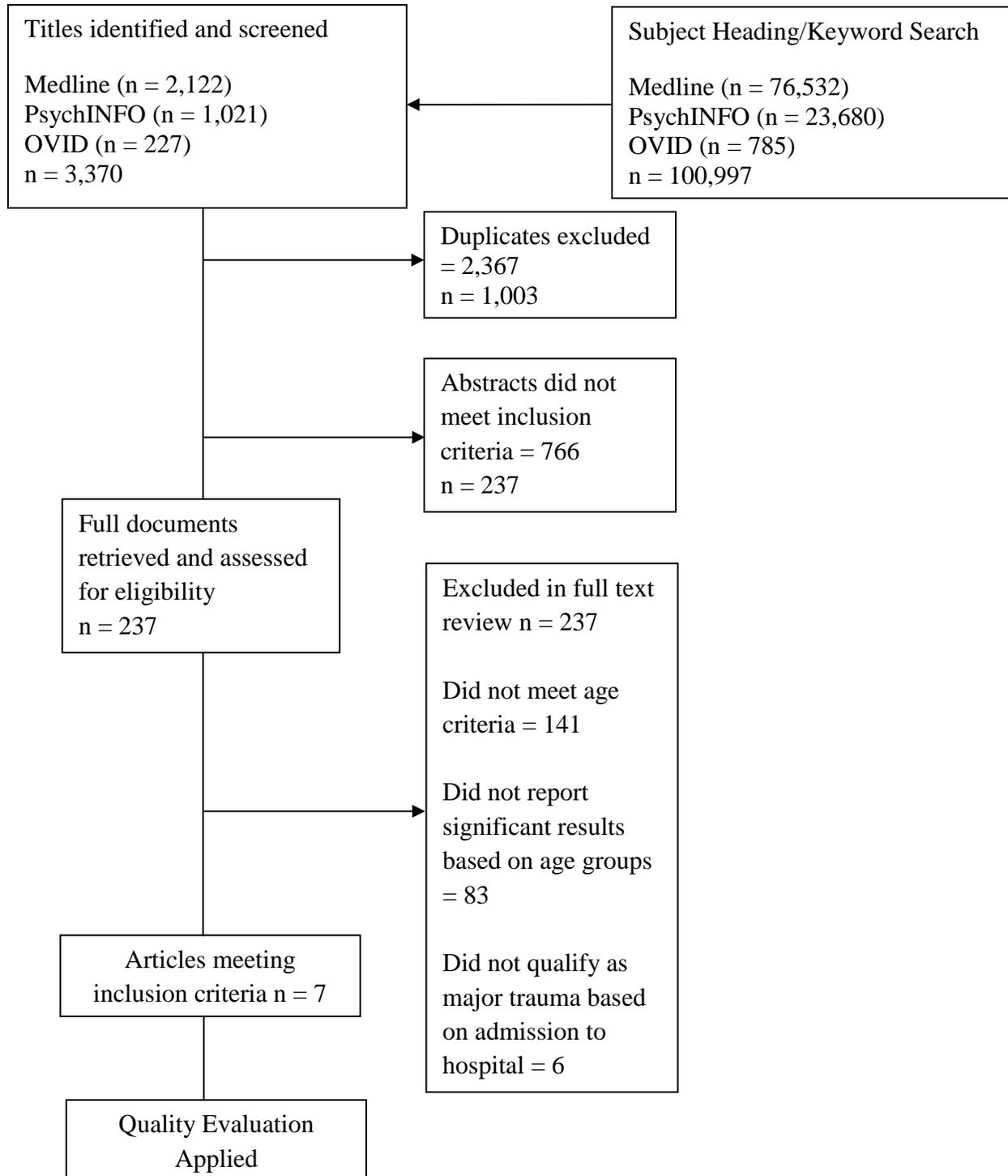


Table 1

*Study Quality Criteria*

|                         | Representative sample <sup>1</sup> | Defined sample <sup>2</sup> | Blinded outcome assessment <sup>3</sup> | > 85% follow-up rate <sup>4</sup> | Appropriate outcome measures <sup>5</sup> | Outcome data reported at follow-up <sup>6</sup> | Multivariate analysis, w/ adj. for confounds <sup>7</sup> | Total |
|-------------------------|------------------------------------|-----------------------------|---|-----------------------------------|---|---|---|-------|
| Delahanty et al. (2013) | 0                                  | 1                           | 1                                       | 0                                 | 1   | 1   | 1   | 5     |
| Hoffman et al. (2009)   | 0                                  | 1                           | 1                                       | 1                                 | 0   | 1   | 0   | 4     |
| Norman et al. (2011)    | 1                                  | 1                           | 1                                       | 1                                 | 1   | 1   | 1   | 6     |
| Paylo et al. (2014)     | 0                                  | 1                           | 1                                       | 0                                 | 1   | 0   | 0   | 3     |
| Ramchand et al. (2008)  | 1                                  | 1                           | 1                                       | 0                                 | 1   | 1   | 1   | 6     |
| Shields et al. (2015)   | 1                                  | 1                           | 1                                       | 0                                 | 0   | 1   | 0   | 4     |
| Stein et al. (2007)     | 1                                  | 1                           | 1                                       | 1                                 | 1   | 1   | 0   | 6     |

Note. '1' signifies that the investigators met the stated criteria, whereas '0' indicates the criteria was not met.

<sup>1</sup> "Participants selected as consecutive or random cases" (Hall, Ferreira, Maher, Latimer, & Ferreira, 2010, p. 1103).

<sup>2</sup> "Description of participant source and inclusion and exclusion criteria" (p. 1103).

<sup>3</sup> "Assessor was unaware of prognostic factors at the time of outcome assessment" (p. 1103).

<sup>4</sup> "Outcome data were available for at least 85% of participants at one follow-up point" (p. 1103).

<sup>5</sup> "Appropriate choice of outcome measures" (p. 1103).

<sup>6</sup> "Reporting of outcome data at follow up" (p. 1103).

<sup>7</sup> "Multivariate analysis conducted, with adjustment for potentially confounding variables" (p. 1103).

Table 2

## Result Summary

| Authors                | Sample Size  | Participant Characteristics: race/ethnicity and gender  | Age   | Setting   | Participant characteristics: modality of injury   | Demographic and BPS-S variables               | Psychosocial Measurement Tool             | Results  |
|------------------------|--|---|-------|---|---|---|---|--|
| Delahanty et al., 2013 | Baseline: (n= 64)<br>1m: (n=51)<br>3m: (n=42)  | n=64<br>(34% female, 66% male;<br>84% W, 14% AA, 2% NA)   | 18-56 | Baseline: tertiary level I<br>1 & 3m: home                                | TxG (n =31; 48%):<br>MVA (n = 20; 65%),<br>fall (n = 5; 16%),<br>assault (n = 4; 13%),<br>other (n = 2; 6%);<br>CG (n = 33; 52%):<br>MVA (n = 17; 52%),<br>fall (n = 7; 21%),<br>assault (n = 7; 21%),<br>other (n = 2; 6%) | Age;<br>PTSD;<br>Depression;<br>HRQOL         | PDEQ; CAPS;<br>CES-D;<br>SF-36            | PF (Hydrocortisone Tx):<br>led to lower CES-D &<br>PDEQ and higher HRQOL<br>than CG at 1m & 3m f/u.  |
| Hoffman et al., 2009   | 1  | male  | 32    | PT Clinic   | Ped v Veh   | Pain  | Graphic Rating Scales (0-10); ROM         | PF (VRT): was shown to control pain and increase fun.  |
| Norman et al., 2011    | Baseline: (n=163);<br>1m: (n=152; 93.8%);<br>4m: (n=145; 89.5%);<br>8m: (n=121; 94.8%) | 44% W, 33% H, 11% AA, 9% A, 2% NA. Median education level was 13 years (ranging 8–17); 79% were employed at the time of injury. | 18-65 | Baseline: Level I trauma<br>48hours post admission<br>1m, 4m, & 8m: phone | MVA (45%); falls (17%); MCC (9%);<br>Ped v Veh (4%);<br>burns (3%); ATV (3%); and OI (3%).  | Pain; PTSD;<br>Depression;<br>Injury Severity | MPQ; NISS;<br>PDEQ; PCL-C; CES-D;<br>CIDI | PF (YA): resulted in lower CES-D scores and greater PCL-C decreases at 7m f/u.<br>NO (RxO): use at 4m f/u led to higher CES-D scores; RxO use at 4m and 8m f/u led to higher PCL-C and CES-D scores.<br>NO (MD): Higher baseline PCL-C and PTSD Dx associated with higher CES-D scores at 1m f/u.<br>PCL-C scores at 1m f/u positively correlated with CES-D scores. |

|                       |  |   |       |  |  |                            |   |  |
|-----------------------|--|---|-------|--|--|----------------------------|---|--|
| Palyo et al., 2014    | 345 Pts (95 men, 250 women)                      | W (n = 285, 83%), married (n =154, 55%), and employed (n =175, 51%). Pt. accidents occurred between 1–215 months (Mdn = 11, M=25.9, SD = 34.0) prior to assessment. | 18-65 | N/A  | MVA  | Depression; PTSD           | CAPS; BDI                                       | NO (MD): Higher BDI was a predictor of PTSD numbing cluster of CAPS. PTSD hyperarousal cluster of CAPS predicted numbing cluster of CAPS.  |
| Ramchand et al., 2008 | Baseline: 413<br>3m: 294 (71%)<br>12m: 260 (63%) | male (94%); H (78%); AA (13%); W (3%); A (3%); NA/muliracial (4%)   | 18-40 | Baseline: Level I Trauma; 3m & 12m: Homes            | 59% GSW; 41% Penetrating or blunt objects; average ISS=9   | PTSD; Physical Functioning | PCL-C; RAND-36; ISS                             | NO (SOI): hospitalized longer, predicted longer recovery, or had higher PCL-C scores (higher RAND-36).<br>NO (MD): Perception of injuries as more severe or requiring longer recovery led to higher PCL-C scores. Higher RAND-36 at 3m f/u reported higher PCL-C at 12m f/u. |
| Shields et al., 2015  | 77 total; Pts <50 (n=38)                         |   |       | Previous Level I Trauma patients contacted via phone | LE: ground level (n = 22); falls, stairs (n = 6); sporting (n = 5); OI (n = 3); ladder (n = 2); assault (n = 1).<br>HE: MVA/MCC (n = 14); Ped v Veh (n = 6); ski/snowboard (n = 4); horse-riding (n = 3); ATV (n = 2), GSW (n = 1); tree falls (n = 1); bikes (n = 1). | Physical Functioning,      | DASH; SST; SF-12 & subscales (PCS and MCS); CCI | PF (YA): Pts. < 50 y/o predicted lower CCI & higher SST. NO (MD): Pts with psychiatric histories more likely to report higher DASH scores.   |

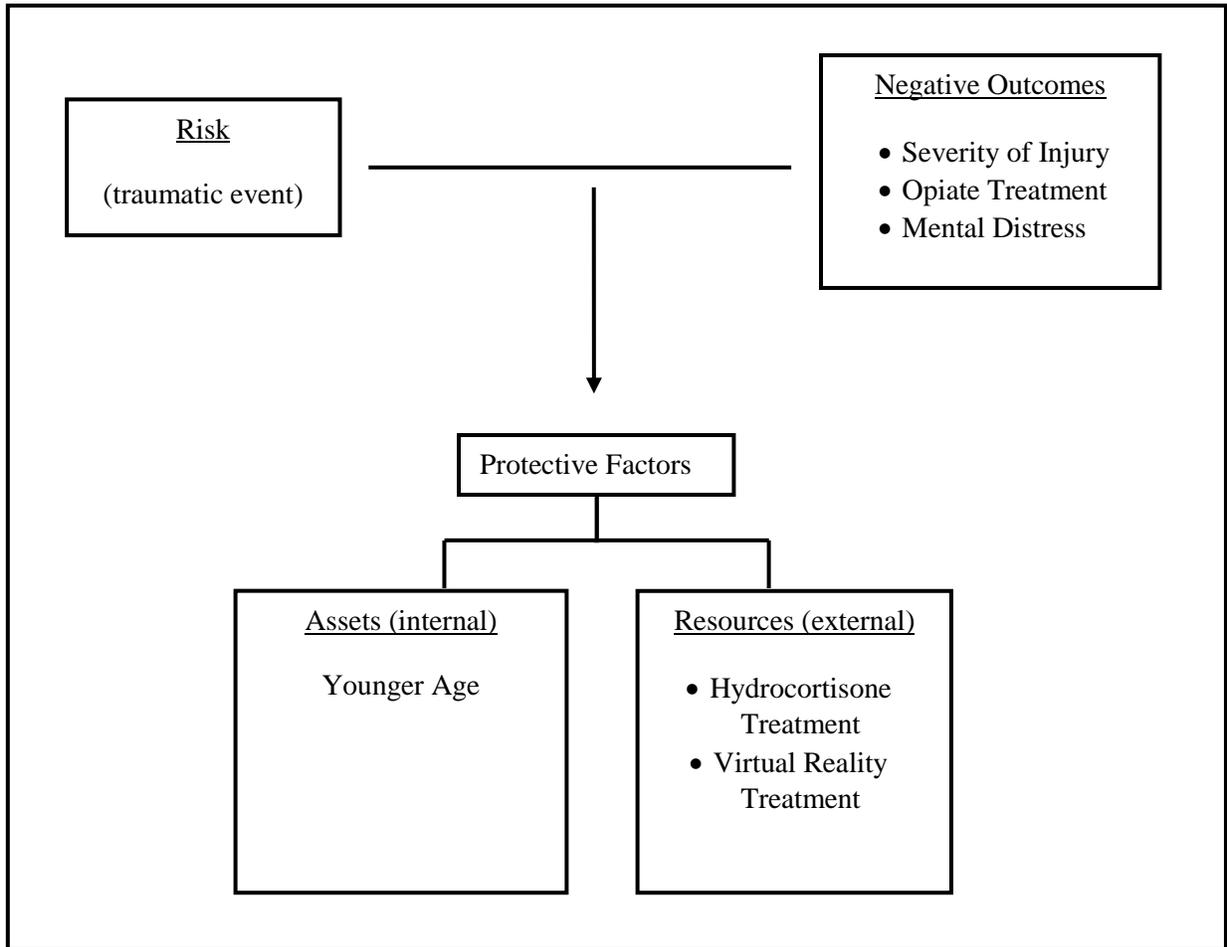
|                    |    |   |       |   |  |                  |                          |   |
|--------------------|----|---|-------|---|--|------------------|--------------------------|---|
| Stein et al., 2007 | 48 | Men (n=26; 54%);<br>Women (n=22; 46%); Mean education: 13 years (10-17 years);<br>Employment: (n=35; 73%); 40% H; 35% W; 10% AA; 10% A; 4% NA | 18-65 | Baseline: Level I Trauma; 1m, 4m, 8m: phone | MVA (n = 28; 58%); falls (n = 10; 21%); burns (n =3; 6%); Ped v Veh (n = 2; 4%); assault (n = 2; 4%); other (e.g., surfing; n = 3; 6%); Mean ISS = 5.21; mean NISS 6.40 (SD = 7.10; range = 1–34). | PTSD, Depression | NISS; PCL-C; CIDI; CES-D | Time post-injury led to PCL-C scores that decreased over 7m regardless of Tx or CG. |
|--------------------|----|---|-------|---|--|------------------|--------------------------|---|

*Note:* AA = African American; A = Asian; ATV = all terrain vehicle; BDI = Beck Depression Inventory; CES-D = Center for Epidemiological Studies - Depression Scale; CCI = Charlson Comorbidity Index; CAPS = Clinician-administered PTSD Scale; CIDI = Composite International Diagnostic Interview; DASH = Disabilities of the Arm; Dx = diagnosis; HE = high energy; HRQOL = Health Related Quality of Life; H = Hispanic; ISS = Injury Severity Score; LE = low energy; M = mean; Mdn = median; MD = mental distress; m = month; MPQ = McGill Pain Questionnaire (Visual analogue scale portion); MVA = motor vehicle accident; NA = Native American; NISS = New Injury Severity Score; PDEQ = Peritraumatic Dissociative Experiences Questionnaire Self-report version; PF = Protective Factors; PTSD = Posttraumatic Stress Disorder; PCL-C = Posttraumatic Stress Disorder Checklist-Civilian; SST = Simple Shoulder Test; SF-12 = Short form 12; PCS = Physical Component Summary (SF-12 subscale); MCS = Mental Component Summary (SF-12 subscale); NO = negative outcome; OI = occupational injuries; Ped v Veh = pedestrian vs. vehicle; Pts = patients/participants; PT = physical therapy; ROM = range of motion; RxO = prescription opiate; SD = standard deviation; SOI = severity of injuries; Tx = treatment; TxG = treatment group; f/u = follow-up; Virtual Reality Treatment = VRT; W = White; YA = younger age; y.o. = years old

Figure 3

*Systematic Review Results in the Protective Model of Resiliency Theory and BPS-S Framework*

*Concept Map*



## CHAPTER 3: METHODOLOGY

Oftentimes mental health and substance use disorders contribute to the occurrence of physical trauma (Sareen et al., 2013). Mental health screening rates among Level I and II trauma centers vary according to types of mental health (and substance use) conditions. For example, researchers found that over 90% routinely screen for alcohol with lab tests or questionnaires (Love & Zatzick, 2014). The rates of screening for alcohol and other substances may be high due to a mandate that went into effect in 2007 requiring all American College of Surgeons accredited Level I trauma centers to screen patients for alcohol use disorders and provide an intervention for patients with positive results (American College of Surgeons Committee on Trauma, 2006; Terrell et al., 2008). Unfortunately, not all mental health concerns that could lead to or result from trauma were included in this mandate; therefore many mental health concerns go unidentified and are not reported.

Screening protocols for depression occurred in only 23% of trauma centers, which is much less than screening for alcohol or other substances (Love & Zatzick, 2014). This lack of screening is a concern since researchers identified depression prevalence rates after a motor vehicle accident (MVA) were 12.35% at six weeks and 12.24% at six months (Irish et al., 2011), which provides evidence that this is not a temporary adjustment issue. Furthermore, 21% of physical trauma survivors met criteria for both depression and posttraumatic stress disorder (PTSD) six months post traumatic event and 19% met criteria for both co-occurring mental health concerns 12 months post traumatic event (Shih, Schell, Hambarsoomian, Marshall, & Belzberg, 2010). Researchers reported that PTSD for traumatic injury survivors varies between 18-24% up to six months post injury and 2-36% for 12 months post injury (O'Donnell, Creamer, Bryant, Schnyder, & Shaley, 2003; Steel, Dunlavy, Stillman, & Pape, 2011).

Screening for mental health issues is important to patients' treatment and discharge plans because a variety of psychosocial risk factors have been associated with missed follow-up appointments. For example, patients who underwent cardiac rehab found that those who had poor attendance or did not attend rehabilitation appointments reported higher symptoms of anxiety and depression (Whitmarsh, Koutantji, & Sidell, 2003). Researchers studying older female musculoskeletal injury survivors found depressive symptoms influenced follow-up appointment attendance, which resulted in more missed appointments (Resnick et al., 2008). Other risk factors that resulted in poorer physical trauma survivor follow-up attendance included type of insurance (e.g., Medicaid or self-pay insurance status) and patients who were not referred to receive social work, pastoral care, or case management services when they were hospitalized initially (Hansen, Shaheen, & Crandall, 2014). Unfortunately, studies like these are few and studies looking at social support factors are non-existent. There is a dearth of literature available for understanding exactly how physical trauma survivors' follow-up attendance is impacted by other health factors (e.g., psychological, and social), which further limits the knowledge that connects psychological and social factors to overall health outcomes. Very few have considered patients' biopsychosocial (BPS) health comprehensively and its influence on outpatient follow-up. Researchers have instead focused exclusively on one or two factors (e.g., biological and psychological) and one or fewer demographic factors or diagnoses (e.g., insurance or substance abuse). The relevance of this limited method of investigation results in missed opportunities for assessment and intervention that may impact patients' overall health outcomes.

A descriptive quantitative research design will be used to study BPS factors influencing patients' adherence to a one time follow-up clinic appointment after being discharged from a traumatic physical injury. The trauma outpatient clinic is only capable of providing minimal

follow-up appointments for each patient, due to the volume of trauma patients served. However, it is necessary for patients' to receive at least one initial post-discharge evaluation so treatment plans can be constructed and then managed by their primary care providers. Recognizing the absence of literature studying the support persons' influence on follow up attendance, both patients and support persons will be invited to complete self-report surveys about the biological, psychological, and social that may be influencing their follow-up care. The overarching research question for this dissertation is: "What health and well-being factors of primary support person and physical trauma survivor patients impact the survivors' adherence to follow-up appointments?" Unfortunately, due to the lack of available primary support persons of patients, there were only 19 primary support persons collected in the sample. This was not enough to support a meaningful analysis and resulted in an adjusted research question: "What health and well-being factors of physical trauma survivor patients impact adherence to follow-up appointments?"

### **Study Design**

This descriptive quantitative study used self-report surveys obtained from adult physical trauma survivor patients and their primary social support person. A quantitative design was determined to be the best design due to its ability to address the need for more studies looking at prevalence rates of BPS health factors, as well as studies that extend more statistical comparisons across other studies and result in greater generalizability. In addition, the use of validated and reliable measures provided specific information on the variables that was utilized in this study. The initial hypotheses for the study are:

1. Patients being treated for more severe injuries will be more likely to attend follow-up appointments.

2. Physical trauma survivor patients who report feeling less depressed while hospitalized will demonstrate better follow-up attendance than physical trauma survivor patients who report feeling more depressed.
3. Physical trauma survivor patients who report less anxiety while hospitalized will demonstrate better follow-up attendance than physical trauma survivor patients with more anxiety.
4. Physical trauma survivor patients who report lower scores on posttraumatic stress disorder (PTSD) screening tool while hospitalized will have better follow-up attendance than physical trauma survivor patients who report higher scores on PTSD screening tool.
5. Physical trauma survivor patients who report higher scores on perceived social support screening tool during hospital admission will have better follow-up attendance than physical trauma survivor patients who report lower scores on perceived social support screening tool.

The proposed study took place at a hospital in Ohio. Therefore, it was submitted and approved by the OhioHealth Institutional Review Board (IRB). East Carolina University's IRB determined that the study would be reviewed, approved, and overseen by the OhioHealth IRB due to the nature of the study's participant recruitment, data collection, and storage. OhioHealth IRB approval was granted before participation recruitment began.

### **Setting**

The setting for this dissertation research is an Ohio-based medical facility with a Level I trauma center that was accredited in 1993 by the American College of Surgeons (ACS). In 2016, the medical center served 6,964 trauma patients from Ohio's 54,273 admitted trauma patients (7.79%). This Ohio-based medical facility serves patients from 55 of Ohio's 88 counties, which

include both rural and urban populations and patients from diverse socioeconomic backgrounds. It is equipped to manage 47 to 101 trauma patient beds at a time. It employs nine surgeons, 26.6 advanced practice providers, 20.17 trauma program staff, and 2.6 for the Outpatient Trauma and Acute Care Surgery Office (OTACSO). Every trauma patient receives an appointment to the OTACO within five to 10 days post discharge.

## **Participants**

Physical trauma survivor patients were eligible for participation in the study based on the following inclusion criteria: (a) English-speaking; (b) 18 years of age or older; (c) being treated for physical trauma in the trauma unit; (d) were be scheduled for a follow-up appointment in the outpatient trauma and acute care surgery office (OTACSO); (e) provided consent for the lead researcher to obtain the patients' attendance to the OTACSO for follow-up from the electronic health record (EHR); and (f) provided consent for the lead researcher or research assistants to identify other information from the patients' EHR (e.g., modality of injury, type of health insurance, urinalysis (i.e., alcohol level), toxicology (i.e., presence of legal/illegal substances), and additional behavioral health screening tool scores (i.e., AUDIT and CAGE-AID). The eligibility for the patient's primary support person in the study was based on the following inclusion criteria: (a) English-speaking; (b) 18 years of age or older, and (c) primary support person to a consenting patient participant.

Physical trauma survivor patients were not eligible for participation in the study based on the following exclusion criteria: (a) patients with physical and/or cognitive impairment that would limit their ability to consent or participate in the surveys, (b) patients who were discharged after re-hospitalization for the same physical trauma, and (c) patients who were not scheduled for a follow-up appointment at the OTASCO. The primary support person identified by the patient

was not eligible for participation in the study if he or she reported or evidenced a cognitive impairment that would limit his or her ability to consent or participate in the study.

Upon expressing interest, participants were asked to complete the informed consent, and then were administered the demographic survey and research survey using REDCap (Harris et al., 2009), which is a secure internet-based application to assist in data collection (via wireless tablet). The entire process took approximately 30 minutes for participants to complete. The targeted enrollment for the study was a minimum of 100 physical trauma survivor patients and 100 primary social support persons. However, a total of 200 physical trauma patients and 200 patient-identified primary support persons (if the physical trauma survivor patient desires the inclusion of the primary support person) was the intended sample size. We estimated at least 113 participants were needed to perform the appropriate statistical analysis of 16 variables to achieve a power of .80 and odds ratio of 2.0 (medium effect size). The sample size and power were determined using G\*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The final sample size was 105 patients and 19 primary support persons. Due to the lack of participation from primary support persons, they were not utilized in the analysis. There were 80 patients who attended OTASCO follow-up appointments.

## **Measures**

This study measured eight independent variables for both the patient and a primary social support person (16 total), which included: (a) anxiety symptoms using the General Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), (b) depressive symptoms using the Patient Health Questionnaire (PHQ-8; Kroenke et al., 2009), (c) Posttraumatic Stress Disorder (PTSD) symptoms using the Primary Care PTSD Screen (PC-PTSD-5; Prins et al., 2016), (d) perceived social support using the Medical Outcome Scale Social Support Survey

(MOS-SSS; Sherbourne & Stewart, 1991), (e) health and well-being using the Health and Well-Being Questionnaire (HWB; Mills, 2005), (f) pain using the Brief Pain Inventory (BPI; Cleeland, 1991), (g) substance use using the Opioid Risk Tool (ORT; Webster & Webster, 2005) and data obtained from information in the EHR (e.g., urinalysis, toxicology, and screening tools).

Additional data was collected through the EHR. The Level I trauma center EHR includes a toxicology report for all patients who are admitted to the trauma unit. Each patient is tested for the presence of illicit substances in their systems, as well as a urinalysis for blood alcohol content levels. The EHR was utilized by research assistants to determine the modality of injury (i.e., motor vehicle accident [MVA]/motor cycle crash [MCC; vehicle], MVA/MCC [pedestrian], gun shot wound [GSW]/stabbing, assault, fall, other), health insurance type, urinalysis and toxicology reports, substance abuse screening tools (e.g., AUDIT and CAGE-AID), and the participant's follow-up attendance to the OTACSO follow-up appointment. The participant's follow-up attendance to the OTASCO clinic was obtained from the OTASCO schedule book and appointment record.

Demographic information was also collected via self-report using a self-report questionnaire, which was collected via REDCap survey. Information collected from the patients included: sex/gender, age, race/ethnicity, type of primary and secondary health insurance relationship status, highest level of education, employment status, household income, relationship to patient/primary support person, and if the primary support person resides with the patient (i.e., yes or no). Information collected from the patient identified primary support person included: sex/gender, age, race/ethnicity, type of primary and secondary health insurance, relationship status, highest level of education, employment status, household income,

relationship to patient, and if the patient resides with them (i.e., yes or no). Permission was obtained for the use of any copyrighted measures (Appendix B).

### **Independent Variables**

Independent variables collected from participants included: (a) demographic information (e.g., sex/gender, age, race/ethnicity, type of health insurance, level of education, and household income); (b) relationship to primary support person (e.g., partner, parent, sibling, cousin, extended relative, friend); (c) if patient primary support person lives with the patient (e.g., yes or no); (d) anxiety symptoms; (e) depressive symptoms; (f) PTSD symptoms; (g) social support; (h) health and well-being; (i) pain; (j) and substance use (e.g., opioid risk, urinalysis, toxicology, AUDIT, and CAGE). Independent variables for the primary support participant included: (a) demographic information (e.g., sex/gender, age, race/ethnicity, type of health insurance, health insurance deductible amount, level of education; and household income); (b) relationship to patient (e.g., partner, parent, sibling, cousin, extended relative, friend); (c) if the primary support person resides with the patient (e.g., yes or no); (d) anxiety symptoms; (e) depressive symptoms; (f) PTSD symptoms; (h) social support; (i) health and well-being; (j) pain; and (k) substance use (e.g., opioid risk).

**Demographic information.** Demographic information was collected utilizing a self-report survey via REDCap (Appendix D). Information collected from the patients included: sex/gender, age, race/ethnicity, type of primary and secondary health insurance, relationship status, highest level of education, employment status, household income, relationship to primary support person (e.g., partner, parent, sibling, cousin, extended relative, friend), and if the patient's primary social support person resides with them (e.g., yes or no). Information to be collected from the patient identified primary support person included: sex/gender, age,

race/ethnicity, type of health insurance, relationship status, highest level of education, employment status, household income, relationship to patient (e.g., partner, parent, sibling, cousin, extended relative, friend), and if the patient resides with them (e.g., yes or no).

**Type of physical injury modality.** Type of physical injury modality was recorded from the EHR and collected by a research assistant, which was entered through a drop-down menu or within narrative documentation depending on the provider entering the information. The potential categories included: (a) MVA/MCC (vehicle); (b) MVA/MCC (pedestrian); (c) GSW/stabbing; (d) fall; (e) other.

**Health insurance type.** The type of health insurance was recorded from the EHR and collected by a research assistant, which was obtained through information from billing personnel. The potential categories included: (a) Medicaid; (b) Medicare; (c) private; (d) self pay/uninsured; (e) other government; (f) workman's comp; and (g) other (i.e., charity).

**Injury severity score.** The patient's injury severity score (ISS; Baker, O'Neill, Haddon, & Long, 1974) was recorded from the EHR and was collected by a research assistant, which was obtained through information in the patient's medical record. The ISS was further coded in the data set to indicate its severity level. Injury severity scores of zero to nine are considered minor, 10 to 15 are considered moderate, 16 to 24 are considered moderate/severe, and scores equal to or greater than 25 are severe/critical (Baker et al., 1974).

**Anxiety.** The GAD-7 (Spitzer et al., 2006) was included in the survey to measure symptoms of anxiety. Developed as a brief screening tool for anxiety symptoms, it instructs participants to rate the frequency of various anxiety symptoms over the past two weeks on a four-point Likert scale (0 indicated not at all, 1 indicated several days, 2 indicated more than half the days, and 3 indicated every day). The GAD-7 contains seven items on the questionnaire. An

example question is, “Over the past two weeks how often have you felt nervous, anxious, or on edge?” The sensitivity of the GAD-7 is 83% and a specificity is 84% (Plummer, Manea, Trepel, & McMillan, 2016). The GAD-7 is able to account for sensitivity for multiple anxiety disorders, including generalized anxiety disorder (88%), social anxiety disorder (70%), posttraumatic stress disorder (59%), and panic disorder (76%); the specificity for the previous anxiety disorders is 81-83% (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2006). Psychometrics for the GAD-7 with people who are suffering from addictions has been tested with 80% sensitivity and 86% specificity with a cutoff of nine or above (Delgadillo et al., 2012).

**Depression.** The PHQ-8 (Kroenke et al., 2009) was included in this survey to measure symptoms of depression. This 8-item measure instructs participants to rate the frequency of various depressive symptoms over the past two weeks on a four-point Likert scale (0 indicating not at all, 1 indicating several days, 2 indicating more than half of the day, and 3 indicating every day). An example question is, “Over the past two weeks how often have you been bothered by little interest of pleasure in doing things?” The sensitivity of the PHQ-8 is 88% and the specificity is 88% (Kroenke & Spitzer, 2002). The PHQ-8 is able to account for sensitivity for both major depressive disorder (100%) and any depressive disorder (70%); the specificity for major depressive disorder and any other depressive disorder ranges from 95-98% (Kroenke et al., Mokdad, 2009). The sensitivity and specificity psychometrics for the PHQ-8 are 91% and 99% respectively (Dhingra, Kroenke, Zack, Strine, & Balluz, 2011).

**PTSD.** The PC-PTSD-5 (Prins et al., 2016) was designed to measure symptoms of posttraumatic stress disorder. Participants answered five items on the questionnaire related to symptoms of PTSD. Questionnaire answers are dichotomous (i.e., yes or no). An example question on the PC-PTSD-5 is, “Have you ever had any experience that was so frightening,

horrible, or upsetting that, in the past month you tried hard not to think about it or went out of your way to avoid situations that reminded you of it?” Sensitivity for a cutoff score of three is 95% and the specificity is 85% which is the optimal cut off due to the best sensitivity and specificity (Prins et al., 2016). The sensitivity (98%) and specificity (78%) for a score of two compromises the specificity (Prins et al., 2016). The PC-PTSD-5 has a probability of .94, and was developed using the criteria in the DSM-5 (American Psychiatric Association, 2013).

**Social support.** The 19-item Medical Outcomes Study Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991) measures perceived social support. The MOS-SSS is a multidimensional self-administered survey (Sherbourne & Stewart, 1991). It instructs participants to rate the frequency of various social supports on a five-point Likert scale (1 indicated none of the time, 2 indicated a little of the time, 3 indicated some of the time, 4 indicated most of the time, and 5 indicated all of the time). One example question on the MOS-SSS is, “How often is each of the follow kinds of support available to you if you need it; someone you can count on to listen to you when you need to talk?” Subscale reliabilities demonstrating internal consistency are all greater than .91 on Cronbach’s alpha and the validity of the MOS-SSS subscales are highly correlated with one another (.69-.82; Sherbourne & Stewart, 1991).

**Pain.** The BPI-short (Cleeland, 1991) was included in the survey to measure pain. This is a 15-item measure that assesses severity and impact of pain on a 0 to ten scale (0 = no pain/does not interfere and 10 = pain as best as you can imagine/completely interferes) (Cleeland, 1991). An example question on the BPI is, “Please rate your pain by circling the one number that best describes your pain on the average.” In a population of cancer patients, McDowell and Newell (1996) reported reliability ranging from .82 to .95. Unfortunately, this is

a relatively understudied measurement tool. However, to protect the participants from survey fatigue it is important to find measurement tools that are short in order to capture all of the variables. Therefore, the use of the BPI-short was utilized in this proposal.

**Health and well-being.** The HWBQ (Mills, 2005) was included in the survey to measure different aspects of health and well-being (e.g., sleep, exercise, diet, smoking, alcohol, etc.). The measurement included 20 items covering ten aspects of health and well-being. An example question on the HWBQ is, “How do you feel about the coming six months (with the following options for answers: very concerned and worried; moderately concerned and worried; neither concerned nor optimistic; moderately optimistic; very optimistic)?” Mills (2005) reported test re-test validity for the HWB was high (.90). In addition, researchers reported Chronbach’s  $\alpha$  between .73 and .83 on the HWBQ (Mills, Kessler, Cooper, & Sullivan, 2007). Unfortunately, health and well-being measurement tools that utilize all ten aspects of health are uncommon. Therefore, the researcher decided to include the HWBQ despite its lack of extensive psychometrics.

**Substance Use.** The Opioid Risk tool (ORT; Webster & Webster, 2005) includes five items that include 15 potential items to sum. The measurement tool includes questions about family history of substance abuse, personal history of substance abuse, age, history of childhood sexual abuse, and any psychological disorders. Each of the questions allows for multiple follow up items and each corresponds to an item score based on gender of the participant. One example question on the ORT is, “identify personal history of substance abuse” and provides the following options for participants to select (which may include more than one), “alcohol, illegal drugs, or prescription drugs.” The sensitivity of the ORT is .45 but was obtained from a very small sample size (n=48; Moore, Jones, Browder, Daffron, & Passik, 2009). Due to the

requirements of the Level I accreditation, there is a substance abuse program to provide screening, brief intervention, referral, and treatment (SBIRT; Office of National Drug Control Policy, 2012). All trauma patients are screened through positive drug (e.g., toxicology report) or alcohol (e.g., urinalysis) results, which are recorded in the patient chart through the EHR. A substance abuse counselor then conducts SBIRT protocol for patients with positive labs. The research assistant obtained the toxicology, urinalysis, and substance use screening tools from the EHR.

### **Dependent Variable Measure**

The dependent variable for this study was attendance by the physical trauma survivor for his/her OTACSO follow-up appointment. Attendance was defined as appearing to the OTACSO and being seen by a medical provider for a scheduled appointment within approximately 10 to 15 days after hospital discharge and up to a month post discharge (depending on injury severity this window was shorter or longer). The lead researcher included physical trauma survivor patients' attendance if the patients attended within a month post-discharge. Attendance was coded as a dichotomous variable (i.e., attended or not attended).

### **Data Collection and Procedures**

The following section will include the processes that the lead researcher engaged in to recruit, enroll, and provide consent to potential research participants at Grant Medical Center. In addition, the data collection process will be discussed in further detail to specify the procedure, as well as the use of the EHR for additional data. This section will conclude with a brief description of the data analysis.

### **Recruitment, Enrollment, and Consent**

The lead researcher, along with medical staff at Grant Medical Center, identified participants who were admitted to the tertiary care Level I trauma unit via a list of medically stable patients from the daily census report. The following methods were used by the study's lead investigator to determine if patients met eligibility criteria and are eligible to consent to study participation: (a) examine the daily census report, (b) attend daily trauma treatment meetings to ascertain information regarding patients' medical status (e.g., intubation, location in specific areas of the hospital, cognitive functioning, etc.), (c) reviewing the general schedule (e.g., surgeries, discharge, additional therapies, etc.), and (d) collaborating with the scheduled shift healthcare provider primarily responsible for patient treatment to confirm patients were medically stable enough to discuss the study and consent to participation.

Once the eligible patients were identified, the lead researcher entered the potential patient participant's hospital room and explained the research study and consent process. If the patient consented to participate, and identified a primary support person to approach for consent if present. Patients engaged in informed consent to the study and consulted with any visitors present to ensure they felt comfortable consenting to the study by discussing the study with their visitors if available. Physical trauma survivor patients who preferred not to include a primary support person or if one was not available completed the study individually. If the patient-identified primary support person was in the room, a study description and consent occurred immediately. If the patient-identified primary support person was not present in the room, the lead researcher attempted to set a time to return to the room when the patient-identified primary support person was expected to return. Unfortunately, the rate of participation was low for primary support persons if they were not enrolled at the same time as the patient. The researcher verbally reviewed the informed consent with each potential participant, allowed each to read the

consent form and ask questions while they reviewed the document. The lead researcher brought two wireless electronic tablets for the participants to use simultaneously to complete the surveys. All surveys were completed by accessing the REDCap (Harris et al., 2009) online survey link on the electronic wireless tablets (REDCap surveys in Appendix D and E). No survey data was stored on the electronic wireless tablet or other computer hard-drive. The informed consent document included consent to participate in the self-report measurement surveys and consent for the researchers to access the patients' EHR to determine if they attended their appointments at the OTASCO clinic. The enrollment process took approximately 10 minutes and the survey took an additional 20 minutes. All research participants (physical trauma patients and patient identified primary support persons) who participated were provided with a voucher for one free red box rental (approximate value of \$1.50). The participant signed a receipt form confirming his/her incentive for participating in the research study.

### **Data Collection**

Data collection took place using electronic self-report surveys and data extracted from the patient participant's hospital EHR. Approximately two months after all of the participants were enrolled and participated in the study a research assistant obtained the patient participant's attendance at the OTASCO from the OTASCO appointment book. Once the information on patients who were scheduled for an appointment at the OTASCO was obtained from the first research assistant, a second research assistant was able to obtain the remaining information needed from the patient EHR (i.e., modality of injury, ISS, health insurance type, toxicology (i.e., legal/illegal substances found in the patient), urinalysis (i.e., ethanol alcohol levels found in the patient), and the substance use screening tools (i.e., AUDIT and CAGE-AID if applicable). The lead researcher entered this information into the data set that was securely stored on

REDCap (Harris et al., 2009). Participants were assigned a unique identifier used to de-identify them. The unique identifiers were assigned by REDCap (Harris et al., 2009) and were simply sequential numbers based on the order in which participants began the survey.

**Electronic Health Record and Pass Protected File.** All data (including analyzed) was stored securely on the lead researcher's REDCap (Harris et al., 2009), which was accessible through the internet. The REDCap was a password protected, secure, and encrypted server to which the lead researcher had access.

### **Data Analysis**

For this research, self-report surveys and information collected from the EHR (e.g., modality of injury, health insurance type, substance use screening tools, urinalysis, and toxicology) were utilized. The researchers utilized logistic regression to answer the research question. The analysis was used to examine the influence of the independent variables (e.g., anxiety symptoms, depressive symptoms, PTSD symptoms, perceived social support, health and well-being factors, substance use, and modality of injury) and demographic factors (e.g., age, race, insurance status, gender) on the dependent variable (e.g., traumatic injury survivors' follow-up trauma appointment attendance). The SPSS statistical software program was used to analyze the data. In the event of missing data, the researchers utilized multiple imputation.

The first step to determining the use of the appropriate statistical analysis for the data was to examine the descriptive statistics by conducting a univariate analysis. The second step was to conduct bivariate correlation matrices of the variables. The third step was to conduct multivariate analysis, such as logistic regression.

This research studied health and well-being factors for physical trauma survivor patients and their identified primary social support persons. The independent variables included: anxiety

symptoms, depressive symptoms, PTSD symptoms, perceived social support, health and well-being, pain, and substance use as self-reported by the patient and their support person. The use of substance use was utilized as variables to control while determining how the other variables influence the dependent variable (e.g., patient attendance in the OTASCO clinic).

### **Ethical Considerations**

The design of this research study included a variety of safeguards to ensure the well-being of the research participants. This research study had minimal risks to participants, which included: time and energy spent completing both surveys and interviews, disclosure of sensitive information (e.g., mental health as well as health and well-being symptoms), but these were considered and appropriate safeguards were presented to reduce the risks.

Participants were informed that they could stop surveys to take a break or withdraw from participation at any time. Since the surveys were completed on a tablet and the scores to the measurement tools were not available to the researcher instantly upon completion, each participant was provided a list of local mental health and substance use counseling services as well as a list of emergency numbers should they desire help for any of their symptoms.

Upon enrolling participants in the study, REDCap assigned a de-identified sequential numerical code to each participant prior to completing the survey. In addition, the document containing the patient names to their de-identified code and follow-up attendance results will all be kept on a password-protected, secure, and encrypted server on site at OhioHealth. In addition, the participant research files required and owned by OhioHealth were securely stored in the Trauma Services office in a locked file cabinet. The safety and security of participants (e.g., physical trauma patients and their identified primary support persons) were treated with support and respect for the sharing of their experiences after a traumatic event.

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## CHAPTER 4: PHYSICAL TRAUMA SURVIVOR PATIENTS' HEALTH AND WELL-BEING FACTORS THAT IMPACT FOLLOW-UP ADHERENCE

Over the past five years, physical trauma admissions have risen steadily among Level I (12.9%), Level II (17.7%), and Level III (34.9%) United States trauma centers (American College of Surgeons; ACS, 2010, 2015). However, the Level IV trauma centers responsible for treating the least severe physical trauma survivors have experienced a 69.3% decrease. These statistics correspond with reported increases in injury severity scores (ISS; Baker, O'Neill, Haddon, & Long, 1974) from 23.1% in 2009 (ACS, 2010) to 104.9% in 2015 (ACS, 2015). Yet what is unexplained is how the average length of stay (LOS) has not changed comparatively (ACS, 2010, 2015), as well as why despite available evidence, psychological and social screening and intervention protocols have not become standardized.

The American College of Surgeons Committee on Trauma (2006) acknowledged the role alcohol use plays in many of the injuries treated. In 2006, they passed a 2007 alcohol use disorder screening and brief intervention mandate to be implemented in Level I trauma centers. While this mandate only applies to Level I trauma centers, over 90% of Level II trauma centers have already begun screening for alcohol use (Love & Zatzick, 2014), even without a mandate. Beyond alcohol use, U.S. trauma centers are not screening for commonly occurring mental health conditions despite convincing evidence. For example, U.S. trauma centers that implemented screening for depression found 23% of patients screened positively for it and 7% screened positively for posttraumatic stress disorder (PTSD; Love & Zatzick, 2014). Not only may mental health conditions play a factor in causing the injury incident, evidence exists that 12.35% of motor vehicle accident survivors exhibit depressive symptoms at six weeks post-injury and 12.24% at six months (Irish et al., 2011). Furthermore, the post-injury prevalence

rates of PTSD for physical trauma survivors at six months range from 18 to 24% and at 12 months range from 2 to 36% (O'Donnell, Creamer, Bryandt, Schnyder, & Shaley, 2003; Steel, Dunlavy, Stillman, & Pape, 2011). To date, there are no known anxiety prevalence rates available for this patient population to determine if they are at any different level of risk than the 18.1% of U.S. adults who meet the criteria for it annually (Kessler, Chiu, Demler, & Walters, 2005).

Untreated mental health issues have been found to exacerbate patients' participation and progress in treatment. For example, patients who were enrolled in cardiac rehabilitation, and who reported higher levels of anxiety and depression, had poorer attendance or were absent from their cardiac rehabilitation appointments (Whitmarsh, Koutantji, & Sidell, 2003). Among older women with musculoskeletal injuries, those who reported higher depressive symptoms had lower coping scores and attended fewer exercise groups as compared to those with lower depressive symptoms (Resnick et al., 2008). This is important because patients who underwent total joint arthroplasty and had co-morbid depression were 21 to 24% more likely to be readmitted to the hospital within 90 days post-surgery compared to those without depression (Gold et al., 2016).

Post-discharge complications are not only biopsychosocially challenging, but can also be financially devastating for families. Trauma center readmissions range from 3%, if within 30 days (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016), to 38% if admitted within 12 months post discharge (Staudenmayer et al., 2016). Healthcare costs for patients readmitted within one year post-injury were nearly three times higher as compared to those who were not readmitted (\$49,504 and \$17,040 respectively) with costs for physical trauma patients who experienced major complications during hospitalization approximately being \$74,658 (Hemmila et al., 2008).

Also playing a factor in how well patients recover from their physical injuries is post-discharge follow-up attendance. Poor follow-up attendance can not only result in higher healthcare costs for patients, it can also impact missed or unaddressed physical health outcomes (i.e., unmanaged pain, additional injuries that were missed, infections, and deep vein thrombosis; Malhorta et al., 2009). In a sample of 692 physical trauma survivors, 33.3% of patients experienced additional complications that required treatment adjustments (Malhorta et al., 2009). Of those, 45% sought treatment from an emergency department (ED) as compared to 34% who saw an outpatient provider. Among patients who sought treatment in an outpatient setting, only 15% required readmission compared to the 75% who went to the ED. According to Showalter (2015), ED preference may be related to the availability of care (i.e., EDs are 24-hour facilities) and legal inability of EDs to deny care based on insurance status and/or ability to pay. Barriers to attending outpatient follow-up appointments after admissions are not clearly understood and to date have not been well studied.

In sum, while there have been increases in physical traumas, injury severity scores, and numbers of trauma centers, the average LOS has remained the same (ACS, 2010, 2015). This means patients with more complex needs are being discharged at the same rate as those with less severe injuries. Unfortunately, the risk of complications and readmissions may be due to potentially missed injuries causing patients a delayed recovery and increased financial stress (Hemmila et al., 2008; Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016; Overton, Shafi, & Gandhi, 2014; Staudenmayer et al., 2016). Furthermore, behavioral health screening or treatment, with the exception of alcohol use, is largely missing from the treatment of physical trauma patients (Love & Zatzick, 2014). This is particularly evident among the more seriously injured, despite evidence that it may impact patient engagement and attendance in follow-up

appointments (Resnick, 2008; Whitmarsh et al., 2003). Overall, there has been limited study on the use and biopsychosocial impact of mental health screening tools and interventions available in inpatient and outpatient trauma centers, as well as adequate investigation into what resiliency factors impact patients' biopsychosocial recovery rates and utilization of healthcare services.

### **Resiliency Theory and Biopsychosocial Framework**

Researchers found survivors who apply resilience strategies, subsequent to experiencing a traumatic physical event, reduce its negative impact (Fergus & Zimmerman, 2005; Garmezy, Mastern, & Tellegen, 1994; Luthar & Cicchetti, 2000; Rutter, 1985; Werner, 1992). Proponents of resiliency theory (Fergus & Zimmerman, 2005) suggested that there should be a focus on healthy development or coping techniques regardless of the severity of the traumatic event (Fergus & Zimmerman, 2005). Resiliency theory originated from research that focused on the assets and resources of people who were able to transcend the negative effects of risk exposure compared to earlier research that focused on the risks (Fergus & Zimmerman, 2005).

An acute traumatic event can be a risk factor explained through resiliency theory (Fergus & Zimmerman, 2005). Each survivor has protective factors that help to mitigate the negative effects of a traumatic event (which include assets and resources; Beauvais & Oetting, 1999; Fergus & Zimmerman, 2005). Assets are positive factors that are internal to each person (e.g., coping skills, competence, or self-efficacy) and resources are positive factors that can assist each person through their traumatic event and the aftermath which are external (e.g., social support, community organizations, financial stability, etc.). Resiliency theory offers different models, which include: compensatory, protective, protective-stabilizing, protective-reactive, challenging, and inoculation (Fergus & Zimmerman, 2005). Within this study the protective model is used to conceptualize the research.

The protective model (Fergus & Zimmerman, 2005) is comprised of the following four concepts: (1) risk, which can be exposure to a traumatic event or sociodemographic factors that put people at risk for negative influences; (2) protective factors, which are both assets and resources (see previous examples) that moderate the effects of the risk; (3) negative factors, which are high levels of mental health symptoms or injury severity within this study; and (4) outcome, appointment attendance. The literature related to the resiliency theory's protective model and health has been researched primarily with youth who have not experienced physical trauma. For example, researchers have focused on family as a means of social support for various health outcomes (Caldwell, Sellers, Bernat, & Zimmerman, 2004; Zimmerman, 2013) including, improving driving skills (Ramirez et al., 2013), condom use in Latino youth (Malcom et al., 2013), healthy eating and physical activity (Shneyderman & Schwartz, 2013), using mentors for adolescent mothers protected against negative effects of stress on mental health (Hurd & Zimmerman, 2010), and self-esteem and cultural identity within Native American youth to protect against the use of alcohol (Zimmerman et al., 1995). This study applies resiliency theory's protective model (Fergus & Zimmerman, 2005) to the adult population who have survived an acute physical trauma event.

In addition to resiliency theory (Fergus & Zimmerman, 2005), the additional application of the biopsychosocial (BPS) framework (Engel, 1977, 1980) provides a complementary BPS infrastructure for researching risk factors, protective factors, and outcomes. For example, the risk factor is the traumatic event. Protective factors (e.g., social support) may influence the relationship between the risk factors (e.g., high levels of mental health condition symptoms) and outcome (e.g., patient OTASCO attendance) (Fergus & Zimmerman, 2005). Available research that addresses adult physical trauma survivors' BPS health and resiliency is limited and needed

to develop targeted comprehensive interventions that reduce readmissions and decrease negative health outcomes. The purpose of this study was to determine which health and well-being factors of physical trauma patients' predict outpatient follow-up attendance in attempt to better support the patients and services in most need of additional resources.

### **Method**

A descriptive exploratory quantitative analysis was used to study the following research question: "What are the health and well-being factors that impact physical trauma survivor patients' adherence to follow-up appointments?" Self-report and electronic health record (EHR) data was gathered between July 10, 2017 and July 31, 2017 at a Level I U.S. Midwestern trauma center, following IRB approval.

### **Setting**

The Midwestern trauma center serves patients from over 50 rural and urban counties. It is equipped to manage approximately 50-100 admitted trauma cases at a time. It employs approximately 9 surgeons, 25 advanced practice providers, 20 trauma program staff, and 2 advanced practice providers. Every hospitalized trauma patient receives an appointment within five to 10 days post discharge with the trauma center's own outpatient trauma care facility (i.e., Outpatient Acute Surgery and Care Office attendance; OTASCO).

### **Participants**

Participants were enrolled in this study if they met the following inclusion criteria: (a) English-speaking; (b) 18 years of age or older; (c) being treated for physical trauma in the trauma unit; (d) scheduled for a follow-up appointment in the outpatient trauma clinic; (e) provided consent for the lead researcher to obtain the patients' outpatient follow-up attendance from the EHR; and (f) provided consent for the lead researcher or research assistants to retrieve

information from the patients' EHR (e.g., injury severity score, modality of injury, type of insurance, urinalysis [i.e., ethanol alcohol level], toxicology [i.e., presence of legal/illegal substances], distance from home to the outpatient trauma center, and additional behavioral health screening tool scores [i.e., AUDIT and CAGE-AID]). Physical trauma survivor patients were not eligible for participation if they met the following exclusion criteria: (a) showed evidence of physical and/or cognitive impairment that would limit their ability to consent or participate in the surveys, (b) were being discharged after re-hospitalization for the same physical trauma, and (c) were not scheduled for a follow-up appointment at the hospital's outpatient trauma center.

There were a total of 112 patient participants admitted to the study with 105 remaining in the final sample. One patient decided to withdraw from the study before completing the survey and six patients did not have OTASCO follow-up appointments scheduled. Within the sample 54.3% ( $n = 57$ ) of patients identified as male, 79.1% ( $n = 83$ ) as White non-Hispanic, the average patient age was 47.0 years of age ( $SD = 20.0$ ; range 19-96 years old) with 42.9% ( $n = 45$ ) employed at the time of the injury. Distance from patients' homes to the OTASCO clinic were reflected in the following categories: (a) less than 10 miles (27.6%), (b) 10 to 20.99 miles (23.8%), (c) 21 to 40.99 miles (13.3%), (d) 41 to 60.99 miles (15.2%), and (e) 61 miles and further (16.2%). A complete demographic description of the sample is included in Table 1.

Data collected from the EHR further described the patient participants (see Table 2). For example, the majority of participants (40%) were injured in a motor vehicle accident (MVA) or motorcycle crash (MCC). The majority of patient ISS fell into the minor category (1-9), which accounted for 62.9% of patients. Upon admission, 82.9% of patients did not test positive for the presence of ethanol alcohol in a urinalysis. Furthermore, toxicology panels provided evidence of legal and illegal substances within patients upon admission with 7.6% of patients having one or

more legal/illegal substances in their system. Most patients had Medicaid (34.3%), Medicare (21.0%), or private insurance (36.2%). There was also a combined Medicaid/Medicare variable as (53.3%) had both types of coverage.

## **Measures**

This study utilized measurement tools for five independent variables for physical trauma patients, which included: (a) anxiety symptoms using the General Anxiety Disorder Scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006), (b) depressive symptoms using the Patient Health Questionnaire (PHQ-8; Kroenke et al., 2009), (c) Posttraumatic Stress Disorder (PTSD) symptoms using the Primary Care PTSD Screen (PC-PTSD-5; Prins et al., 2016), (d) perceived social support using the Medical Outcome Scale Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991), (e) health and well-being using the Health and Well-Being Questionnaire (HWB; Mills, 2005), and data obtained from information in the EHR (i.e., injury severity score; ISS), as well as distance from home to the OTASCO, type of health insurance, urinalysis (i.e., ethanol alcohol level), and toxicology results; i.e., presence of legal/illegal substances). The research team obtained participants' follow-up OTASCO outpatient attendance data from the clinic's schedule and appointment record system.

## **Independent Variables**

Independent variables collected from participants included: (a) demographic information (e.g., sex/gender, age, race/ethnicity, level of education, and household income); (b) relationship to primary support person (e.g., partner, parent, sibling, cousin, extended relative, friend); (c) if patient primary support person lives with the patient (e.g., yes or no); (d) type of physical injury modality; (e) anxiety symptoms; (f) depressive symptoms; (g) PTSD symptoms; (h) social support; (i) health and well-being; (j) pain; (k) substance use (e.g., opioid risk, urinalysis,

toxicology, AUDIT, and CAGE), (l) injury severity (ISS), and (m) distance from home to the outpatient trauma clinic. Items related to patient admission are reported in the patient information table (see Table 2). Further operationalization of the independent variables is below.

**Type of physical injury modality.** Type of physical injury modality was obtained from the EHR. Available categories included: (a) MVA/MCC (vehicle); (b) MVA/MCC (pedestrian); (c) GSW/stabbing; (d) fall; (e) other (i.e., undocumented, n = 5; shortness of breath, n = 1; punched glass, n = 1; machine, n = 2; and bicycle, n = 1). While it was not clear what physical injury the patient whose modality of injury was shortness of breath was admitted for, the patient met all of the inclusion criteria.

**Health insurance type.** The type of health insurance was obtained from the EHR. Available categories included: (a) Medicaid; (b) Medicare; (c) private; (d) self-pay/uninsured; (e) other government; (f) workman's compensation; and (g) other (e.g., charity).

**Injury severity score.** The patient's ISS (Baker et al.,1974) was collected by a research assistant from the EHR. The ISS was coded according to injury severity level (Baker et al., 1974). Scores ranged from: (a) zero to nine (minor), 10 to 15 (moderate), 16 to 24 (moderate/severe), and (d) equal to or greater than 25 (severe/critical).

**Anxiety.** The GAD-7 (Spitzer et al.,2006) was developed as a 7-item brief screening tool for anxiety symptoms. It instructs participants to rate the frequency of various anxiety symptoms over the past two weeks on a four-point Likert scale (0 indicated not at all, 1 indicated several days, 2 indicated more than half the days, and 3 indicated every day). An example question is, "Over the past two weeks how often have you felt nervous, anxious, or on edge?" The sensitivity of the GAD-7 is 83% and a specificity is 84% (Plummer, Manea, Trepel, & McMillan, 2016). The GAD-7 is able to account for sensitivity for multiple anxiety disorders,

including generalized anxiety disorder (88%), social anxiety disorder (70%), posttraumatic stress disorder (59%), and panic disorder (76%); the specificity for the previous anxiety disorders is 81-83% (Kroenke et al., 2007). Psychometrics for the GAD-7 with people who are suffering from addictions has been tested with 80% sensitivity and 86% specificity with a cutoff of nine or above (Delgadillo et al., 2012).

**Depression.** An adapted version of the PHQ-9 (Kroenke, Spitzer, & Williams, 2001) was utilized in this study to measure depression. The last question of the PHQ-9 was dropped because the lead researcher did not have immediate access to the patients' survey responses to respond promptly and ethically. The PHQ-8 (Kroenke et al., 2009) was included in this survey to measure symptoms of depression. This 8-item measure instructs participants to rate the frequency of various depressive symptoms over the past two weeks on a four-point Likert scale (0 indicating not at all, 1 indicating several days, 2 indicating more than half of the day, and 3 indicating every day). An example question is, "Over the past two weeks how often have you been bothered by little interest or pleasure in doing things?" The sensitivity of the PHQ-8 is 88% and the specificity is 88% (Kroenke & Spitzer, 2002). The PHQ-8 is able to account for sensitivity for both major depressive disorder (100%) and any depressive disorder (70%); the specificity for major depressive disorder and any other depressive disorder ranges from 95-98% (Kroenke, et al., 2009). The sensitivity and specificity psychometrics for the PHQ-8 are 91% and 99% respectively (Dhingra, Kroenke, Zack, Strine, & Balluz, 2011).

**PTSD.** The PC-PTSD-5 (Prins et al., 2016) was designed to measure symptoms of posttraumatic stress disorder. Participants answered five items on the questionnaire related to symptoms of PTSD. Questionnaire answers are dichotomous (i.e., yes or no). An example question on the PC-PTSD-5 is, "Have you ever had any experience that was so frightening,

horrible, or upsetting that, in the past month you tried hard not to think about it or went out of your way to avoid situations that reminded you of it?” Sensitivity for a cutoff score of three is 95% and the specificity is 85% which is the optimal cut off due to the best sensitivity and specificity (Prins et al., 2016). The sensitivity (98%) and specificity (78%) for a score of two compromises the specificity (Prins et al., 2016). The PC-PTSD-5 has a probability of .94, and was developed using the criteria in the DSM-5 (American Psychiatric Association, 2013).

**Social support.** The 19-item Medical Outcomes Study Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991) measures perceived social support. The MOS-SSS is a multidimensional self-administered survey (Sherbourne & Stewart, 1991). It instructs participants to rate the frequency of various social supports on a five-point Likert scale (1 indicated none of the time, 2 indicated a little of the time, 3 indicated some of the time, 4 indicated most of the time, and 5 indicated all of the time). One example question on the MOS-SSS is, “How often is each of the follow kinds of support available to you if you need it; someone you can count on to listen to you when you need to talk?” Subscale (e.g., emotional support, informational support, affection, tangible support, and positive interaction) reliabilities demonstrating internal consistency were all greater than .91 on Cronbach’s alpha and the MOS-SSS subscales were highly correlated with one another (.69-.82; Sherbourne & Stewart, 1991).

**Health and well-being.** The HWBQ (Mills, 2005) was included in the survey to measure different aspects of health and well-being (i.e., medical health, pain, physical activity, nutrition, sleep, stress, job satisfaction, smoking status, alcohol consumption, and body mass index). The measurement included 20 items covering ten aspects of health and well-being. An example question on the HWBQ is, “How do you feel about the coming six months (with the following options for answers: very concerned and worried; moderately concerned and worried;

neither concerned nor optimistic; moderately optimistic; very optimistic)?" Mills (2005) reported that the HWBQ's test re-test validity was high (.90). In addition, researchers reported Chronbach's  $\alpha$  was between .73 and .83 (Mills, Kessler, Cooper, & Sullivan, 2007). Unfortunately, health and well-being measurement tools that utilize all ten aspects of health are uncommon. Therefore, the researcher decided to include the HWBQ despite its lack of extensive psychometrics, such as sensitivity and specificity, which are included with the other measurements.

**Substance use.** Due to the requirements of the Level I accreditation requirements for the trauma center, all trauma patients are screened for illegal drug (e.g., toxicology report) or ethanol alcohol (e.g., urinalysis) use. Results are recorded in the EHR. Toxicology and urinalysis results are recorded and obtained from the EHR.

### **Dependent Variable**

The study's dependent variable is outpatient trauma center follow-up attendance. According to hospital guidelines, all patients discharged from the inpatient trauma center had to be seen by an OTASCO medical provider within approximately 31 days. The dependent variable was recorded as patient participants attending or not-attending their scheduled OTASCO out-patient appointment.

### **Hypotheses**

This study was exploratory and descriptive in nature; therefore, it tested the following hypotheses:

1. Patients being treated for more severe injuries will be more likely to attend follow-up appointments.

2. Physical trauma survivor patients who report feeling less depressed while hospitalized will demonstrate better follow-up attendance than physical trauma survivor patients who report feeling more depressed.
3. Physical trauma survivor patients who report less anxiety while hospitalized will demonstrate better follow-up attendance than physical trauma survivor patients with more anxiety.
4. Physical trauma survivor patients who report lower scores on posttraumatic stress disorder (PTSD) screening tool while hospitalized will have better follow-up attendance than physical trauma survivor patients who report higher scores on PTSD screening tool.
5. Physical trauma survivor patients who report higher scores on perceived social support screening tool during hospital admission will have better follow-up attendance than physical trauma survivor patients who report lower scores on perceived social support screening tool.

### **Procedures**

The lead researcher identified participants who were admitted to the tertiary care Level I trauma unit via a list of medically stable patients from the daily census report. The following methods were used to determine if patients met the study's eligibility criteria: (a) examined the daily census report, (b) attended daily trauma treatment meetings to ascertain information regarding patients' medical status (e.g., intubation, location in specific areas of the hospital, cognitive functioning, etc.), (c) reviewed the general schedule (e.g., surgeries, discharge, additional therapies, etc.), and (d) collaborated with the scheduled shift healthcare provider primarily responsible for patient treatment to confirm patients were medically and mentally stable enough to discuss the study and consent to participation.

Once eligible patients were identified, the lead researcher entered the potential patient participant's hospital room and explained the research study and consent process. Patients who agreed to engage in the informed consent process were asked if they wanted any visitors present to step out of the room. No patients asked their visitors to leave. However, some patients asked the lead researcher to return at time when they did not have visitors in their room.

The lead researcher verbally reviewed the informed consent with each potential participant, allowed each to read the consent form and ask questions prior to giving their consent. A wireless electronic tablet was provided to each participant for survey completion. All survey data was stored electronically using a REDCap (Harris et al., 2009). The enrollment process took approximately 10 minutes and the survey took an additional 20 minutes to complete. All research participants who completed the data collection process were provided a voucher for one free Red Box movie rental (approximate value of \$1.50). Each participant signed a paper form confirming their incentive receipt.

### **Data Collection and Analyses**

Patient participants were surveyed using REDCap (Harris et al., 2009), a secure internet-based data collection application. Data collection took place using electronic tablets to capture the self-report data and the patient participant's hospital EHR. Participants were assigned a unique identifier to de-identify them. Approximately two months after all participants were enrolled and completed the study survey, a co-researcher obtained the patient participant's outpatient trauma center follow-up attendance. A second co-researcher then collected data from each patient's EHR (i.e., modality of injury, ISS, health insurance type, toxicology (i.e., legal/illegal substances found in the patient), urinalysis (i.e., ethanol alcohol levels found in the patient), and the substance use screening tools (i.e., AUDIT and CAGE-AID if applicable). The

EHR data was also securely stored on REDCap (Harris et al., 2009). Data were analyzed using SPSS statistical software. Descriptive statistics were conducted to provide simple summaries about the sample and the measures. Logistic regressions were completed to test the study's hypotheses and determine which demographic and/or biopsychosocial measures impacted the probability of physical trauma patients' adherence to follow-up appointments.

## **Results**

The targeted enrollment for the study was a minimum of 100 physical trauma survivor patients. We estimated at least 113 participants were needed to perform the appropriate statistical analysis of two variables to achieve a power of .80 and odds ratio of 2.0 (medium effect size). The sample size and power were determined using G\*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The final sample size was 105 patients. However, the number of patients who attended OTASCO follow-up appointments was 80. Prior to testing the hypotheses, the lead researcher conducted bivariate correlations on the study's variables (see Table 3). There were significant positive correlations between the following variables: depressive and anxiety symptoms ( $r = 0.75$ ) and depressive and PTSD symptoms ( $r = 0.63$ ), and anxiety and PTSD symptoms ( $r = 0.63$ ). There were also significant positive correlations between injury severity and depressive symptoms ( $r = 0.27$ ) and anxiety symptoms ( $r = 0.25$ ). There were significant negative correlations between patient perceptions of social support and mental health symptoms, with depressive symptoms ( $r = -0.31$ ), anxiety symptoms ( $r = -0.27$ ) and PTSD symptoms ( $r = -0.27$ ). Injury severity was the only variable that did not manifest in a significant relationship among the variables of PTSD symptoms and patient perceived social support. The results of these correlations help to establish the connections between the biological, psychological and social domains of health among physical trauma patients.

### **Hypothesis 1: Injury Severity**

The first hypothesis predicted that patients with more severe injuries would be more likely to attend the OTASCO follow-up appointments. The ISS was utilized to test this hypothesis and was taken from the EHR and coded as a continuous variable based on the ISS score. A logistic regression model was used to determine if injury severity affected the likelihood of attending the OTASCO appointment. The dependent variable for this analysis was the binary item (i.e., 1 = yes, 0 = no) indicating if patients attended their scheduled appointments at the OTASCO. The results of the model showed that injury severity was not significantly related to attending the OTASCO follow-up appointment (See Table 4). The model was not statistically significant ( $\chi^2(1) = 1.31, 0.252$ ), only explained 2.0% of the variance (Nagelkerke  $R^2$ ), and correctly classified 76.0% of cases. These results suggest that the level of injury severity did not influence the likelihood that patients would attend the OTASCO follow-up appointment.

### **Hypothesis 2: Depressive Symptoms**

The second hypothesis predicted that there would be significant differences in patients who reported lower severity regarding depressive symptoms would predict better follow-up attendance at the OTASCO using a logistic regression model. Depressive symptoms were measured using the PHQ-8 total score. The dependent variable was a binary item on whether the patients' attended a follow-up appointment at the OTASCO. Results of the first model showed that the PHQ-8 total score was not statistically significant ( $\chi^2(1) = .779, p = .377$ ) and only explained 1.1% of the variance (Nagelkerke  $R^2$ ), and correctly identified 77.1% of cases (See Table 4). The depressive symptoms based on the PHQ-8 total score did not influence a patients' follow-up attendance at the OTASCO.

### **Hypothesis 3: Anxiety Symptoms**

The third hypothesis predicted that there would be significant differences in patients who reported lower severity regarding anxiety symptoms would predict better follow-up attendance at the OTASCO using a logistic regression model. Anxiety symptoms were measured using the GAD-7 total score. The dependent variable was a binary item on whether the patients' attended a follow-up appointment at the OTASCO. Results of the first model showed that the GAD-7 total score was not statistically significant ( $\chi^2(1) = 1.154, p = 0.228$ ), only explained 2.1% of variance (Nagelkerke  $R^2$ ), and correctly classified 11.7% of cases (See Table 4). The anxiety symptoms based on the GAD-7 total score did not influence a patients' follow-up attendance at the OTASCO.

### **Hypothesis 4: PTSD Symptoms**

The fourth hypothesis predicted that there would be significant differences in patients who reported lower severity regarding PTSD symptoms would predict better follow-up attendance at the OTASCO using a logistic regression model. Posttraumatic stress disorder symptoms were measured using the PC-PTSD-5 total score. The dependent variable was a binary item on whether the patients' attended a follow-up appointment at the OTASCO. Results of the model showed that the PC-PTSD-5 total score was not statistically significant ( $\chi^2(1) = 2.329, p = 0.127$ ), explained 3.3% of the variance, and identified 77.1% of cases (See Table 4). The PTSD symptoms based on the PC-PTSD-5 total score did not influence a patients' follow-up attendance at the OTASCO.

### **Hypothesis 5: Social Support**

The fifth hypothesis predicted that there would be significant differences in patients who reported perceived higher levels of social support would predict better follow-up attendance at

the OTASCO using a logistic regression model. Perceived social support was measured using the MOS-SSS total score. The dependent variable was a binary item on whether the patients' attended a follow-up appointment at the OTASCO. Results of the first model showed that the MOS-SSS total score was not statistically significant ( $\chi^2(1) = 1.041, p = .308$ ), explained 1.5% of the variance (Nagelkerke  $R^2$ ), and correctly identified 77.1% of cases (See Table 4). The patients' social support perception based on the MOS-SSS total score did not influence a patients' follow-up attendance at the OTASCO.

### **Exploratory Analyses**

While the models utilized to predict the hypotheses did not produce statistically significant results, they were conducted to determine if controlling for relevant factors provided identification of important predictors. The independent variables tested to determine the impact on the dependent variable (e.g., whether patients attended a follow-up appointment at the OTASCO) included age and modality of injury. Additionally, there was a more complex logistic regression model created and tested that produced several variables with statistical significance. First, bivariate correlations were run on the exploratory variables (see Table 5). Significant negative correlations occurred between health and well-being of patients and mental health symptoms (anxiety symptoms [ $r = -0.50$ ], depressive symptoms [ $r = -0.55$ ], and PTSD symptoms [ $r = -0.44$ ]). Interestingly, there was a significant positive correlation between health and well-being of patients and their perception of social support ( $r = 0.29$ ). Lastly, there was also a significant negative correlation between the age of patients and PTSD symptoms ( $r = -0.32$ ). Furthermore, the variable health and well-being did not manifest in a significant relationship among the variables of injury severity, age, or the distance from the patients' home to the

outpatient clinic. Additionally, the variable of injury severity did not result in significant results with patient age or the distance from their home to the clinic.

**Age.** The first exploratory analysis conducted was a logistic model to determine if age impacted patient OTASCO follow-up attendance. The dependent variable was a binary item on whether the patients' who attended a follow-up appointment at the OTASCO. The results of this model were statistically significant ( $\chi^2(1) = 4.191, p = .045$ ), explaining 5.9% of the variance (Nagelkerke  $R^2$ ), and correctly classified 76.9% of cases. Nagelkerke  $R^2$  in this analysis indicates a small effect size. This means that as patients get older, they are more likely to not attend follow-up appointments compared to younger patients. Since age appeared to have statistical significance in predicting if patients attended the OTASCO follow-up appointment, a more complex model was tested (See Table 6). A second logistic regression model was used to explore the effect of age on OTASCO attendance controlling for modality of injury and Medicaid/Medicare health insurance types (See Table 6). The modality of injury was coded as follows: MVA/MCC (vehicle), MVA/MCC (pedestrian), GSW/stab, assault, and other. The MVA/MCC (vehicle) and MVA/MCC (pedestrian) categories were merged to create one dummy variable called "MVA/MCC," indicating "yes," and "no" for the occurrence of group membership. The GSW/stab, assault, and other categories were merged to create a second dummy variable named "violence and other," indicating "yes" and "no" for the occurrence of group membership. This left the patients who experienced falls as the reference group. The model was statistically significant ( $\chi^2(4) = 11.399, p = 0.022$ ), explained 15.7% of the variance (Nagelkerke  $R^2$ ), and correctly identified 76.0% of cases. Within this analysis the Nagelkerke  $R^2$  indicates a medium effect size. While the overall model was statistically significant, the results indicate that age was not significant in the model.

**Modality of injury.** A logistic regression model was used to determine if modality of injury affected the likelihood of attending OTASCO follow-up appointments. The modality of injury was coded as follows: MVA/MCC (vehicle), MVA/MCC (pedestrian), GSW/stab, assault, fall, other. The MVA/MCC (vehicle) and MVA/MCC (pedestrian) categories were merged to create one dummy variable called “MVA/MCC,” indicating “yes,” and “no” for the occurrence of group membership. The GSW/stab, assault, and other categories were merged to create a second dummy variable called “violence and other,” indicating “yes” and “no” for the occurrence of group membership. This left the patients who experienced falls as the reference group. This model was statistically significant ( $\chi^2(2) = 10.209, p = 0.006$ ), explaining 14.1% of the variance (Nagelkerke  $R^2$ ) in response to attending the outpatient follow-up appointment, and correctly classified 77.1% of cases (see Table 7). The results of Nagelkerke  $R^2$  in this analysis was a medium effect size. Patients in the MVA/MCC modality of injury group ( $B = 1.664, SE = 0.560, p = 0.003$ ) were 5.28 times more likely to attend their follow-up appointments compared to patients whose modality of injury were falls (reference group). Patients in the violence and other modality of injury group ( $B = 1.253, SE = 0.653, p = 0.055$ ) were 3.50 times more likely to attend their follow-up appointments compared to patients in the falls modality of injury group (reference group). The results of the MVA/MCC and violence and other modality of injury group variables also demonstrated a medium effect size based on their odds ratios. The results explain the role of injury modality on OTASCO follow-up appointment attendance.

A second logistic regression model was used to determine if modality of injury affected the likelihood of attending the OTASCO follow-up appointment; however, this model also controlled for the factors of patient age and injury severity score. This model was also statistically significant ( $\chi^2(4) = 10.324, p = 0.035$ ), explaining 14.8% of the variance (Nagelkerke

$R^2$ ) in response to attending the outpatient follow-up appointment, and correctly classified 78.8% of cases (see Table 7). The Nagelkerke  $R^2$  of this analysis resulted in a medium effect size. Patients in the MVA/MCC modality of injury group ( $B = 1.383$ ,  $SE = 0.608$ ,  $p = 0.023$ ) were 3.98 times more likely to attend their follow-up appointments compared to patients whose injury modality was falls (reference group), which was a medium effect size. Patients in the violence and other group ( $B = 0.719$ ,  $SE = 0.785$ ,  $p = 0.360$ ) were 2.05 times more likely to attend their follow-up appointments compared to patients whose injuries resulted from falls (reference group), which was a small effect size. Age and injury severity as controls in this model did not appear to impact the follow-up attendance of patients who were in the MVA/MCC modality of injury group in comparison to those who experienced falls.

**Multiple independent variables.** While the hypotheses did not produce any statistically significant results, the patient age and modality of injury were statistically significant predictors of follow-up attendance. Therefore, the lead researcher decided to further conduct a complex regression model to determine if controlling for relevant factors provided new information on previously tested predictors. A logistic regression model was created to explore the effect of a number of independent variables that may impact patient OTASCO attendance. The independent variables controlled for included: (a) non-white race, (b) health insurance types (i.e., Medicaid/Medicare insurance, private insurance, self-pay/uninsured), (c) presence of any substances in the patient upon admission (i.e., ethanol alcohol or legal/illegal drugs), and (d) distance from the patients' home to the OTASCO clinic. Independent variables included: (a) injury severity (measured by the ISS), (b) PTSD symptoms (measured by the PC-PTSD-5 total score), and (c) health and well-being of the patient (measured by the HWBQ total score). The dependent variable for this analysis was the binary item (i.e., 1 = yes, 0 = no) indicating if

patients attended the OTASCO follow-up appointment (See Table 8). This model was not statistically significant ( $\chi^2(9) = 16.819, p = .052$ ), explained 24.4% of the variance (Nagelkerke  $R^2$ ), and correctly classified 80.2% of cases regarding what health and well-being factors impact patient follow-up attendance. Furthermore, there were three independent variables that resulted in statistically significant results, which included: self-pay/uninsured ( $B = -4.163, SE = 1.938, p = .032$ ), PC-PTSD-5 scores ( $B = .432, SE = 0.211, p = .041$ ), and HWBQ scores ( $B = .366, SE = .157, p = .019$ ). While the *p-values* of these variables were found to be significant, the effect sizes based on the odds ratios were considered small. Within this logistic regression model, physical trauma patients who were self-pay/uninsured were four times more likely to not attend the OTASCO follow-up appointment. Patients who reported higher levels of PTSD symptoms were significantly more likely to attend the follow-up appointment, which is interesting given that injury severity was controlled for in the model. Additionally, patients who reported higher health and well-being scores were also significantly more likely to attend the OTASCO follow-up appointment.

## Discussion

The purpose of this study was to determine which health and well-being factors predict physical trauma patients' outpatient follow-up attendance. This study was conducted in an attempt to better support the patients and services in need of additional resources. The resiliency theory's protective model (Fergus & Zimmerman, 2005) guided and organized this study. Additionally, the BPS (Engel, 1977, 1980) framework was applied to identify the biological, psychological, and social (BPS) factors that most impacted physical trauma patients' outpatient attendance. This study is the first of its kind in examining what BPS health and well-being factors predict physical trauma patient outpatient follow-up attendance. The results expand and

enhance the trauma literature, as well as provide opportunities for advancements in trauma research and policy.

The first contribution of this study is the utilization of the resiliency theory (Fergus & Zimmerman, 2005) to guide research for adults, which can assist in better understanding the protective factors and negative outcomes of patients. The second contribution is the continued evaluation of a combination of BPS factors when studying physical trauma survivors' health, which there is a dearth of literature that focuses on all three factors with this population. While there were limited studies that evaluated the BPS factors of physical trauma patients, it became apparent that more studies were needed to explore these factors.

As discussed above, this study shows that the resiliency theory (Fergus & Zimmerman, 2005) and the BPS (Engel, 1977, 1980) framework are pragmatic to designing and organizing evaluation of physical trauma patients. Unfortunately, studies have not investigated the variables that impact follow-up attendance for physical trauma survivors. Therefore, comparing the results of this study to others is challenging.

According to resiliency theory (Fergus & Zimmerman, 2005), the risk factor (Fergus & Zimmerman, 2005) is the event that caused the physical trauma. This study demonstrated that modality of injury predicts patient attendance to outpatient follow-up appointments. Furthermore, patients whose injury was from a MVA/MCC were the patients most likely to attend a follow-up appointment, even after controlling for age and injury severity. Previous research conducted at the same Level I trauma center found that patients whose modality of injury included GSWs or MCCs were more likely to attend follow-up appointments than those who experienced MVAs, assaults, and falls (Fletcher et al., 2017). The notable difference in the study conducted by Fletcher and colleagues (2017) and this study was that they found patients

whose modality of injuries were GSWs were more likely to attend follow-up appointments, which the current study did not find. However, the results of patients who experienced MCCs were more likely to attend follow-up appointments were found in both studies. Interestingly, Fletcher and colleagues (2017) did not find that patients whose modality of injury was MVAs were also more likely to attend follow-up appointments, which was found in the current study. This may be due to current study's creation of a variable that combined MVAs and MCCs for analysis. While injury modalities have been studied previously with respect to different health outcomes such as physical functioning (e.g., Shields et al., 2015), injury severity (e.g., Norman et al., 2011; Ramchand et al., 2008), pain (e.g., Norman et al., 2011), depression (e.g., Gold et al., 2016), PTSD (e.g., Norman et al., 2011), and health related quality of life (e.g., Delahanty et al., 2013), aside from Fletcher and colleague's and this study, no research has been done using them to understand follow-up attendance rates post-discharge.

Another variable associated with the resiliency theory's risk factor (Fergus & Zimmerman, 2005) was the severity of patient injuries. Previous researchers (Ramchand, Marshall, Schell, & Jaycox, 2008) discovered that patients who were hospitalized longer displayed longer recovery times had worse physical functioning. However, this study, similar to the one completed by Fletcher and colleagues (2017), did not find injury severity scores to be statistically significant or associated with patient follow-up attendance. There is something different impacting follow-up attendance that is not showing up in longer hospital stays. However, there were drastic differences in the studies' patient populations. Within this study, the patients were primarily White who experienced a variety of modalities of injury. However, in Ramchand and colleagues' (2008) study, nearly all patients identified as White Hispanic males. Furthermore, all of the reported injuries resulted from community violence. While both

studies contribute to the trauma literature, comparing the results would be challenging and potentially misleading based on the differences in the sample populations.

There were two protective factors identified through this study which were both assets (Fergus & Zimmerman, 2005). The first factor was health and well-being. Evidence to support the importance of smoking and substance use for physical trauma patients' health outcomes is strong. Researchers found that patients who were younger were more likely to report smoking and alcohol use (Jørgensen & Kehlet, 2013). Patients who reported smoking were more likely to experience a hospital readmission than non-smokers 30 days post discharge from hip and knee reconstruction. Furthermore, previous researchers, Whiting and colleagues (2015) found that patients who reported tobacco use were significantly less likely to attend follow-up appointments. While smoking may not be intuitive as a predictor of recovery for physical trauma patients, it decreases bone mineral density, increases the risks of preoperative complications, nonunion and delay of union for fractures, and wound-healing complications (Lee, Patel, Biermann, & Dougherty, 2013). Substance use has also been associated with poor health outcomes for physical trauma patients. Patients who were in a MVA and had a substance use disorder had were more likely to have bone fractures and driving trauma (e.g., number of years with a revoked driver's license, number of MVA/MCCs, number of cars hit, number of cars repaired, and number killed; Reece, 2008). The evidence of patients who have a history of smoking and substance use disorders resulted in negative health outcomes, but there are other health outcomes that need to be recognized for patients.

This study utilized a more comprehensive health and well-being questionnaire (HWBQ; Mills, 2005). The measurements may have been different, but the results were similar. When testing a complex logistic regression model that controlled demographic variables (e.g., race,

health insurance types, injury severity, presence of ethanol alcohol or legal/illegal drugs, and distance from patients homes to the OTASCO), PTSD symptoms, and health and well-being; the higher the health and well-being scores patients reported the more likely they were to attend the outpatient follow-up appointment.

The second protective factor examined in this study was patient age. Within this study, patients who were younger were more likely to attend outpatient follow-up appointments, even after controlling for the modality of injury and Medicaid or Medicare health insurance type. This result was different from the one found by Fletcher et al. (2017), where there were no differences found related to patient demographic factors. However, it confirms other studies that demonstrated the importance of age regarding health outcomes for physical trauma patients. Shields and colleagues (2015) found that patients who were younger than 50 years old reported better physical functionality and less disability. Norman and colleagues (2011) found that patients who were younger reported lower depressive symptoms and more significant decreases in PTSD symptoms over time. Additionally, this study found that the modality of injury that physical trauma patients experienced was shown to be significant in predicting physical trauma patients' outpatient follow-up attendance. This demonstrates that younger patients and patients who were involved in MVA/MCCs have a better chance of attending follow-up appointments and may result in better recovery.

The last component of the resiliency theory's protective model is negative outcomes (Fergus & Zimmerman, 2005). While the current study's dependent variable was patient attendance with follow-up appointments there was one factor that significantly predicted patients missing OTASCO follow-up appointments, which was being self-pay/uninsured. When testing a complex logistic regression model that controlled demographic variables (e.g., race, health

insurance types, injury severity, presence of ethanol alcohol or legal/illegal drugs, and distance from patients homes to the OTASCO), and determined if PTSD symptoms, and health and well-being predicted follow-up attendance; patients who were self-pay/uninsured were less likely to attend the outpatient follow-up appointments than those with other types of health insurance types. Fletcher and colleagues (2017) found that insurance status was not associated with follow-up attendance at the same Level I trauma center within their study sample. However, this study's finding is consistent with previous researchers who also found patients who did not have insurance were less likely to attend follow-up appointments (Whiting et al., 2015). While missed follow-up appointments may be a short-term negative outcome, there may be long-term negative outcomes associated with missed appointments. Some of the long-term negative outcomes can include: medical complications (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016), missed injuries (Malhorta et al., 2009), and hospital readmissions (Malhorta et al., 2009). Patients without health insurance may experience numerous health disparities that impact their access to health care, financial burden, and resulting health outcomes after a physical trauma. Clearly this is an area deserving more investigation.

The same complex logistic regression model that controlled demographic variables (i.e., race, health insurance types, injury severity, presence of ethanol alcohol or legal/illegal drugs, and distance from patients homes to the OTASCO), and determined if PTSD symptoms, and health and well-being predicted follow-up attendance tested the psychological factor of PTSD. Interestingly, what was found was that when patients reported higher levels of PTSD symptoms they were more likely to attend the OTASCO follow-up appointment. Unfortunately, PTSD has not been studied to date in regards to follow-up attendance. However, Sripada and colleagues (2016) reported varying rates of treatment initiation for PTSD among Veterans Health

Administration's patients, based on individual (62%) or group treatment (38%) modalities. Unfortunately, it is unclear whether patients with more PTSD symptoms were more likely to initiate treatment across all presenting concerns, but it is clear that rates of PTSD treatment initiation (for both individual and group treatment) are lower than the follow-up appointment attendance of this study's sample. Another study found that higher severity of emotional distress was associated with patient's non-adherence to their first appointment for psychological therapy services (Di Bona, Saxon, Barkham, Dent-Brown, & Parry, 2014). Sripada and colleagues (2016) speculated that this phenomenon in both medical and mental health settings may be due to the behavioral avoidance and social isolation that patients with PTSD exhibit. However, given that our sample population displayed higher follow-up attendance, further research may be indicated.

Aside from follow-up attendance outcomes, researchers found several other factors related to PTSD. First, Researchers found patients who reported more severe PTSD symptoms were also more likely to have higher depressive symptom scores (Norman et al., 2011). Second, higher depressive symptoms were also found to be predictors of PTSD symptoms (Palyo et al., 2014). Third, patients who had a history of psychiatric histories were more likely to report higher disabilities of the arm, shoulder, or hand (Shields et al., 2015). Lastly, patients whose perception that their recovery time would be longer reported higher PTSD symptom scores (Ramchand et al., 2008). PTSD appears to play a major role in patient recovery processes and warrants continued investigation.

Unfortunately, unlike PTSD, there are not many studies that incorporate social support as a factor for physical trauma patients. Interestingly, the current study did not produce significant results from any of the variables related to the impact of social support on patients' outpatient

follow-up attendance. The variables included the patients' relationship status, the type of relationship the patient had to their identified primary support person, if the patient resided with the primary support person, patients' perception of social support, and if the patient-identified primary support person took the primary support person survey. However, one research team found the presence of family and friends in the Emergency Department after a MVA was negatively associated with anxiety and depression of survivors at two weeks post-discharge (Lubomirsky et al., 2014). More investigation into the family/support system's role and impact on trauma recovery is needed.

### **Limitations**

There were a number of limitations pertaining to this study. The sample was small and collected from one trauma center over a three week time period. This limitation does not significantly constrain the results or interpretation of the data; however, future research should attempt to gather a larger sample size and possibly from more than one trauma center. A second limitation is the recruitment methods used as they were based on a single researcher identifying, recruiting, enrolling, and surveying as many patients as possible. Inadvertently, some qualified participants may not have been admitted. Additionally, limitations of the trauma center and patient treatment schedule also may have led to some qualified patients not being admitted into the study (i.e., surgery schedule, other procedures, additional therapies, numerous patient visitors, patient sleeping schedules, administering of medications/baths/dressing changes, and discharge processes). A third limit of the study is the patient participation bias that may have occurred due to the willingness of some patients to participate while others declined.

While the hypotheses in this study were found to be non-significant, there may be additional factors that contributed to the outcomes. The follow-up rate within this sample

population was 76.0%. Other studies have reported rates of trauma patient follow-up attendance appointments as low as 31% (Stone, Marsh, Cucuzzo, Reddy, Teperman, & Kaban, 2014). This population studied may have higher than usual rates of patient follow-up attendance, but it is unclear what that factor might be causing the outcome difference.

Another limitation of this study may have been the specific outcome variable measured, follow-up appointments. The follow-up appointments of the physical trauma patients occurred one to two weeks post-discharge. While this area of research is important to understanding the physical trauma patients' treatment experience is only one possible variable impacted. Other variables may have provided a more comprehensive glimpse into their recovery outcomes. Additional outcome variables that warrant investigation include: (a) economic factors (e.g., cost of health care treatment), (b) lost wages, presenteeism, and absenteeism due to injury and recovery, (c) petitions for short-term and long-term disability benefits, (d) underemployment/unemployment, (e) patients' physical health factors (e.g., general physical functioning scales [SF-12, SF-36, and RAND-36] and specific physical functioning scales [DASH and SST]), and (f) caregivers' health factors.

### **Research Implications**

Results from this study illustrated the importance of researching biological and psychological health factors that impact patient follow-up attendance. Unfortunately, due to a limited sample size, this study was not able to fully investigate the social factors and their impact. Future researchers should continue to social health as a determinant of better recovery and treatment responses. Continuing to further investigate patients' comprehensive biopsychosocial health, may assist in identifying the aspects of resiliency theory (e.g., risk factors, protective factors, and negative health outcomes), critical to addressing patient needs and

reducing unnecessary costs and ineffective treatments. Additionally, future studies may consider exploring various data collection times (e.g., initial hospital admission, three months, six months, 12 months, and 24 months post-discharge) to better understand the protective factors and negative outcomes of both short- and long-term health factors on physical trauma patient recovery.

### **Clinical Implications**

This study revealed that patient health and well-being factors are clearly related to their outpatient follow-up attendance. Results from this study illustrated the importance of evidence-based screening tools to assess for patients' health and well-being. This finding is re-affirming that trauma centers are conducting mandated alcohol screenings for physical trauma patients. It is clear from this study that biological, as well as health and well-being factors, influence patient follow-up attendance. If trauma centers have professionals on staff who could conduct screening and brief behavioral health interventions, it would help to decrease the potential negative outcomes (e.g., missed outpatient appointments) that accompany patients evidencing psychosocial issues.

### **Policy Implications**

The mandated protocol for alcohol enacted in 2006 has led to screening, brief intervention, referral, and treatment opportunities for physical trauma patients (ACS Committee on Trauma, 2006). However, no other mental health illness to date has the same mandated screening policy despite evidence of concern with the physical trauma population (e.g., PTSD, depression, health and well-being, etc.). Within this study, patients who reported more PTSD symptoms were significantly more likely to attend their outpatient follow-up appointments, even after controlling for the presence of alcohol or legal/illegal drugs in the patient system upon

admission. This result indicates the need for trauma centers to consider the impact of screening and treating a broader range of mental health conditions outside of substance use disorders. A solution that trauma centers should consider is implementing integrated behavioral healthcare for additional screening, brief intervention, and referral to treatment (SBIRT; Office of National Drug Control Policy, 2012) services similar to the alcohol and drug screening protocol. This will help in providing trauma patients with long-term success by addressing behavioral health needs that may lead to missed follow-up appointments or future traumas.

### **Summary**

This study was the first of its kind to determine which health and well-being factors of physical trauma patients' predict outpatient follow-up attendance. We found that there are a number of demographic and BPS factors that impact physical trauma patients' follow-up attendance, which can further be identified as risk factors, protective factors, and negative outcomes. The implications for this study are relevant to researchers, clinicians (medical and behavioral health providers), and administrators who are working to change policies at trauma centers to improve patient health outcomes and reduce excessive healthcare expense. It is time for researchers, clinicians (medical and behavioral health), and administrators to align, using their unique skills and knowledge to provide better services for patients and their families, as well as to create a more financially efficient trauma care system.

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Table 1

*Participant Self-Report Demographic Information*

| <i>Participant Information</i>                         | <i>N</i> | <i>Frequency (%)</i> |
|--|----------|----------------------|
| <b>Gender</b>  |          |                      |
| Male   | 57       | 54.3%                |
| Female   | 48       | 45.7%                |
| <b>Race</b>  |          |                      |
| White  | 83       | 79.1%                |
| Non-White  | 19       | 19.0%                |
| Multiracial  | 3        | 2.9%                 |
| <b>Age</b>   |          |                      |
| Young Adult (19-24)                                    | 11       | 10.5%                |
| Adult (25-44)  | 41       | 39.0%                |
| Middle Age (45-64)                                     | 30       | 28.6%                |
| Advanced Age (65+)                                     | 22       | 21.0%                |
| <b>Education Level</b>                                 |          |                      |
| Less than high school                                  | 20       | 19.0%                |
| High school or GED                                     | 37       | 35.2%                |
| Some college, no degree                                | 24       | 22.9%                |
| Associate degree                                       | 11       | 10.5%                |
| Bachelor's degree and above                            | 13       | 12.4%                |
| <b>Employment</b>                                      |          |                      |
| Working (paid or self-employed)                        | 45       | 42.9%                |
| Not working (temporarily laid-off or looking for work) | 25       | 23.8%                |
| Not working (retired)                                  | 22       | 21.0%                |
| Not working (disabled, student, other)                 | 23       | 21.9%                |
| <b>Relationship Status</b>                             |          |                      |
| Single   | 47       | 44.8%                |
| Married  | 22       | 21.0%                |
| Widowed  | 10       | 9.5%                 |
| Divorced   | 20       | 19.0%                |
| Separated  | 6        | 5.7%                 |
| <b>Household Income</b>                                |          |                      |
| <\$10,000  | 13       | 12.4%                |
| \$10,000-\$19,999                                      | 30       | 28.6%                |
| \$20,000-\$29,999                                      | 13       | 12.4%                |

|  |    |       |
|--|----|-------|
| \$30,000-\$39,999                      | 9  | 8.6%  |
| \$40,000-\$49,999                      | 10 | 9.5%  |
| \$50,000-\$59,999                      | 4  | 3.8%  |
| \$60,000-\$69,999                      | 4  | 3.8%  |
| \$70,000-\$79,999                      | 5  | 4.8%  |
| \$90,000-\$99,999                      | 3  | 2.9%  |
| \$100,000-\$149,999                    | 2  | 1.9%  |
| \$150,000+                             | 8  | 7.6%  |
| <hr/>                                  |    |       |
| Relationship to Primary Support Person |    |       |
| Partner                                | 39 | 37.1% |
| Parent                                 | 15 | 14.3% |
| Child/Grandchild                       | 17 | 16.2% |
| Sibling                                | 7  | 6.7%  |
| Friend                                 | 10 | 9.5%  |
| Other                                  | 5  | 4.8%  |
| N/A (self)                             | 7  | 6.7%  |
| <hr/>                                  |    |       |
| Reside with primary support person     |    |       |
| Yes                                    | 62 | 59.0% |
| No                                     | 39 | 37.1% |
| <hr/>                                  |    |       |
| Distance from home to OTASCO           |    |       |
| <10 miles                              | 29 | 27.6% |
| 10-20.99 miles                         | 25 | 23.8% |
| 21-40.99 miles                         | 14 | 13.3% |
| 41-60.99 miles                         | 16 | 15.2% |
| 61+ miles                              | 17 | 16.2% |
| <hr/>                                  |    |       |

Table 2

*Participant EHR-obtained Demographic Information*

| <i>Participant Information</i>   | <i>N</i> | <i>Frequency (%)</i> |
|--|----------|----------------------|
| <i>Modality of injury</i>  |          |                      |
| MVA/MCC (vehicle)  | 42       | 40.0%                |
| MVA/MCC (pedestrian)   | 7        | 6.7%                 |
| Gunshot wound/stab   | 7        | 6.7%                 |
| Assault  | 6        | 5.7%                 |
| Fall   | 33       | 31.4%                |
| Other  | 10       | 9.5%                 |
| <i>Injury severity score</i>   |          |                      |
| Minor (1-9)  | 66       | 62.9%                |
| Moderate (10-15)   | 22       | 21.0%                |
| Moderate/severe (16-24)  | 9        | 8.6%                 |
| Severe (25+)   | 2        | 1.9%                 |
| <i>Presence of Ethanol (ETOH; alcohol)</i>                                 |          |                      |
| Yes  | 18       | 17.1%                |
| No   | 87       | 85.9%                |
| <i>Presence of legal/illegal substances</i>                                |          |                      |
| Benzodiazepine   | 2        | 1.9%                 |
| THC/marijuana  | 5        | 4.8%                 |
| Amphetamines   | 1        | 1.0%                 |
| Cocaine  | 3        | 2.9%                 |
| Opiates  | 4        | 3.8%                 |
| <i>Number of substances present (ETOH and/or legal/illegal substances)</i> |          |                      |
| 0  | 84       | 77.1%                |
| 1  | 19       | 18.1%                |
| 2  | 1        | 1.0%                 |
| 3  | 4        | 3.8%                 |
| <i>Type of Health Insurance</i>  |          |                      |
| Medicaid   | 36       | 34.3%                |
| Medicare   | 22       | 21.0%                |
| Medicaid and Medicare  | 2        | 1.9%                 |
| Private  | 38       | 36.2%                |
| Self-Pay/uninsured   | 4        | 3.8%                 |
| Other Government   | 4        | 3.8%                 |
| Workman's compensation   | 2        | 1.9%                 |
| Other (i.e., charity)  | 4        | 3.8%                 |

Table 3

*Correlation Table of Variables in the Hypotheses*

| Variables              | 1     | 2      | 3      | 4      | 5 |
|------------------------|-------|--------|--------|--------|---|
| 1. Injury Severity     |       |        |        |        |   |
| 2. Depressive Symptoms | .27** |        |        |        |   |
| 3. Anxiety Symptoms    | .25*  | .75**  |        |        |   |
| 4. PTSD Symptoms       | .18   | .63**  | .63**  |        |   |
| 5. Social Support      | .02   | -.31** | -.27** | -.27** |   |

Note. PTSD = posttraumatic stress disorder.

\* $p \leq .05$ ; \*\* $p \leq .01$ ; \*\*\* $p \leq .001$ .

Table 4

*Binary Logistic Regression on Studies' Independent Variables*

| Injury Severity Score | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|-----------------------|----------|-------------|-----------|--------------|----------------|
|                       | .05*     | 0.04        | 1.05      | [0.96, 1.14] | .29            |
| Constant              | .78      | 0.41        | 2.18      |              | .06            |
| <i>X</i> <sup>2</sup> |          | 1.31        |           |              |                |
| <i>df</i>             |          | 1           |           |              |                |
| Depressive Symptoms   | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|                       | .04*     | 0.05        | 1.04      | [0.95, 1.14] | .39            |
| Constant              | .99      | 0.34        | 1.04      |              | .00            |
| <i>X</i> <sup>2</sup> |          | 0.78        |           |              |                |
| <i>df</i>             |          | 1           |           |              |                |
| Anxiety Symptoms      | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|                       | .05*     | 0.05        | 1.05      | [0.97, 1.15] | .25            |
| Constant              | .96      | 0.31        | 2.60      |              | .00            |
| <i>X</i> <sup>2</sup> |          | 1.45        |           |              |                |
| <i>df</i>             |          | 1           |           |              |                |
| PTSD Symptoms         | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|                       | .23      | 0.16        | 1.26      | [0.92, 1.73] | .15            |
| Constant              | .91      | 0.30        | 2.49      |              | .00            |
| <i>X</i> <sup>2</sup> |          | 2.33        |           |              |                |
| <i>df</i>             |          | 1           |           |              |                |
| Social Support        | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|                       | .01**    | 0.01        | 1.01      | [0.99, 1.04] | .30            |
| Constant              | .19      | 1.01        | 1.21      |              | .85            |
| <i>X</i> <sup>2</sup> |          | 1.04        |           |              |                |
| <i>df</i>             |          | 1           |           |              |                |

Note. *N* = 105; PTSD = posttraumatic stress disorder

\**p* ≤ .05; \*\**p* ≤ .01; \*\*\**p* ≤ .001.

Table 5

*Correlation Table of Exploratory Variables*

| Variables       | 1      | 2      | 3      | 4     | 5    | 6    | 7   | 8 |
|-----------------|--------|--------|--------|-------|------|------|-----|---|
| 1. GAD-7        |        |        |        |       |      |      |     |   |
| 2. PHQ-8        | .75**  |        |        |       |      |      |     |   |
| 3. PC-PTSD-5    | .63**  | .63**  |        |       |      |      |     |   |
| 4. MOS-SSS      | -.27** | -.31** | -.27** |       |      |      |     |   |
| 5. HWBQ         | -.50** | -.55** | -.44** | .29** |      |      |     |   |
| 6. ISS          | .25*   | .27**  | .18    | .02   | -.16 |      |     |   |
| 7. Age          | -.17   | .04    | -.32** | .06   | .00  | -.08 |     |   |
| 8. Distance HtC | .11    | .15    | .09    | .02   | -.09 | .12  | .08 |   |

Note. GAD-7 = Generalized Anxiety Disorder; PHQ-8 = Patient Health Questionnaire; PTSD = posttraumatic stress disorder; MOS-SSS = Medical Outcome Study – Social Support Survey; HWBQ = Health and Well-Being Questionnaire; ISS = Injury Severity Score; HtC = Home to Clinic

\* $p \leq .05$ ; \*\* $p \leq .01$ ; \*\*\* $p \leq .001$ .

Table 6

*Binary Logistic Regression on Exploratory Analysis (Age)*

| Age                     | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI        | <i>p-value</i> |
|-------------------------|----------|-------------|-----------|---------------|----------------|
|                         | -.02     | 0.01        | 0.98      | [0.96, 1.00]  | .05*           |
| Constant                | 2.36     | 0.65        | 10.61     |               | 0              |
| <i>X</i> <sup>2</sup>   |          | 4.10        |           |               |                |
| <i>df</i>               |          | 1           |           |               |                |
| Age & Control Variables | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI        | <i>p-value</i> |
| Controlled Variables    |          |             |           |               |                |
| MOI - MVA/MCC           | 1.42     | 0.62        | 4.14      | [1.24, 13.85] | .021*          |
| MOI - Violence/Other    | .98      | 0.77        | 2.67      | [0.59, 12.12] | .20            |
| Medicaid/Medicare       | -.46     | 0.47        | 0.63      | [0.25, 1.59]  | .33            |
| Age                     | -0.01    | 0.02        | 0.99      | [0.97, 1.02]  | .27            |
| Constant                | 1.08     | 0.98        | 2.94      |               | .27            |
| <i>X</i> <sup>2</sup>   |          | 11.40       |           |               | .02            |
| <i>df</i>               |          | 4           |           |               |                |

Note. *N* = 105; MCC = motor cycle crash; MOI = modality of injury; MVA = motor vehicle accident.

\**p* ≤ .05; \*\**p* ≤ .01; \*\*\**p* ≤ .001.

Table 7

*Binary Logistic Regression on Exploratory Analysis (Modality of Injury)*

| Modality of Injury    | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI        | <i>p-value</i> |
|-----------------------|----------|-------------|-----------|---------------|----------------|
| MVA/MCC               | 1.66     | 0.56        | 5.28      | [1.76, 15.84] | .003**         |
| Violence/Other        | 1.25     | 0.65        | 3.50      | [0.97, 12.59] | .055           |
| Constant              | .31      | 0.35        | 1.36      |               | .39            |
| <i>X</i> <sup>2</sup> |          | 10.21       |           |               | .01**          |
| <i>df</i>             |          | 2           |           |               |                |
| Controlled Variables  |          |             |           |               |                |
| Age                   | -.01**   | .01         | 0.99      | [0.96, 1.02]  | .46            |
| ISS                   | .03      | .05         | 1.03      | [0.94, 1.13]  | .49            |
| Modality of Injury    |          |             |           |               |                |
| MVA/MCC               | 1.38     | 0.61        | 3.99      | [1.21, 13.12] | .02*           |
| Violence/Other        | .72      | 0.79        | 2.05      | [0.44, 9.57]  | .36            |
| Constant              | .72      | 1.021       | 2.06      |               | .48            |
| <i>X</i> <sup>2</sup> |          | 10.324      |           |               | .04*           |
| <i>df</i>             |          | 4           |           |               |                |

Note. *N* = 105; ISS = injury severity score; MCC = motor cycle crash; MOI = modality of injury; MVA = motor vehicle accident.

\**p* ≤ .05; \*\**p* ≤ .01; \*\*\**p* ≤ .001.

Table 8

*Binary Logistic Regression on Exploratory Analysis (Multiple Independent Variables)*

| Variable                     | <i>B</i> | <i>SE B</i> | <i>OR</i> | 95% CI       | <i>p-value</i> |
|------------------------------|----------|-------------|-----------|--------------|----------------|
| Race, non-white              | -.74     | .70         | 0.48      | [0.12, 1.89] | .29            |
| H.I. Medicaid/Medicare       | -1.06    | 1.06        | 0.35      | [0.04, 2.75] | .32            |
| H.I. Private                 | -.51     | 1.13        | 0.60      | [0.07, 5.50] | .65            |
| H.I. self-pay/uninsured      | -4.16    | 1.94        | 0.02      | [0.00, 0.70] | .03*           |
| Substance Use                | .36      | 0.46        | 1.44      | [0.62, 3.34] | .40            |
| Distance from Home to Clinic | .00      | 0.01        | 1.00      | [0.98, 1.03] | .85            |
| ISS                          | .10      | 0.06        | 1.10      | [0.11, 1.10] | .12            |
| PC-PTSD-5                    | .43      | 0.21        | 1.54      | [1.02, 2.33] | .04*           |
| HWBQ                         | .37      | 0.16        | 1.44      | [1.06, 1.96] | .02*           |
| Constant                     | -2.41    | 1.90        | 0.09      |              | 0.21           |
| $X^2$                        |          | 16.82       |           |              |                |
| <i>df</i>                    |          | 9           |           |              |                |

Note.  $N = 105$ ; H.I. = health insurance; HWBQ = health and well-being questionnaire; ISS = injury severity score; PC-PTSD-5 = primary care posttraumatic stress disorder.

\* $p \leq .05$ ; \*\* $p \leq .01$ ; \*\*\* $p \leq .001$ .

## CHAPTER 5: MENTAL HEALTH SCREENING POLICY BRIEF

National attention is growing on the role mental health and substance use disorders play in people experiencing physical traumas (Sareen et al., 2013). Not only is there a growing body of evidence in this area, but researchers are finding that 25% of patients with level I physical traumas are re-hospitalized for an unrelated physical trauma within the past five years (McCoy, Como, Greene, Laskey, & Claridge, 2013). While it is unclear what percentage of patients with repeat unrelated traumas had mental health or substance use conditions, there is sufficient evidence to support the need for mandatory mental health screening and intervention policies. This policy brief presents the research to substantiate the need. It will highlight the impact of physical trauma survivors' mental health on their recovery, trauma center mental health screening prevalence rates, and the financial burden on physical trauma patients. Recommendations are made for policies that will aid trauma centers in better identifying undiagnosed, un/undertreated, or undetected mental health conditions.

### **Impact of Mental Health on Recovery**

Among the physical injuries that patients experience post-trauma, there is adequate evidence to demonstrate the impact of mental health concerns on their recovery process. Depression may not be a mental health condition that is immediately thought of when assessing and treating physical trauma survivors. However, depression has been found to impact patients' recovery outcomes (Braden et al., 2009; Davis, Lin, Liu, & Sites, 2017; Gold et al., 2016; Hser et al., 2017; Resnick et al., 2008). Many physical trauma patients will go on to experience Posttraumatic Stress Disorder (PTSD) post-injury. Researchers have found that PTSD impacts both physical and mental aspects of recovery (Norman et al., 2011; Ramchand, Marshall, Schell, & Jaycox, 2008). Physical trauma patients may also experience PTSD and depression (Norman

et al., 2011; Palyo, Clapp, Beck, Grant, & Marques, 2008), as well as, substance use (Fabbri et al., 2005; Reece, 2008; Vingilis & Wilk, 2008) during their recovery.

## **Depression**

Trauma patients with depression have been found to struggle with treatment adherence, readmissions, and pain (Braden et al., 2009; Gold et al., 2016; Resnick, et al., 2008). According to Irish and colleagues (2011), 12.35% of physical trauma patients received a diagnosis of major depressive disorder at six weeks and 12.24% at 12 months post-injury (Irish et al., 2011).

Researchers found that in a sample of older women with musculoskeletal injuries, those who reported higher depressive symptoms had lower coping scores and attended fewer exercise groups, as compared to those with lower depressive symptoms (Resnick et al., 2008). They also found those with depressive symptoms reported a lack of coping skills. Those experiencing depression were also 21 to 24% more likely to be readmitted to the hospital within 90 days post-surgery compared to those without depression (Gold et al., 2016). Unfortunately, patients who struggle with depressive symptoms may also experience additional challenges with pain.

Patients experiencing comorbid diagnoses of chronic pain and depression displayed higher average daily doses and days supplied of opiate prescriptions as compared to patients without depression (Braden et al., 2009). Researchers found a positive relationship between opiate use and mental stress (Davis et al., 2017), and a negative relationship between mental stress and pain management (Hser et al., 2017). Sadly, patients who utilized opiate treatment were at an increased risk for depression (Norman et al., 2011), and had more missed outpatient appointments, a long-term rehabilitation process (Resnick et al., 2008), and more hospitalizations (Gold et al., 2016). While depression is a concern among physical trauma survivors, a more common mental health condition that they may experience is PTSD.

## **Posttraumatic Stress Disorder**

Researchers found that physical aspects (i.e., physical functioning and age) and mental aspects (i.e., perceptions of injuries and recovery) impact the development of PTSD symptoms among physical trauma patients. In fact, patients who perceived their injuries as being more severe or requiring a longer recovery displayed more PTSD symptoms (Ramchand et al., 2008). Interestingly, patients who reported less progress with their physical functioning at their three month follow-up appointment reported more PTSD symptoms at their 12-month follow-up (Ramchand et al., 2008). Additionally, patients who were younger reported greater decreases in their PTSD symptoms at a seven month follow-up visit as compared to older patients (Norman et al., 2011); unfortunately, the reasons why are unclear. However, it was found that patients who reported higher levels of PTSD symptoms, were also more likely to attend follow-up appointments when controlling for race, type of health insurance, the presence of any alcohol or legal/illegal substances in patients upon admission, the severity of patient injuries, and the distance from the patient's home to the outpatient clinic (Author, 2018). While PTSD may present challenges to patients in their rehabilitation process, when it is combined with a co-morbid depression, the struggle to meet their treatment goals becomes even harder.

## **Depression and Posttraumatic Stress Disorder**

There are only two known studies that examined depression and PTSD among physical trauma survivors (Norman et al., 2011). Norman and colleagues (2011) found patients who were using prescription opiates at four and eight months post-injury reported higher PTSD and depressive symptoms. Furthermore, they reported higher PTSD symptoms and a PTSD diagnosis were positively correlated with higher depressive symptoms at one month post injury. Palyo and colleagues (2008) also found patients who experienced more depressive symptoms

post injury reported a group of PTSD symptoms (i.e., numbing cluster). While experiencing depression and PTSD, some patients resort to using and abusing substances (Wasan et al., 2015).

### **Substance Use**

Substance use has been associated with poor health outcomes and re-occurring accidents for physical trauma patients. Reece (2008) found patients who were in a motor vehicle accident (MVA) and had a substance use disorder were more likely to have bone fractures and driving-related trauma (i.e., number of years with a revoked driver's license, number of MVA/MCCs, number of cars hit, number of cars repaired, and number killed). After adjusting results to reflect U.S. standards of blood alcohol concentrations (80 mg/dL), the blood alcohol concentration (BAC) was the highest risk factor for crash recidivism, which was present in approximately 75% of the re-occurring MVAs studied (Fabbri et al., 2005). Similarly, Vingilis and Wilk (2008) found that the most significant risk factor for younger patients (12-29 years of age) who experienced MVA injuries was binge drinking. Furthermore, the most significant risk factor in middle-aged patients' (30-59 years of age) for MVA injuries was medication use (e.g., pain relievers, tranquilizers, antidepressants, codeine, opioids, and sleeping pills). Research is clear that mental health conditions play a role in the cause, result, and recovery of physical trauma patients. However, the financial burden patients and families experience as a result is even more alarming.

### **Financial Burden**

Trauma centers are designed to provide extensive treatment to severely injured patients (American Trauma Society, 2015). The wide range of resources and treatment expertise to return severely injured patients to their best health can result in high costs. The average cost of treatment during hospitalization is \$17,618 (Hemmila et al., 2008) and the average annual health

care cost, during the first year post-injury, is \$17,040 (Staudenmayer et al., 2016). These costs are estimated though on patients without additional complications or readmissions.

Patients experiencing missed diagnoses or complications add to the already high health care costs physical trauma patients accrue. In a study done by Malhorta and colleagues (2009) with 692 survivors of physical traumas, the rate of medical complications post-discharge was 17%. Researchers studied the financial burden associated with a variety of complications of physical trauma patients and found that patients who experienced major complications during an initial hospitalization spent \$71,658 on average (Hemmila et al., 2008). These costs only continue to mount if patients are readmitted for the same or another physical injury.

The rates of readmission varied depending upon the timeframe studied. Researchers who studied patients 30 days post-discharge found 2.3% to 7.6% were readmitted for additional care (Malhorta et al., 2009; Morris et al., 2011; Olufajo et al., 2016). However, another research team studied the time period of initial discharge to 12 months post discharge and found that rate increased to 38% (Staudenmayer et al., 2016). The same research team found that the average cost of readmission was \$49,501 (Staudenmayer et al., 2016). It is clear that the nature of traumatic events are costly for any physical trauma and how patients manage those expenses depend greatly on their financial resources and insurance.

Patients who are uninsured or receiving government insurance have been identified by researchers as being at risk for repeat traumatic injuries. McCoy and colleagues (2013) found that being uninsured was a significant predictor among patients experiencing hospital treatment for multiple unrelated traumas within a five year period. Researchers have also demonstrated the importance of the type of insurance on outpatient follow-up attendance. Patients who were uninsured or had public insurance were more likely to miss follow-up appointments as compared

to patients with private insurance (Hansen, Shaheen, & Crandall, 2014; Whiting et al., 2015). While it is important for any patient to attend follow-up appointments, researchers found orthopedic patients' needs are greater due to their injury type and need for surgeries (Schmidt et al., 2010). An additional research team found that patients who were uninsured attended less follow up visits and this was controlling for patient race, type of insurance, distance from home to clinic, the presence of alcohol or legal/illegal substance present in the patient upon admission, and the injury severity (Author, 2018). The type of health insurance or lack of health insurance that physical trauma patients have clearly impacts the additional financial burden of patients who may have additional barriers, screening for mental health conditions may help to connect patients with treatment that may help to remove one barrier. Therefore, it is important to examine how widely mental health screening protocols are implemented in outpatient and inpatient trauma centers.

### **Current Mental Health and Substance Use Screening in Trauma Centers**

Trauma Centers in the United States reported varied prevalence rates of screening for mental health and substance use conditions (Love & Zatzick, 2014). While there is evidence that supports the negative consequences associated with mental health conditions, unfortunately, there are varying amounts of support for mental health screening in trauma centers. Furthermore, the motivating factors associated with trauma centers' screening protocols for mental health or substance use conditions are different.

### **Mental Health**

Trauma centers are not implementing mental health screening protocols routinely. Depression screenings are reported to occur in only 23% of trauma centers (Love & Zatzick, 2014). This percentage is alarmingly low considering the prevalence of depression is 12.35% at

six weeks and 12.24% at six months post motor vehicle accident (Irish et al., 2011). While the number of trauma centers screening for depression may be concerning, even fewer (7%) are screening for PTSD (Love & Zatzick, 2014). Researchers found 18-24% of physical trauma patients experience PTSD symptoms at six months post-injury and 2-36% at 12-months post-injury (O'Donnell, Creamer, Bryandt, Schnyder, & Shaley, 2003; Steel, Dunlavy, Stillman, & Pape, 2011). However, while the implementation of mental health screening protocols is generally low across trauma centers, the prevalence of substance use screenings is extremely high.

### **Substance Use**

While the rates of alcohol related injuries have increased (Mullins, Mazer-Amirshahi, & Pines, 2017), so has the rates of screening in trauma centers. In 1987, Soderstrom and Cowley conducted a study of trauma centers and found that 55.2% of trauma centers were obtaining the blood alcohol content (BAC) of trauma patients. In 1994, 63.7% of Level I and II trauma centers were regularly taking BACs of physical trauma patients (Soderstrom, Dailey, & Kerns, 1994). However, despite these measures, it appeared that the alcohol related injuries continued to rise. In response, the American College of Surgeons (ACS; which is the accrediting body for trauma centers) created a mandate for trauma centers to engage in screening, brief intervention, referral, to treatment (SBIRT; Office of National Drug Control Policy, 2012) to screen and treat any Level I trauma center patients who tested positive for alcohol upon admission (American College of Surgeons Committee on Trauma, 2006). While this mandate only applied to Level I trauma centers, Love and Zatzick (2014) found that 90% of both Level I and Level II trauma centers reported screening for alcohol and 80% reported screening for alcohol and drug problems. The

success of this mandate has prompted questioning about expanding screening protocols to include other mental health issues.

### **Importance of a PTSD/MH screening protocol**

The available literature points to the need for a mandate mental health screening and treatment protocol similar to the SBIRT (Office of National Drug Control Policy, 2012) protocol mandated by the ACS Committee on Trauma for alcohol and other substances. If physical trauma patients' mental health conditions are identified with screening tools and patients are provided with brief interventions and referrals for mental health care, this may reduce the risk of subsequent physical traumas from occurring (Sareen et al., 2013). While it is clear that trauma centers are not utilizing mental health screening tools consistently with patients (Love & Zatzick, 2014), there is evidence, however limited, to suggest the impact of patient reported mental health symptoms on outpatient follow-up attendance (Author, 2018; Resnick et al., 2008).

### **Benefits**

This policy brief has identified three specific benefits that an inpatient and outpatient mental health screening protocol can potentially offer for trauma patients. These benefits align well with targeted areas for improving quality health care proposed in triple aim (Berwick, Nolan, & Whittington, 2008). The Institute for Healthcare Improvement (IHI) developed the triple aim framework as a way to describe an approach to optimize health system performance. It was the IHI's intention to simultaneously pursue three dimensions: (a) improving the individual experience of care, (b) improving the health of populations, and (c) reducing the per capita costs of care for populations. These dimensions are reflected in the benefits proposed below.

**Improve individual experience of care.** Researchers support that physical trauma patients are at risk for developing mental health symptoms and diagnoses (Irish et al., 2011; O'Donnell et al., 2003; Palyo et al., 2008; Norman et al., 2011; Ramchand et al., 2008; Steel et al., 2011). Physical and/or psychological traumas patients experienced prior to the current one may have compounding effects. Unfortunately, mental health conditions of patients may not have been addressed during previous admissions, based on the limited number of trauma centers conducting PTSD and depression screenings (Love & Zatzick, 2014). However, patients and their family members could have an opportunity to receive additional services, if their mental health is addressed in conjunction with their physical health within tertiary care settings.

**Improving the population health outcomes.** Trauma centers have piloted various prevention efforts for the detection of co-morbidities among trauma patients. For example, there are fall prevention programs to assist with elderly patients (Thobaben, 2009). Additionally, there have been different campaigns to reduce the number of MVAs due to texting and driving (Cismaru & Nimegeers, 2017). Furthermore, the ACS previously implemented the mandate to screen for alcohol in Level I trauma centers (ACS Committee on Trauma, 2006) in response to rising concerns from alcohol related injuries. These are admirable efforts, which help to improve population health and help to reduce the risk of traumas. Unfortunately, trauma centers appear to be neglecting the mounting evidence that demonstrates the connection between mental health and the occurrence of traumatic events (McCoy et al., 2013; Vingilis & Wilk, 2008), missed follow-up appointments (Author, 2018; Resnick et al., 2008), readmissions (Gold et al., 2016), and re-occurrence of injuries (Fabbri et al., 2015; Reece, 2008). The indication that trauma centers are invested in prevention efforts to improve population health is strong (ACS Committee on Trauma, 2006; Cismaru & Nimegeers, 2017; Thobaben, 2009). Therefore, the

lack of attention to mental health within trauma centers is baffling. However, this policy brief aims to bring forth this important issue.

**Reducing the rising costs of care.** The potential to reduce healthcare costs for patients is another benefit of a mental health screening protocol. The impact could be substantial, considering patients who are self-pay/uninsured are less likely to attend follow-up appointments (Author, 2018; Hansen et al., 2014; Whiting et al., 2015), which may increase their risk of complications or hospital re-admissions (McCoy et al., 2013). Furthermore, the financial burden associated with physical trauma treatment ranges from \$17,040 to \$71,658 per patient annually (Hemmila et al., 2008; Staudenmayer et al., 2016). These costs would be difficult to manage if you were a self-pay patient without health insurance and limited financial reserves. This does not account for the potential 25% of physical trauma patients who will go on to experience an unrelated physical trauma admission either during the previous or following five years (McCoy et al., 2013). With any proposed change there are benefits and challenges, which may be the reason that the problem has not been addressed.

### **Challenges**

There are three noticeable challenges to implementing a mental health screening protocol within trauma centers or outpatient clinics. The first challenge is the difficulty for healthcare delivery systems to buy-into mental health treatment due to the entrenched stigma associated with mental healthcare. The second challenge is the necessary increases in mental health professional staff and additional cost associated with an additional health care delivery service within the system. A third challenge reflects operational difficulties, such as modifications to the clinic's electronic health record (EHR) or work flow systems.

**Stigma associated with mental health access and treatment.** Unfortunately, mental health care has not been historically valued in the United States. In 2008, Congress passed the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equality Act, which guaranteed mental health and substance use treatment coverage from employers (Newkirk II, 2017). The Affordable Care Act extended this mental health parity to Medicaid and Medicare managed care plans (Newkirk II, 2017). However, in 2017, Republicans attempted to reverse the established mental health parity in the proposed American Health Care Act (Newkirk II, 2017). It has taken decades to recognize the importance of mental health and substance use treatment and to provide access and coverage for citizens in the United States. Furthermore, it is obvious that this is not a value that all stakeholders view as important to healthcare. Therefore, it is difficult to bridge the gap between physical and mental health to form a more unified definition of health with this stigma in place. The value placed on mental health is not the only challenge. With the challenge regarding stigma that surround mental health and substance use it is at times difficult to justify the need for additional staff (including the financial sustainability of said staff) to support the services.

**Staffing.** While SBIRT (Office of National Drug Control Policy, 2012) has a pre-screening process, which first identifies patients from a positive urinalysis to provide evidence of alcohol in the patients' body, a mental health screening protocol would need to screen each patient in person. Even if some patients did not experience a psychologically traumatic injury, previous research has demonstrated the possibility of patients who have a history of prior mental health, substance use disorders, or physical trauma may experience further physical traumas in the future (McCoy et al., 2013; Sareen et al., 2013). To meet the rise in patient screenings, healthcare delivery systems would need to hire additional mental health professionals.

There are four pieces of information recommended to help determine how many mental health professionals should be hired to implement a mental health screening protocol. First, trauma centers need to run a health insurance payor' report on their patient panel. This report will help to inform the type of mental health professionals needed who can be reimbursed for services rendered (i.e., mental health screening, brief intervention, and referral to treatment). However, employers need to be careful to screen out mental health professionals who do not have experience working on interdisciplinary trauma treatment teams or who have experience in an integrated behavioral health care context.

Second, a needs assessment should be done to calculate the number of positive mental health screenings across a fixed period of time (e.g., 1-3 months) to help determine the number of behavioral health providers the trauma center needs to provide ethical care. Researchers have found that approximately 25% of patients in a Level I trauma center reported a positive screen on a PTSD screening tool and 46.7% of patients reported a positive screening on a depressive symptom screening tool (Author, 2018). While this statistic is helpful in estimating the number of positive mental health screenings for patients during their admission to Level I trauma centers; the size of trauma centers vary nationally. Trauma centers range in size with 20.91% of trauma centers having 200 or less beds, 38.74% having 201 to 400 beds, 22.92% having 401 to 600 beds, and 17.43% of centers having 600 or more beds (ACS, 2015).

Third, an estimation of the time required to conduct brief interventions, and referral to treatment for all positive mental health screenings of patients is needed. It has been reported that brief interventions can be successfully accomplished in 15 to 20 minutes (Giorlando & Schilling, 1997). Therefore, it is important to understand an approximate number of patients who will screen positively on the mental health assessments. Program administrators will want to

calculate the average of amount of time it takes for mental health professionals to provide brief intervention and referral to treatment services. Cowell, Dowd, Mills, Hinde, and Gray (2017) conducted a study that looked at details of the SBIRT process across sites that included inpatient, outpatient, and emergency departments/trauma centers. The average length of screening lasted 3.9 to 13.8 minutes, brief interventions took 12.2 to 21.6 minutes, and referral to treatment took 4.5 to 27.3 minutes to complete. After these calculations are completed it will provide a better idea of how many mental health professionals are needed to sustain the proposed screening service in trauma centers.

Fourth, determining the economic impact of hiring additional mental health professionals to treat patients who screen positively is an important step. Based on the information gathered from the health insurance payor's report, it will help to inform the trauma center what payors will and will not pay for and specific mental health professionals who qualify for reimbursement. Completing mental health screening tools for patients and providing brief interventions are billable services. However, the billable services of each mental health professional may not be substantial enough to cover their salary and benefits within a tertiary care setting (Cowell et al., 2017). What is known is that trauma centers that utilized SBIRT (Office of National Drug Control Policy, 2012) were able to bill for the protocol and justified the positions needed (Cowell et al., 2017). Evidence for trauma centers' willingness to integrate a mental health screening protocol may be found with the implementation of mandated substance use screenings. As a result of the 2006 mandate by the American College of Surgeons Committee on Trauma (2006), Level I trauma centers were required to provide SBIRT services. However, Love and Zatzick (2014) found Level II trauma centers also reported an increase in SBIRT services. This was regardless of any limited financial reimbursement for SBIRT and any

additional costs associated with hiring and retaining appropriately trained behavioral health staff members.

**Operational.** As previously discussed, there are significant challenges associated with the large ranges in trauma center patients being served based on the number of beds (ACS, 2015). In addition to the staffing concerns, it is unclear how the protocol would operate in order to reach each patient. A solution may be to train other members of trauma services staff members in trauma centers to assist with the mental health screeners. Upon admission, a medical provider will conduct a thorough assessment of the patient. Furthermore, nurses will follow-up with additional psychosocial questions that are all entered into the patient chart via the EHR. If medical providers and nurses are presented with a brief training on the mental health screeners they can conduct the screening protocol that will pre-screen physical trauma patients, which may take an additional 10-15 minutes. If the patient reports a positive on the mental health screeners, a mental health professional will be alerted via a pager or a referral order sent through the EHR to follow-up with the full assessment for the patient. This process would provide an efficient and effective screening protocol for trauma centers, staff members, and patients. Therefore, a mandate policy like the one for screening substance use initiated in 2012 by the ACS, is needed to help initiate this change.

### **Policy Recommendation**

The policy recommendation, based on all the aforementioned evidence, is to implement a mental health screening protocol to ensure each physical trauma survivor receives empirically-validated mental health screeners. Inpatient and outpatient trauma centers are encouraged to initiate use of screening tools for depression and PTSD, considering the substantial evidence that supports the negative impact these conditions have on physical trauma patients' recovery

(Author, 2018; Braden et al., 2009; Gold et al., 2016; Irish et al., 2011; Norman et al., 2011; O'Donnell et al., 2003; Palyo et al., 2008; Ramchand et al., 2008). Screening tools such as the patient health questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) for depression, and the PTSD check list civilian version (PCL-C; Weathers, Litz, Herman, Huska, & Keane, 1993), are empirically-supported screeners recommended for use in medical settings.

It is recommended that trauma teams screen patients for co-morbid mental health issues at admission and discharge. The best place to screen physical trauma patients would be in the trauma center, as opposed to the emergency department, which is similar to the SBIRT (Office of National Drug Control Policy, 2012) protocol. However, the literature also suggested that patients remained at risk for mental health issues up to a year post-discharge (Irish et al., 2011; O'Donnell et al., 2003; Steel et al., 2011). Since not all patients attend follow-up appointments, with researchers reporting 76% to 79.6% of physical trauma centers attending outpatient trauma follow-up clinic appointments (Aaland, Marose, & Zhu, 2012; Author, 2018), it is even more important that the screening start in the inpatient trauma setting.

In response to a policy mandate, trauma centers will need to train staff members to administer, score, and refer patients who screen positively. Tasking the initial depression and PTSD screeners to medical providers and/or nurses who complete the admission assessments, will help to maximize the time and mental health staff resources. Furthermore, engaging medical staff members (e.g., medical providers and nurses) in mental health screening protocols helps to break down the stigma associated with mental health compared to physical health.

### **Summary**

There appears to be strong evidence to support the challenges that exist within the current healthcare delivery system of trauma centers regarding mental health care. This policy brief

highlighted the importance of mental health in the role of recovery for physical trauma patients, current prevalence rates of mental health screenings across trauma centers, and the financial burden of physical trauma patients. The proposal to create a mental health screening protocol in trauma centers was discussed. The benefits, guided by the triple aim (Berwick et al., 2008), help to address: improving the individual experience of care, improving the health of populations, and reducing the per capita costs of care for populations. While there are challenges associated with the proposed mental health screening protocol (e.g., stigma associated with mental health access and treatment, staffing, and operational feasibility), the risk of inaction would be the continued re-occurrence of physical traumas due to potential unidentified or untreated mental health conditions. This would continue to burden the healthcare delivery system and put more stress and strain on the patient and their family, shifting the problem to others as opposed to solving it.

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APPENDIX A.1: MeSH TERMS AND KEYWORDS USED TO SEARCH  
PUBMED, PSYCHINFO, AND OVID SEARCH ENGINES

| <b>Medline via PubMed</b>                               | <b>PsychINFO via EBSCO</b>                                 | <b>OVID via EBSCO</b>  |
|---|--|--|
| "wounds and injuries" AND "mental processes"            | "wounds and injuries" AND "mental processes"               | "wounds and injuries" AND "mental processes"                 |
| "wounds and injuries" AND <i>psychological injuries</i> | "wounds and injuries" AND <i>psychological injuries</i>    |  |
| "wounds and injuries" AND "adaptation, psychological"   | "wounds and injuries" AND <i>psychological adaptation</i>  | "wounds and injuries" AND "adaptation, psychological"        |
| "wounds and injuries" AND "mental competency"           | "wounds and injuries" AND <i>mental competency</i>         | "wounds and injuries" AND "mental competency"                |
| "wounds and injuries" AND "self efficacy"               | "wounds and injuries" AND <i>self efficacy</i>             | "wounds and injuries" AND "self efficacy"                    |
| "wounds and injuries" AND "quality of life"             | "wounds and injuries" AND "quality of life"                | "wounds and injuries" AND "quality of life" /px [psychology] |
| "wounds and injuries" AND <i>coping behavior</i>        | "wounds and injuries" AND "coping behavior"                | "wounds and injuries" AND <i>coping behavior</i>             |
| "wounds and injuries" AND <i>coping skills</i>          | "wounds and injuries" AND <i>coping skills</i>             | "wounds and injuries" AND <i>coping skills</i>               |
|   | "wounds and injuries" AND "stress"                         | "wounds and injuries" AND "stress, psychological"            |
| "wounds and injuries" AND "emotional adjustment"        | "wounds and injuries" AND "emotional adjustment"           | "wounds and injuries" AND <i>emotional adjustment</i>        |
| "wounds and injuries" AND "depressive disorder"         | "wounds and injuries" AND <i>depressive disorder</i>       | "wounds and injuries" AND <i>depressive disorder</i>         |
| "wounds and injuries" AND <i>major depression</i>       | "wounds and injuries" AND "major depression"               | "wounds and injuries" AND <i>major depression</i>            |
| "wounds and injuries" AND "depression"                  | "wounds and injuries" AND "depression (emotional)"         | "wounds and injuries" AND "depression"                       |
| "wounds and injuries" AND "anxiety"                     | "wounds and injuries" AND "anxiety"                        | "wounds and injuries" AND "anxiety"                          |
|   | "wounds and injuries" AND <i>anxiety disorders</i>         | "wounds and injuries" AND "anxiety disorders"                |
|   | "wounds and injuries" AND "emotional trauma"               | "wounds and injuries" AND <i>emotional trauma</i>            |
|   | "wounds and injuries" AND <i>traumatic stress disorder</i> | "wounds and injuries" AND "stress disorders, traumatic"      |

|   |   |   |
|---|---|---|
| "wounds and injuries" AND<br><i>traumatic acute stress disorder</i> | "wounds and injuries" AND<br><i>traumatic acute stress disorder</i> | "wounds and injuries" AND<br>"stress disorders, traumatic, acute" |
| "wounds and injuries" AND<br>"stress disorders, post-traumatic"     | "wounds and injuries" AND<br>"posttraumatic stress disorder"        | "wounds and injuries" AND<br>"stress disorders, post-traumatic"   |
| "wounds and injuries" AND<br><i>psychosocial factors</i>            | "wounds and injuries" AND<br>"psychosocial factors"                 | "wounds and injuries" AND<br><i>psychosocial factors</i>          |
| "wounds and injuries" AND<br>"social support"                       | "wounds and injuries" AND<br>"social support"                       | "wounds and injuries" AND<br>"social support"                     |
| "wounds and injuries" AND<br>"family relations"                     | "wounds and injuries" AND<br>"family relations"                     | "wounds and injuries" AND<br>"family relations"                   |
| "wounds and injuries" AND<br>"caregivers"                           | "wounds and injuries" AND<br>"caregivers"                           | "wounds and injuries" AND<br>"caregivers"                         |
|   | "wounds and injuries" AND<br>family"                                | "wounds and injuries" AND<br>"family"                             |
| "wounds and injuries" AND<br>"spirituality"                         | "wounds and injuries" AND<br>"spirituality"                         | "wounds and injuries" AND<br>"spirituality"                       |
| "wounds and injuries" AND<br>"religion"                             | "wounds and injuries" AND<br>"religion"                             | "wounds and injuries" AND<br>"religion"                           |
| "wounds and injuries" AND<br><i>religion and medicine</i>           | "wounds and injuries" AND<br><i>religion and medicine</i>           | "wounds and injuries" AND<br>"religion and medicine"              |
| "wounds and injuries" AND<br><i>religiosity</i>                     | "wounds and injuries" AND<br>"religiosity"                          | "wounds and injuries" AND<br><i>religiosity</i>                   |
| "orthopedics" AND "mental<br>processes"                             | "orthopedics" AND "mental<br>processes"                             | "orthopedics" AND "mental<br>processes"                           |
| "orthopedics" AND<br><i>psychological injuries</i>                  | "orthopedics" AND<br><i>psychological injuries</i>                  |   |
| "orthopedics" AND "adaptation,<br>psychological"                    | "orthopedics" AND<br><i>psychological adaptation</i>                | "orthopedics" AND "adaptation,<br>psychological"                  |
| "orthopedics" AND "mental<br>competency"                            | "orthopedics" AND <i>mental<br/>competency</i>                      | "orthopedics" AND "mental<br>competency"                          |
| "orthopedics" AND "self<br>efficacy"                                | "orthopedics" AND <i>self efficacy</i>                              | "orthopedics" AND "self efficacy"                                 |
| "orthopedics" AND "quality of<br>life"                              | "orthopedics" AND "quality of<br>life"                              | "orthopedics" AND "quality of<br>life" /px [psychology]           |
| "orthopedics" AND <i>coping<br/>behavior</i>                        | "orthopedics" AND "coping<br>behavior"                              | "orthopedics" AND <i>coping<br/>behavior</i>                      |
| "orthopedics" AND <i>coping skills</i>                              | "orthopedics" AND <i>coping skills</i>                              | "orthopedics" AND <i>coping skills</i>                            |

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|  | "orthopedics" AND "stress"                               | "orthopedics" AND "stress, psychological"              |
| "orthopedics" AND "emotional adjustment"                 | "orthopedics" AND "emotional adjustment"                 | "orthopedics" AND <i>emotional adjustment</i>          |
| "orthopedics" AND "depressive disorder"                  | "orthopedics" AND <i>depressive disorder</i>             | "orthopedics" AND <i>depressive disorder</i>           |
| "orthopedics" AND <i>major depression</i>                | "orthopedics" AND "major depression"                     | "orthopedics" AND <i>major depression</i>              |
| "orthopedics" AND "depression"                           | "orthopedics" AND "depression (emotional)"               | "orthopedics" AND "depression"                         |
| "orthopedics" AND "anxiety"                              | "orthopedics" AND "anxiety"                              | "orthopedics" AND "anxiety"                            |
| "orthopedics" AND <i>anxiety disorders</i>               | "orthopedics" AND <i>anxiety disorders</i>               | "orthopedics" AND "anxiety disorders"                  |
| "orthopedics" AND <i>emotional trauma</i>                | "orthopedics" AND "emotional trauma"                     | "orthopedics" AND <i>emotional trauma</i>              |
| "orthopedics" AND <i>traumatic stress disorder</i>       | "orthopedics" AND <i>traumatic stress disorder</i>       | "orthopedics" AND "stress disorders, traumatic"        |
| "orthopedics" AND <i>traumatic acute stress disorder</i> | "orthopedics" AND <i>traumatic acute stress disorder</i> | "orthopedics" AND "stress disorders, traumatic, acute" |
| "orthopedics" AND "stress disorders, post-traumatic"     | "orthopedics" AND "posttraumatic stress disorder"        | "orthopedics" AND "stress disorders, post-traumatic"   |
| "orthopedics" AND <i>psychosocial factors</i>            | "orthopedics" AND "psychosocial factors"                 | "orthopedics" AND <i>psychosocial factors</i>          |
| "orthopedics" AND "social support"                       | "orthopedics" AND "social support"                       | "orthopedics" AND "social support"                     |
| "orthopedics" AND "family relations"                     | "orthopedics" AND "family relations"                     | "orthopedics" AND "family relations"                   |
| "orthopedics" AND "caregivers"                           | "orthopedics" AND "caregivers"                           | "orthopedics" AND "caregivers"                         |
|  | "orthopedics" AND family"                                | "orthopedics" AND "family"                             |
| "orthopedics" AND "spirituality"                         | "orthopedics" AND "spirituality"                         | "orthopedics" AND "spirituality"                       |
| "orthopedics" AND "religion"                             | "orthopedics" AND "religion"                             | "orthopedics" AND "religion"                           |
| "orthopedics" AND <i>religion and medicine</i>           | "orthopedics" AND <i>religion and medicine</i>           | "orthopedics" AND "religion and medicine"              |
| "orthopedics" AND <i>religiosity</i>                     | "orthopedics" AND "religiosity"                          | "orthopedics" AND <i>religiocity</i>                   |

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| <i>orthopaedics</i> AND "mental processes"                     | "orthopaedics" AND "mental processes"                     | <i>orthopaedics</i> AND "mental processes"                   |
| <i>orthopaedics</i> AND <i>psychological injuries</i>          | "orthopaedics" AND <i>psychological injuries</i>          |  |
| <i>orthopaedics</i> AND "adaptation, psychological"            | "orthopaedics" AND <i>psychological adaptation</i>        | <i>orthopaedics</i> AND "adaptation, psychological"          |
| <i>orthopaedics</i> AND "mental competency"                    | "orthopaedics" AND <i>mental competency</i>               | <i>orthopaedics</i> AND "mental competency"                  |
| <i>orthopaedics</i> AND "self efficacy"                        | "orthopaedics" AND <i>self efficacy</i>                   | <i>orthopaedics</i> AND "self efficacy"                      |
| <i>orthopaedics</i> AND "quality of life"                      | "orthopaedics" AND "quality of life"                      | <i>orthopaedics</i> AND "quality of life" /px [psychology]   |
| <i>orthopaedics</i> AND <i>coping behavior</i>                 | "orthopaedics" AND "coping behavior"                      | <i>orthopaedics</i> AND <i>coping behavior</i>               |
| <i>orthopaedics</i> AND <i>coping skills</i>                   | "orthopaedics" AND <i>coping skills</i>                   | <i>orthopaedics</i> AND <i>coping skills</i>                 |
|  | "orthopaedics" AND "stress"                               | <i>orthopaedics</i> AND "stress, psychological"              |
| <i>orthopaedics</i> AND "emotional adjustment"                 | "orthopaedics" AND "emotional adjustment"                 | <i>orthopaedics</i> AND <i>emotional adjustment</i>          |
| <i>orthopaedics</i> AND "depressive disorder"                  | "orthopaedics" AND <i>depressive disorder</i>             | <i>orthopaedics</i> AND <i>depressive disorder</i>           |
| <i>orthopaedics</i> AND <i>major depression</i>                | "orthopaedics" AND "major depression"                     | <i>orthopaedics</i> AND <i>major depression</i>              |
| <i>orthopaedics</i> AND "depression"                           | "orthopaedics" AND "depression (emotional)"               | <i>orthopaedics</i> AND "depression"                         |
| <i>orthopaedics</i> AND "anxiety"                              | "orthopaedics" AND "anxiety"                              | <i>orthopaedics</i> AND "anxiety"                            |
| <i>orthopaedics</i> AND <i>anxiety disorders</i>               | "orthopaedics" AND <i>anxiety disorders</i>               | <i>orthopaedics</i> AND "anxiety disorders"                  |
| <i>orthopaedics</i> AND <i>emotional trauma</i>                | "orthopaedics" AND "emotional trauma"                     | <i>orthopaedics</i> AND <i>emotional trauma</i>              |
| <i>orthopaedics</i> AND <i>traumatic stress disorder</i>       | "orthopaedics" AND <i>traumatic stress disorder</i>       | <i>orthopaedics</i> AND "stress disorders, traumatic"        |
| <i>orthopaedics</i> AND <i>traumatic acute stress disorder</i> | "orthopaedics" AND <i>traumatic acute stress disorder</i> | <i>orthopaedics</i> AND "stress disorders, traumatic, acute" |
| <i>orthopaedics</i> AND "stress disorders, post-traumatic"     | "orthopaedics" AND "posttraumatic stress disorder"        | <i>orthopaedics</i> AND "stress disorders, post-traumatic"   |

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| <i>orthopaedics AND psychosocial factors</i>           | "orthopaedics" AND "psychosocial factors"           | <i>orthopaedics AND psychosocial factors</i>                  |
| <i>orthopaedics AND "social support"</i>               | "orthopaedics" AND "social support"                 | <i>orthopaedics AND "social support"</i>                      |
| <i>orthopaedics AND "family relations"</i>             | "orthopaedics" AND "family relations"               | <i>orthopaedics AND "family relations"</i>                    |
| <i>orthopaedics AND "caregivers"</i>                   | "orthopaedics" AND "caregivers"                     | <i>orthopaedics AND "caregivers"</i>                          |
| <i>orthopaedics AND "family"</i>                       | "orthopaedics" AND family"                          | <i>orthopaedics AND "family"</i>                              |
| <i>orthopaedics AND "spirituality"</i>                 | "orthopaedics" AND "spirituality"                   | <i>orthopaedics AND "spirituality"</i>                        |
| <i>orthopaedics AND "religion"</i>                     | "orthopaedics" AND "religion"                       | <i>orthopaedics AND "religion"</i>                            |
| <i>orthopaedics AND religion and medicine</i>          | "orthopaedics" AND <i>religion and medicine</i>     | <i>orthopaedics AND "religion and medicine"</i>               |
| <i>orthopaedics AND religiosity</i>                    | "orthopaedics" AND "religiosity"                    | <i>orthopaedics AND religiosity</i>                           |
| <i>physical trauma AND "mental processes"</i>          | <i>physical trauma AND "mental processes"</i>       | <i>physical trauma AND "mental processes"</i>                 |
| <i>physical trauma AND psychological injuries</i>      | <i>physical trauma AND psychological injuries</i>   |   |
| <i>physical trauma AND "adaptation, psychological"</i> | <i>physical trauma AND psychological adaptation</i> | <i>physical trauma AND "adaptation, psychological"</i>        |
| <i>physical trauma AND "mental competency"</i>         | <i>physical trauma AND mental competency</i>        | <i>physical trauma AND "mental competency"</i>                |
|  | <i>physical trauma AND self efficacy</i>            | <i>physical trauma AND "self efficacy"</i>                    |
| <i>physical trauma AND "quality of life"</i>           | <i>physical trauma AND "quality of life"</i>        | <i>physical trauma AND "quality of life" /px [psychology]</i> |
| <i>physical trauma AND coping behavior</i>             | <i>physical trauma AND "coping behavior"</i>        | <i>physical trauma AND coping behavior</i>                    |
| <i>physical trauma AND coping skills</i>               | <i>physical trauma AND coping skills</i>            | <i>physical trauma AND coping skills</i>                      |
| <i>physical trauma AND stress</i>                      | <i>physical trauma AND "stress"</i>                 | <i>physical trauma AND "stress, psychological"</i>            |
| <i>physical trauma AND "emotional adjustment"</i>      | <i>physical trauma AND "emotional adjustment"</i>   | <i>physical trauma AND emotional adjustment</i>               |
|  | <i>physical trauma AND depressive disorder</i>      | <i>physical trauma AND depressive disorder</i>                |

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|  | <i>physical trauma AND "major depression"</i>              | <i>physical trauma AND major depression</i>                     |
| <i>physical trauma AND "depression"</i>                    | <i>physical trauma AND "depression (emotional)"</i>        | <i>physical trauma AND "depression"</i>                         |
| <i>physical trauma AND "anxiety"</i>                       | <i>physical trauma AND "anxiety"</i>                       | <i>physical trauma AND "anxiety"</i>                            |
|  |  | <i>physical trauma AND "anxiety disorders"</i>                  |
| <i>physical trauma AND emotional trauma</i>                | <i>physical trauma AND "emotional trauma"</i>              | <i>physical trauma AND emotional trauma</i>                     |
|  | <i>physical trauma AND traumatic stress disorder</i>       | <i>physical trauma AND "stress disorders, traumatic"</i>        |
| <i>physical trauma AND traumatic acute stress disorder</i> | <i>physical trauma AND traumatic acute stress disorder</i> | <i>physical trauma AND "stress disorders, traumatic, acute"</i> |
|  | <i>physical trauma AND "posttraumatic stress disorder"</i> | <i>physical trauma AND "stress disorders, post-traumatic"</i>   |
|  | <i>physical trauma AND "psychosocial factors"</i>          | <i>physical trauma AND psychosocial factors</i>                 |
| <i>physical trauma AND "social support"</i>                | <i>physical trauma AND "social support"</i>                | <i>physical trauma AND "social support"</i>                     |
| <i>physical trauma AND "family relations"</i>              | <i>physical trauma AND "family relations"</i>              | <i>physical trauma AND "family relations"</i>                   |
| <i>physical trauma AND "caregivers"</i>                    | <i>physical trauma AND "caregivers"</i>                    | <i>physical trauma AND "caregivers"</i>                         |
| <i>physical trauma AND "family"</i>                        | <i>physical trauma AND family"</i>                         | <i>physical trauma AND "family"</i>                             |
| <i>physical trauma AND "spirituality"</i>                  | <i>physical trauma AND "spirituality"</i>                  | <i>physical trauma AND "spirituality"</i>                       |
| <i>physical trauma AND "religion"</i>                      | <i>physical trauma AND "religion"</i>                      | <i>physical trauma AND "religion"</i>                           |
| <i>physical trauma AND religion and medicine</i>           | <i>physical trauma AND religion and medicine</i>           | <i>physical trauma AND "religion and medicine"</i>              |
| <i>physical trauma AND religiosity</i>                     | <i>physical trauma AND "religiosity"</i>                   | <i>physical trauma AND religiosity</i>                          |
| <i>traumatic injury AND "mental processes"</i>             | <i>traumatic injury AND "mental processes"</i>             | <i>traumatic injury AND "mental processes"</i>                  |
|  | <i>traumatic injury AND psychological injuries</i>         |   |

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| <i>traumatic injury</i> AND "adaptation, psychological"            | <i>traumatic injury</i> AND <i>psychological adaptation</i>        | <i>traumatic injury</i> AND "adaptation, psychological"          |
| <i>traumatic injury</i> AND "mental competency"                    | <i>traumatic injury</i> AND <i>mental competency</i>               | <i>traumatic injury</i> AND "mental competency"                  |
|  | <i>traumatic injury</i> AND <i>self efficacy</i>                   | <i>traumatic injury</i> AND "self efficacy"                      |
| <i>traumatic injury</i> AND "quality of life"                      | <i>traumatic injury</i> AND "quality of life"                      | <i>traumatic injury</i> AND "quality of life" /px [psychology]   |
| <i>traumatic injury</i> AND <i>coping behavior</i>                 | <i>traumatic injury</i> AND "coping behavior"                      | <i>traumatic injury</i> AND <i>coping behavior</i>               |
| <i>traumatic injury</i> AND <i>coping skills</i>                   | <i>traumatic injury</i> AND <i>coping skills</i>                   | <i>traumatic injury</i> AND <i>coping skills</i>                 |
| <i>traumatic injury</i> AND <i>stress</i>                          | <i>traumatic injury</i> AND "stress"                               | <i>traumatic injury</i> AND "stress, psychological"              |
| <i>traumatic injury</i> AND "emotional adjustment"                 | <i>traumatic injury</i> AND "emotional adjustment"                 | <i>traumatic injury</i> AND <i>emotional adjustment</i>          |
|  | <i>traumatic injury</i> AND <i>depressive disorder</i>             | <i>traumatic injury</i> AND <i>depressive disorder</i>           |
|  | <i>traumatic injury</i> AND "major depression"                     | <i>traumatic injury</i> AND <i>major depression</i>              |
| <i>traumatic injury</i> AND "depression"                           | <i>traumatic injury</i> AND "depression (emotional)"               | <i>traumatic injury</i> AND "depression"                         |
| <i>traumatic injury</i> AND "anxiety"                              | <i>traumatic injury</i> AND "anxiety"                              | <i>traumatic injury</i> AND "anxiety"                            |
|  |  | <i>traumatic injury</i> AND "anxiety disorders"                  |
|  | <i>traumatic injury</i> AND "emotional trauma"                     | <i>traumatic injury</i> AND <i>emotional trauma</i>              |
| <i>traumatic injury</i> AND <i>traumatic stress disorder</i>       | <i>traumatic injury</i> AND <i>traumatic stress disorder</i>       | <i>traumatic injury</i> AND "stress disorders, traumatic"        |
| <i>traumatic injury</i> AND <i>traumatic acute stress disorder</i> | <i>traumatic injury</i> AND <i>traumatic acute stress disorder</i> | <i>traumatic injury</i> AND "stress disorders, traumatic, acute" |
|  | <i>traumatic injury</i> AND "posttraumatic stress disorder"        | <i>traumatic injury</i> AND "stress disorders, post-traumatic"   |
| <i>traumatic injury</i> AND <i>psychosocial factors</i>            | <i>traumatic injury</i> AND "psychosocial factors"                 | <i>traumatic injury</i> AND <i>psychosocial factors</i>          |
| <i>traumatic injury</i> AND "social support"                       | <i>traumatic injury</i> AND "social support"                       | <i>traumatic injury</i> AND "social support"                     |

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| <i>traumatic injury AND "family relations"</i>                | <i>traumatic injury AND "family relations"</i>             | <i>traumatic injury AND "family relations"</i>                                      |
|   | <i>traumatic injury AND "caregivers"</i>                   | <i>traumatic injury AND "caregivers"</i>  |
| <i>traumatic injury AND "family"</i>                          | <i>traumatic injury AND family"</i>                        | <i>traumatic injury AND "family"</i>  |
| <i>traumatic injury AND "spirituality"</i>                    | <i>traumatic injury AND "spirituality"</i>                 | <i>traumatic injury AND "spirituality"</i>  |
| <i>traumatic injury AND "religion"</i>                        | <i>traumatic injury AND "religion"</i>                     | <i>traumatic injury AND "religion"</i>  |
| <i>traumatic injury AND religion and medicine</i>             | <i>traumatic injury AND religion and medicine</i>          | <i>traumatic injury AND "religion and medicine"</i>                                 |
| <i>traumatic injury AND religiosity</i>                       | <i>traumatic injury AND "religiosity"</i>                  | <i>traumatic injury AND religiosity</i>   |
| <i>musculoskeletal injury AND "mental processes"</i>          | <i>musculoskeletal injury AND "mental processes"</i>       | "muscle, skeletal/in, su[injuries, surgery]" AND "mental processes"                 |
| <i>musculoskeletal injury AND psychological injuries</i>      | <i>musculoskeletal injury AND psychological injuries</i>   |   |
| <i>musculoskeletal injury AND "adaptation, psychological"</i> | <i>musculoskeletal injury AND psychological adaptation</i> | "muscle, skeletal/in, su[injuries, surgery]"AND "adaptation, psychological"         |
| <i>musculoskeletal injury AND "mental competency"</i>         | <i>musculoskeletal injury AND mental competency</i>        | "muscle, skeletal/in, su[injuries, surgery]" AND "mental competency"                |
| <i>musculoskeletal injury AND "self efficacy"</i>             | <i>musculoskeletal injury AND self efficacy</i>            | "muscle, skeletal/in, su[injuries, surgery]"AND "self efficacy"                     |
| <i>musculoskeletal injury AND "quality of life"</i>           | <i>musculoskeletal injury AND "quality of life"</i>        | "muscle, skeletal/in, su[injuries, surgery]" AND "quality of life" /px [psychology] |
| <i>musculoskeletal injury AND coping behavior</i>             | <i>musculoskeletal injury AND "coping behavior"</i>        | "muscle, skeletal/in, su[injuries, surgery]" AND <i>coping behavior</i>             |
| <i>musculoskeletal injury AND coping skills</i>               | <i>musculoskeletal injury AND coping skills</i>            | "muscle, skeletal/in, su[injuries, surgery]"AND <i>coping skills</i>                |

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| <i>musculoskeletal injury AND stress</i>                             | <i>musculoskeletal injury AND "stress"</i>                        | "muscle, skeletal/in, su[injuries, surgery]" AND "stress, psychological"              |
| <i>musculoskeletal injury AND "emotional adjustment"</i>             | <i>musculoskeletal injury AND "emotional adjustment"</i>          | "muscle, skeletal/in, su[injuries, surgery]" AND <i>emotional adjustment</i>          |
| <i>musculoskeletal injury AND "depressive disorder"</i>              | <i>musculoskeletal injury AND depressive disorder</i>             | "muscle, skeletal/in, su[injuries, surgery]" AND <i>depressive disorder</i>           |
| <i>musculoskeletal injury AND major depression</i>                   | <i>musculoskeletal injury AND "major depression"</i>              | "muscle, skeletal/in, su[injuries, surgery]" AND <i>major depression</i>              |
| <i>musculoskeletal injury AND "depression"</i>                       | <i>musculoskeletal injury AND "depression (emotional)"</i>        | "muscle, skeletal/in, su[injuries, surgery]" AND "depression"                         |
| <i>musculoskeletal injury AND "anxiety"</i>                          | <i>musculoskeletal injury AND "anxiety"</i>                       | "muscle, skeletal/in, su[injuries, surgery]" AND "anxiety"                            |
| <i>musculoskeletal injury AND anxiety disorders</i>                  | <i>musculoskeletal injury AND anxiety disorders</i>               | "muscle, skeletal/in, su[injuries, surgery]" AND "anxiety disorders"                  |
| <i>musculoskeletal injury AND emotional trauma</i>                   | <i>musculoskeletal injury AND "emotional trauma"</i>              | "muscle, skeletal/in, su[injuries, surgery]" AND <i>emotional trauma</i>              |
| <i>musculoskeletal injury AND traumatic stress disorder</i>          | <i>musculoskeletal injury AND traumatic stress disorder</i>       | "muscle, skeletal/in, su[injuries, surgery]" AND "stress disorders, traumatic"        |
| <i>musculoskeletal injury AND traumatic acute stress disorder</i>    | <i>musculoskeletal injury AND traumatic acute stress disorder</i> | "muscle, skeletal/in, su[injuries, surgery]" AND "stress disorders, traumatic, acute" |
| <i>musculoskeletal injury AND "stress disorders, post-traumatic"</i> | <i>musculoskeletal injury AND "posttraumatic stress disorder"</i> | "muscle, skeletal/in, su[injuries, surgery]" AND "stress disorders, post-traumatic"   |
| <i>musculoskeletal injury AND psychosocial factors</i>               | <i>musculoskeletal injury AND "psychosocial factors"</i>          | "muscle, skeletal/in, su[injuries, surgery]" AND <i>psychosocial factors</i>          |

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| <i>musculoskeletal injury</i> AND "social support"             | <i>musculoskeletal injury</i> AND "social support"             | "muscle, skeletal/in, su[injuries, surgery]" AND "social support"        |
| <i>musculoskeletal injury</i> AND "family relations"           | <i>musculoskeletal injury</i> AND "family relations"           | "muscle, skeletal/in, su[injuries, surgery]" AND "family relations"      |
| <i>musculoskeletal injury</i> AND "caregivers"                 | <i>musculoskeletal injury</i> AND "caregivers"                 | "muscle, skeletal/in, su[injuries, surgery]" AND "caregivers"            |
| <i>musculoskeletal injury</i> AND "family"                     | <i>musculoskeletal injury</i> AND family"                      | "muscle, skeletal/in, su[injuries, surgery]" AND "family"                |
| <i>musculoskeletal injury</i> AND "spirituality"               | <i>musculoskeletal injury</i> AND "spirituality"               | "muscle, skeletal/in, su[injuries, surgery]" AND "spirituality"          |
| <i>musculoskeletal injury</i> AND "religion"                   | <i>musculoskeletal injury</i> AND "religion"                   | "muscle, skeletal/in, su[injuries, surgery]" AND "religion"              |
| <i>musculoskeletal injury</i> AND <i>religion and medicine</i> | <i>musculoskeletal injury</i> AND <i>religion and medicine</i> | "muscle, skeletal/in, su[injuries, surgery]" AND "religion and medicine" |
| <i>musculoskeletal injury</i> AND <i>religiosity</i>           | <i>musculoskeletal injury</i> AND "religiosity"                | "muscle, skeletal/in, su[injuries, surgery]" AND <i>religiocity</i>      |
| "accidental falls" AND "mental processes"                      | "falls" AND "mental processes"                                 | "accidental falls" AND "mental processes"                                |
| "accidental falls" AND <i>psychological injuries</i>           | "falls" AND <i>psychological injuries</i>                      |  |
| "accidental falls" AND "adaptation, psychological"             | "falls" AND <i>psychological adaptation</i>                    | "accidental falls" AND "adaptation, psychological"                       |
| "accidental falls" AND "mental competency"                     | "falls" AND <i>mental competency</i>                           | "accidental falls" AND "mental competency"                               |
| "accidental falls" AND "self efficacy"                         | "falls" AND <i>self efficacy</i>                               | "accidental falls" AND "self efficacy"                                   |
| "accidental falls" AND "quality of life"                       | "falls" AND "quality of life"                                  | "accidental falls" AND "quality of life" /px [psychology]                |
| "accidental falls" AND <i>coping behavior</i>                  | "falls" AND "coping behavior"                                  | "accidental falls" AND <i>coping behavior</i>                            |

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| "accidental falls" AND <i> coping skills</i>                   | "falls" AND <i> coping skills</i>                   | "accidental falls" AND <i> coping skills</i>                |
| "accidental falls" AND <i> stress</i>                          | "falls" AND "stress"                                | "accidental falls" AND "stress, psychological"              |
| "accidental falls" AND "emotional adjustment"                  | "falls" AND "emotional adjustment"                  | "accidental falls" AND <i> emotional adjustment</i>         |
| "accidental falls" AND "depressive disorder"                   | "falls" AND <i> depressive disorder</i>             | "accidental falls" AND <i> depressive disorder</i>          |
| "accidental falls" AND <i> major depression</i>                | "falls" AND "major depression"                      | "accidental falls" AND <i> major depression</i>             |
| "accidental falls" AND "depression"                            | "falls" AND "depression (emotional)"                | "accidental falls" AND "depression"                         |
| "accidental falls" AND "anxiety"                               | "falls" AND "anxiety"                               | "accidental falls" AND "anxiety"                            |
| "accidental falls" AND <i> anxiety disorders</i>               | "falls" AND <i> anxiety disorders</i>               | "accidental falls" AND "anxiety disorders"                  |
| "accidental falls" AND <i> emotional trauma</i>                | "falls" AND "emotional trauma"                      | "accidental falls" AND <i> emotional trauma</i>             |
| "accidental falls" AND <i> traumatic stress disorder</i>       | "falls" AND <i> traumatic stress disorder</i>       | "accidental falls" AND "stress disorders, traumatic"        |
| "accidental falls" AND <i> traumatic acute stress disorder</i> | "falls" AND <i> traumatic acute stress disorder</i> | "accidental falls" AND "stress disorders, traumatic, acute" |
| "accidental falls" AND "stress disorders, post-traumatic"      | "falls" AND "posttraumatic stress disorder"         | "accidental falls" AND "stress disorders, post-traumatic"   |
| "accidental falls" AND <i> psychosocial factors</i>            | "falls" AND "psychosocial factors"                  | "accidental falls" AND <i> psychosocial factors</i>         |
| "accidental falls" AND "social support"                        | "falls" AND "social support"                        | "accidental falls" AND "social support"                     |
| "accidental falls" AND "family relations"                      | "falls" AND "family relations"                      | "accidental falls" AND "family relations"                   |
| "accidental falls" AND "caregivers"                            | "falls" AND "caregivers"                            | "accidental falls" AND "caregivers"                         |
| "accidental falls" AND "family"                                | "falls" AND family"                                 | "accidental falls" AND "family"                             |
| "accidental falls" AND "spirituality"                          | "falls" AND "spirituality"                          | "accidental falls" AND "spirituality"                       |
| "accidental falls" AND "religion"                              | "falls" AND "religion"                              | "accidental falls" AND "religion"                           |

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|--|---|--|
| "accidental falls" AND <i>religion and medicine</i>    | "falls" AND <i>religion and medicine</i>                    | "accidental falls" AND "religion and medicine"           |
| "accidental falls" AND <i>religiosity</i>              | "falls" AND "religiosity"                                   | "accidental falls" AND <i>religiocity</i>                |
| "wounds, gunshot" AND "mental processes"               | <i>wounds, gunshot</i> AND "mental processes"               | "wounds, gunshot" AND "mental processes"                 |
| "wounds, gunshot" AND <i>psychological injuries</i>    | <i>wounds, gunshot</i> AND <i>psychological injuries</i>    |  |
| "wounds, gunshot" AND "adaptation, psychological"      | <i>wounds, gunshot</i> AND <i>psychological adaptation</i>  | "wounds, gunshot" AND "adaptation, psychological"        |
| "wounds, gunshot" AND "mental competency"              | <i>wounds, gunshot</i> AND <i>mental competency</i>         | "wounds, gunshot" AND "mental competency"                |
| "wounds, gunshot" AND "self efficacy"                  | <i>wounds, gunshot</i> AND <i>self efficacy</i>             | "wounds, gunshot" AND "self efficacy"                    |
| "wounds, gunshot" AND "quality of life"                | <i>wounds, gunshot</i> AND "quality of life"                | "wounds, gunshot" AND "quality of life" /px [psychology] |
| "wounds, gunshot" AND <i>coping behavior</i>           | <i>wounds, gunshot</i> AND "coping behavior"                | "wounds, gunshot" AND <i>coping behavior</i>             |
| "wounds, gunshot" AND <i>coping skills</i>             | <i>wounds, gunshot</i> AND <i>coping skills</i>             | "wounds, gunshot" AND <i>coping skills</i>               |
| "wounds, gunshot" AND <i>stress</i>                    | <i>wounds, gunshot</i> AND "stress"                         | "wounds, gunshot" AND "stress, psychological"            |
| "wounds, gunshot" AND "emotional adjustment"           | <i>wounds, gunshot</i> AND "emotional adjustment"           | "wounds, gunshot" AND <i>emotional adjustment</i>        |
| "wounds, gunshot" AND "depressive disorder"            | <i>wounds, gunshot</i> AND <i>depressive disorder</i>       | "wounds, gunshot" AND <i>depressive disorder</i>         |
| "wounds, gunshot" AND <i>major depression</i>          | <i>wounds, gunshot</i> AND "major depression"               | "wounds, gunshot" AND <i>major depression</i>            |
| "wounds, gunshot" AND "depression"                     | <i>wounds, gunshot</i> AND "depression (emotional)"         | "wounds, gunshot" AND "depression"                       |
| "wounds, gunshot" AND "anxiety"                        | <i>wounds, gunshot</i> AND "anxiety"                        | "wounds, gunshot" AND "anxiety"                          |
| "wounds, gunshot" AND <i>anxiety disorders</i>         | <i>wounds, gunshot</i> AND <i>anxiety disorders</i>         | "wounds, gunshot" AND "anxiety disorders"                |
| "wounds, gunshot" AND <i>emotional trauma</i>          | <i>wounds, gunshot</i> AND "emotional trauma"               | "wounds, gunshot" AND <i>emotional trauma</i>            |
| "wounds, gunshot" AND <i>traumatic stress disorder</i> | <i>wounds, gunshot</i> AND <i>traumatic stress disorder</i> | "wounds, gunshot" AND "stress disorders, traumatic"      |

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|--|---|---|
| "wounds, gunshot" AND <i>traumatic acute stress disorder</i> | <i>wounds, gunshot</i> AND <i>traumatic acute stress disorder</i> | "wounds, gunshot" AND "stress disorders, traumatic, acute"  |
| "wounds, gunshot" AND "stress disorders, post-traumatic"     | <i>wounds, gunshot</i> AND "posttraumatic stress disorder"        | "wounds, gunshot" AND "stress disorders, post-traumatic"    |
| "wounds, gunshot" AND <i>psychosocial factors</i>            | <i>wounds, gunshot</i> AND "psychosocial factors"                 | "wounds, gunshot" AND <i>psychosocial factors</i>           |
| "wounds, gunshot" AND "social support"                       | <i>wounds, gunshot</i> AND "social support"                       | "wounds, gunshot" AND "social support"                      |
| "wounds, gunshot" AND "family relations"                     | <i>wounds, gunshot</i> AND "family relations"                     | "wounds, gunshot" AND "family relations"                    |
| "wounds, gunshot" AND "caregivers"                           | <i>wounds, gunshot</i> AND "caregivers"                           | "wounds, gunshot" AND "caregivers"                          |
| "wounds, gunshot" AND "family"                               | <i>wounds, gunshot</i> AND family"                                | "wounds, gunshot" AND "family"                              |
| "wounds, gunshot" AND "spirituality"                         | <i>wounds, gunshot</i> AND "spirituality"                         | "wounds, gunshot" AND "spirituality"                        |
| "wounds, gunshot" AND "religion"                             | <i>wounds, gunshot</i> AND "religion"                             | "wounds, gunshot" AND "religion"                            |
| "wounds, gunshot" AND <i>religion and medicine</i>           | <i>wounds, gunshot</i> AND <i>religion and medicine</i>           | "wounds, gunshot" AND "religion and medicine"               |
| "wounds, gunshot" AND <i>religiosity</i>                     | <i>wounds, gunshot</i> AND "religiosity"                          | "wounds, gunshot" AND <i>religiosity</i>                    |
| "accident, traffic" AND "mental processes"                   | "motor traffic accidents" AND "mental processes"                  | "accidents, traffic" AND "mental processes"                 |
| "accident, traffic" AND <i>psychological injuries</i>        | "motor traffic accidents" AND <i>psychological injuries</i>       |   |
| "accident, traffic" AND "adaptation, psychological"          | "motor traffic accidents" AND <i>psychological adaptation</i>     | "accidents, traffic" AND "adaptation, psychological"        |
| "accident, traffic" AND "mental competency"                  | "motor traffic accidents" AND <i>mental competency</i>            | "accidents, traffic" AND "mental competency"                |
| "accident, traffic" AND "self efficacy"                      | "motor traffic accidents" AND <i>self efficacy</i>                | "accidents, traffic" AND "self efficacy"                    |
| "accident, traffic" AND "quality of life"                    | "motor traffic accidents" AND "quality of life"                   | "accidents, traffic" AND "quality of life" /px [psychology] |
| "accident, traffic" AND <i>coping behavior</i>               | "motor traffic accidents" AND "coping behavior"                   | "accidents, traffic" AND <i>coping behavior</i>             |

|   |   |   |
|---|---|---|
| "accident, traffic" AND <i> coping skills</i>                   | "motor traffic accidents" AND <i> coping skills</i>                   | "accidents, traffic" AND <i> coping skills</i>                |
| "accident, traffic" AND <i> stress</i>                          | "motor traffic accidents" AND "stress"                                | "accidents, traffic" AND "stress, psychological"              |
| "accident, traffic" AND "emotional adjustment"                  | "motor traffic accidents" AND "emotional adjustment"                  | "accidents, traffic" AND <i> emotional adjustment</i>         |
| "accident, traffic" AND "depressive disorder"                   | "motor traffic accidents" AND <i> depressive disorder</i>             | "accidents, traffic" AND <i> depressive disorder</i>          |
| "accident, traffic" AND <i> major depression</i>                | "motor traffic accidents" AND "major depression"                      | "accidents, traffic" AND <i> major depression</i>             |
| "accident, traffic" AND "depression"                            | "motor traffic accidents" AND "depression (emotional)"                | "accidents, traffic" AND "depression"                         |
| "accident, traffic" AND "anxiety"                               | "motor traffic accidents" AND "anxiety"                               | "accidents, traffic" AND "anxiety"                            |
| "accident, traffic" AND <i> anxiety disorders</i>               | "motor traffic accidents" AND <i> anxiety disorders</i>               | "accidents, traffic" AND "anxiety disorders"                  |
| "accident, traffic" AND <i> emotional trauma</i>                | "motor traffic accidents" AND "emotional trauma"                      | "accidents, traffic" AND <i> emotional trauma</i>             |
| "accident, traffic" AND <i> traumatic stress disorder</i>       | "motor traffic accidents" AND <i> traumatic stress disorder</i>       | "accidents, traffic" AND "stress disorders, traumatic"        |
| "accident, traffic" AND <i> traumatic acute stress disorder</i> | "motor traffic accidents" AND <i> traumatic acute stress disorder</i> | "accidents, traffic" AND "stress disorders, traumatic, acute" |
| "accident, traffic" AND "stress disorders, post-traumatic"      | "motor traffic accidents" AND "posttraumatic stress disorder"         | "accidents, traffic" AND "stress disorders, post-traumatic"   |
| "accident, traffic" AND <i> psychosocial factors</i>            | "motor traffic accidents" AND "psychosocial factors"                  | "accidents, traffic" AND <i> psychosocial factors</i>         |
| "accident, traffic" AND "social support"                        | "motor traffic accidents" AND "social support"                        | "accidents, traffic" AND "social support"                     |
| "accident, traffic" AND "family relations"                      | "motor traffic accidents" AND "family relations"                      | "accidents, traffic" AND "family relations"                   |
| "accident, traffic" AND "caregivers"                            | "motor traffic accidents" AND "caregivers"                            | "accidents, traffic" AND "caregivers"                         |
| "accident, traffic" AND "family"                                | "motor traffic accidents" AND family"                                 | "accidents, traffic" AND "family"                             |
| "accident, traffic" AND "spirituality"                          | "motor traffic accidents" AND "spirituality"                          | "accidents, traffic" AND "spirituality"                       |

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|--|--|---|
| "accident, traffic" AND "religion"                   | "motor traffic accidents" AND "religion"                   | "accidents, traffic" AND "religion"                   |
| "accident, traffic" AND <i>religion and medicine</i> | "motor traffic accidents" AND <i>religion and medicine</i> | "accidents, traffic" AND "religion and medicine"      |
| "accident, traffic" AND <i>religiosity</i>           | "motor traffic accidents" AND "religiosity"                | "accidents, traffic" AND <i>religiosity</i>           |
| "wounds, stab" AND "mental processes"                | <i>wounds, stabs</i> AND "mental processes"                | "wounds, stab" AND "mental processes"                 |
| "wounds, stab" AND <i>psychological injuries</i>     | <i>wounds, stabs</i> AND <i>psychological injuries</i>     |   |
| "wounds, stab" AND "adaptation, psychological"       | <i>wounds, stabs</i> AND <i>psychological adaptation</i>   | "wounds, stab" AND "adaptation, psychological"        |
| "wounds, stab" AND "mental competency"               | <i>wounds, stabs</i> AND <i>mental competency</i>          | "wounds, stab" AND "mental competency"                |
| "wounds, stab" AND "self efficacy"                   | <i>wounds, stabs</i> AND <i>self efficacy</i>              | "wounds, stab" AND "self efficacy"                    |
| "wounds, stab" AND "quality of life"                 | <i>wounds, stabs</i> AND "quality of life"                 | "wounds, stab" AND "quality of life" /px [psychology] |
| "wounds, stab" AND <i>coping behavior</i>            | <i>wounds, stabs</i> AND "coping behavior"                 | "wounds, stab" AND <i>coping behavior</i>             |
| "wounds, stab" AND <i>coping skills</i>              | <i>wounds, stabs</i> AND <i>coping skills</i>              | "wounds, stab" AND <i>coping skills</i>               |
| "wounds, stab" AND <i>stress</i>                     | <i>wounds, stabs</i> AND "stress"                          | "wounds, stab" AND "stress, psychological"            |
| "wounds, stab" AND "emotional adjustment"            | <i>wounds, stabs</i> AND "emotional adjustment"            | "wounds, stab" AND <i>emotional adjustment</i>        |
| "wounds, stab" AND "depressive disorder"             | <i>wounds, stabs</i> AND <i>depressive disorder</i>        | "wounds, stab" AND <i>depressive disorder</i>         |
| "wounds, stab" AND <i>major depression</i>           | <i>wounds, stabs</i> AND "major depression"                | "wounds, stab" AND <i>major depression</i>            |
| "wounds, stab" AND "depression"                      | <i>wounds, stabs</i> AND "depression (emotional)"          | "wounds, stab" AND "depression"                       |
| "wounds, stab" AND "anxiety"                         | <i>wounds, stabs</i> AND "anxiety"                         | "wounds, stab" AND "anxiety"                          |
| "wounds, stab" AND <i>anxiety disorders</i>          | <i>wounds, stabs</i> AND <i>anxiety disorders</i>          | "wounds, stab" AND "anxiety disorders"                |
| "wounds, stab" AND <i>emotional trauma</i>           | <i>wounds, stabs</i> AND "emotional trauma"                | "wounds, stab" AND <i>emotional trauma</i>            |
| "wounds, stab" AND <i>traumatic stress disorder</i>  | <i>wounds, stabs</i> AND <i>traumatic stress disorder</i>  | "wounds, stab" AND "stress disorders, traumatic"      |

|   |   |   |
|---|---|---|
| "wounds, stab" AND <i>traumatic acute stress disorder</i> | <i>wounds, stabs</i> AND <i>traumatic acute stress disorder</i> | "wounds, stab" AND "stress disorders, traumatic, acute" |
| "wounds, stab" AND "stress disorders, post-traumatic"     | <i>wounds, stabs</i> AND "posttraumatic stress disorder"        | "wounds, stab" AND "stress disorders, post-traumatic"   |
| "wounds, stab" AND <i>psychosocial factors</i>            | <i>wounds, stabs</i> AND "psychosocial factors"                 | "wounds, stab" AND <i>psychosocial factors</i>          |
| "wounds, stab" AND "social support"                       | <i>wounds, stabs</i> AND "social support"                       | "wounds, stab" AND "social support"                     |
| "wounds, stab" AND "family relations"                     | <i>wounds, stabs</i> AND "family relations"                     | "wounds, stab" AND "family relations"                   |
| "wounds, stab" AND "caregivers"                           | <i>wounds, stabs</i> AND "caregivers"                           | "wounds, stab" AND "caregivers"                         |
| "wounds, stab" AND "family"                               | <i>wounds, stabs</i> AND family"                                | "wounds, stab" AND "family"                             |
| "wounds, stab" AND "spirituality"                         | <i>wounds, stabs</i> AND "spirituality"                         | "wounds, stab" AND "spirituality"                       |
| "wounds, stab" AND "religion"                             | <i>wounds, stabs</i> AND "religion"                             | "wounds, stab" AND "religion"                           |
| "wounds, stab" AND <i>religion and medicine</i>           | <i>wounds, stabs</i> AND <i>religion and medicine</i>           | "wounds, stab" AND "religion and medicine"              |
| "wounds, stab" AND <i>religiosity</i>                     | <i>wounds, stabs</i> AND "religiosity"                          | "wounds, stab" AND <i>religiocity</i>                   |

Note. Words in quotations are MeSH terms and italicized words are keywords.

APPENDIX A.2: MeSH TERMS AND KEYWORDS USED TO SEARCH

CINAHL SEARCH ENGINE

| <b>Cinahl via EBSCO</b>   |     |   |
|---|-----|---|
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | AND | (MM "Self-Efficacy")  |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | AND | (MH "Quality of Life")  |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | AND | (MH "Coping") OR (MH "Symptom Distress") OR (MH "Avoidance (Psychology)") |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | AND | (MH "depression+") OR (MH "Anxiety Disorders+")                           |

|   |            |  |
|---|------------|--|
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | <p>AND</p> | <p>(MH "Stress+") OR (MH "Stress Disorders, Post-Traumatic")</p> |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | <p>AND</p> | <p>(MH "Support, Psychosocial")</p>                              |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | <p>AND</p> | <p>(MH "Family Relations+")</p>                                  |
| <p>(MH "Wounds and Injuries") OR (MH "Abdominal Injuries") OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR (MH "Back Injuries") OR (MH "Crush Injuries") OR (MH "Dislocations+") OR (MH "Fractures+") OR (MH "Leg Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck Injuries+") OR (MH "Occupational-Related Injuries") OR (MH "Rupture+") OR (MH "Tears and Lacerations+") OR (MH "Rib Fractures") OR (MH "Flail Chest") OR (MH "Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR (MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH "Accidents, Traffic")</p> | <p>AND</p> | <p>(MH "Spirituality") OR (MH "Spiritual Healing")</p>           |

|  |     |  |
|--|-----|--|
| (MH "Wounds and Injuries") OR (MH "Abdominal Injuries")<br>OR (MH "Arm Injuries") OR (MH "Athletic Injuries+") OR<br>(MH "Back Injuries") OR (MH "Crush Injuries") OR (MH<br>"Dislocations+") OR (MH "Fractures+") OR (MH "Leg<br>Injuries+") OR (MH "Ligament Injuries+") OR (MH "Neck<br>Injuries+") OR (MH "Occupational-Related Injuries") OR<br>(MH "Rupture+") OR (MH "Tears and Lacerations+") OR<br>(MH "Rib Fractures") OR (MH "Flail Chest") OR (MH<br>"Wounds, Penetrating") OR (MH "Wounds, Gunshot") OR<br>(MH "Wounds, Stab") OR (MH "Accidental Falls") OR (MH<br>"Accidents, Traffic") | AND | (MH "Religion and Medicine")<br>OR (MH "Religion and<br>Religions") OR (MH "Religion<br>and Psychology") |
|--|-----|--|

*Note.* MH = searches both major and minor headings; MM = searches just for major headings.

## APPENDIX B.1: PERMISSION RECEIPTS

### PERMISSION TO USE THE BRIEF PAIN INVENTORY (BPI; Cleeland, 1991)

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**RE: Order Form for Department of Symptom Research Assessment Tools**

3 messages

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symptomresearch <symptomresearch@mdanderson.org>

Tue, Feb 28, 2017 at 4:59 PM

To: Mary Moran <moranma14@students.ecu.edu>, symptomresearch <symptomresearch@mdanderson.org>

Hello,

I have attached the BPI as you requested. Please note that:

- Your use of the BPI is limited only to the study specified. To use the BPI in additional studies, you must reapply online at [www.mdanderson.org/departments/prg](http://www.mdanderson.org/departments/prg) > Symptom Assessment Tools > The Brief Pain Inventory (BPI).
- You are permitted to reproduce the copy of the BPI that is included with this e-mail. However, you must not remove the copyright notice.
- The BPI may not be modified in any way or translated into another language without the express written consent of the copyright holder, Charles S. Cleeland, PhD. Failure to comply may result in legal action. Permission to alter or translate the instrument may be obtained by contacting me at [symptomresearch@mdanderson.org](mailto:symptomresearch@mdanderson.org) or by mail.

Please let me know if you have any questions. Thank you for your interest in the BPI.

Regards,  
Kristin VanHouten

**Mary Moran** <[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)>  
To: [symptomresearch](mailto:symptomresearch@mdanderson.org) <[symptomresearch@mdanderson.org](mailto:symptomresearch@mdanderson.org)>

Mon, Jun 5, 2017 at 10:13 AM

To Whom It May Concern:

I wanted to update you on my use of the BPI. I am using an electronic survey for my research participants to complete on wireless electronic tablets. How would you like me to cite the questions that reflect the BPI? The participants will be completing numerous assessments and the complete electronic survey is a total of 90 items. I want to comply with your requests I am just unsure how to do this in an electronic form.

Thank you,  
Mary Moran

**Mary Moran, MA**  
**PhD Student, Child Development Family Science**  
**East Carolina University**  
612 E 10th Street  
Greenville, NC 27858  
Cell Phone: 614-364-3717  
[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)  
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**symptomresearch** <[symptomresearch@mdanderson.org](mailto:symptomresearch@mdanderson.org)>  
To: Mary Moran <[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)>, [symptomresearch](mailto:symptomresearch@mdanderson.org) <[symptomresearch@mdanderson.org](mailto:symptomresearch@mdanderson.org)>  
Cc: "Gordon, Sharlet A" <[SA.Gordon1@mdanderson.org](mailto:SA.Gordon1@mdanderson.org)>

Mon, Jun 5, 2017 at 2:04 PM

Hello,

You must send screenshots of the BPI (or BPI question) for Dr. Cleeland's approval prior to use...copyright must appear. If you are not using the complete BPI (validated) it must clearly state "these questions were taken from the BPI" with the copyright. Otherwise you cannot refer to the BPI.

Regards,

Kristin

## APPENDIX B.2: PERMISSION RECEIPTS

### PERMISSION TO USE THE PRIMARY CARE-POSTTRAUMATIC STRESS DISORDER-5

(PC-PTSD-5; Prins et al., 2016)

Hi Dr. Prins,

My name is Mary Moran and I am currently a doctorate student at East Carolina University in the Medical Family Therapy program. I am getting ready for my dissertation (writing my methods chapter and getting ready for the IRB submission). I planning on collecting data from physical trauma survivors in a tertiary setting and want to collect information for PTSD symptoms. I am emailing you to receive permission to use the PC-PTSD-5 measurement tool. Unfortunately, I am unable to find a pdf document that has the 5 questions and if I need to request your permission to use the tool for research purposes. I found the article you wrote with your colleagues from 2016 that developed and evaluated the PC-PTSD-5 and I want to use it for my data collection. Do you have a document that has the five questions or can I receive your permission to create a document that has the five questions on it?

Thank you,  
Mary Moran

**Mary Moran, MA**  
PhD Student, Child Development Family Science  
East Carolina University  
612 E 10th Street  
Greenville, NC 27858  
Cell Phone: 614-364-3717  
[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)

---

Annabel Prins <[annabel.prins@sjsu.edu](mailto:annabel.prins@sjsu.edu)>  
To: Mary Moran <[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)>

Wed, Mar 8, 2017 at 3:59 PM

Dear Mary,

Thanks for your interest in the PC-PTSD-5. The measure is in the public domain so no copyright restrictions. We are working on creating a pdf version of the measure but it is not yet up on the National Center for PTSD website. In other words, feel free to create your own. We only request that you share your creation with us and that you cite the measure appropriately (JGIM, 2016).

Thank you,  
Dr. Prins  
[Quoted text hidden]  
—  
Annabel Prins, PhD  
Professor  
Department of Psychology  
San Jose State University

Faculty Fellow  
Office of Military and Veteran Students  
San Jose State University

Clinical Psychologist  
Dissemination and Training Division  
National Center for PTSD

Dr. Prins,

I wanted to update you on my use of the PC-PTSD-5. I am using an electronic survey for my research participants to complete on wireless electronic tablets. How would you like me to cite the five questions that reflect the PC-PTSD-5? The participants will be completing numerous assessments and the complete electronic survey is a total of 90 items. I want to comply with your requests I am just unsure how to do this in an electronic form.

Thank you,  
Mary Moran

**Mary Moran, MA**  
PhD Student, Child Development Family Science  
East Carolina University  
612 E 10th Street  
Greenville, NC 27858  
Cell Phone: 614-364-3717  
[moranma14@students.ecu.edu](mailto:moranma14@students.ecu.edu)

[Quoted text hidden]

---

**Annabel Prins** <annabel.prins@sjsu.edu>  
To: Mary Moran <moranma14@students.ecu.edu>

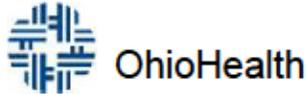
Mon, Jun 5, 2017 at 6:08 PM

Please cite the JGIM article. Thank you.  
[Quoted text hidden]

Clinical Psychologist  
National Center for PTSD  
VA Palo Alto Healthcare System

## APPENDIX C.1: IRB APPROVAL

### OHIOHEALTH IRB APPROVAL



Institutional Review Board  
3545 Olentangy River Road,  
Suite 328  
Columbus, Ohio 43214-3907  
[www.ohiohealth.com](http://www.ohiohealth.com)

#### OhioHealth Corporation Institutional Review Board 2 Expedited Review - Final Approval

July 7, 2017

Teresa Wood, Ph.D, RN,  
NEA-BC

**RE: The Effect of Health & Well-Being of Physical Trauma  
Survivors and Their Primary Support Persons in Relation  
to Patient Outpatient Follow-Up Attendance  
IRB # [1066908-2]**

Dear Dr. Wood:

Your above-referenced protocol was approved by the OhioHealth Corporation Institutional Review Board 2 at the July 31, 2017 meeting. Your study has been approved for a maximum of 400 subjects.

Included in this approval are the following study-related documents:

- Application Form - IRBNetDocument (2).pdf (UPDATED: 06/6/2017)
- Budget - M.Moran\_BUDGET .docx (UPDATED: 06/6/2017)
- Consent Form - Patient Support Person Consent\_4\_10\_17 (1).docx (UPDATED: 06/6/2017)
- Consent Form - Physical Trauma Patient Consent\_4\_10\_17.docx (UPDATED: 06/6/2017)
- Letter - Trauma Support letter.pdf (UPDATED: 06/6/2017)
- Letter - APPENDIX A.2.docx (UPDATED: 06/6/2017)
- Letter - APPENDIX A (1).docx (UPDATED: 06/6/2017)
- Other - OtherCountyServices.pdf (UPDATED: 06/6/2017)
- Other - M.Moran\_DUA OhioHealth.docx (UPDATED: 06/6/2017)
- Other - Columbus\_EMERGENCY-HOTLINE-NUMBERS (1).pdf (UPDATED: 06/6/2017)
- Other - Columbus\_referrals (1).docx (UPDATED: 06/6/2017)
- Other - APPENDIX C.docx (UPDATED: 06/6/2017)
- Protocol - Protocol\_V1\_5\_9\_17 (1).docx (UPDATED: 06/16/2017)
- Questionnaire/Survey - APPENDIX B.docx (UPDATED: 06/6/2017)

If, during the course of the study, there are any modifications or amendments to the study, or you decide to terminate the study, you are required to notify the IRB. In addition, the IRB must be notified of any unanticipated problems that are reported. All correspondence regarding this study must be identified by

the study title and the above assigned IRB Number. Upon completion of the study, you will be required to submit a Study Closure Form to the IRB.

The IRB approval for this study will expire on July 4, 2018. Please submit your Continuing Review by April 5, 2018 in order to avoid lapses in approval of your research and possible suspension. As part of our Continuing Review Process, we may randomly audit your study to ensure compliance with regulations.

If this research is an "applicable trial" per FDA regulations, you are required to register the trial on the [www.clinicaltrials.gov](http://www.clinicaltrials.gov). Please contact the OhioHealth Protocol Registration Account Administrator, Judy Opalek, PhD for assistance.

**As Principal Investigator of this study, it is your responsibility to keep all documentation pertaining to the study.**

The OhioHealth Institutional Review Board is organized and operates according to the Good Clinical Practices, 21 CFR Parts 50 & 56, 45 CFR Part 46, and applicable laws and regulations.

Thank you for your participation in the OhioHealth IRB process. If you have any questions, please contact the Institutional Review Board Office at 614-566-1748

Sincerely,

Randall W. Franz, MD  
Chair, OhioHealth Corporation Institutional Review Board 2

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within OhioHealth Corporation Institutional Review Board 2's records.

## APPENDIX C.2: IRB APPROVAL

### IRB AUTHORIZATION AGREEMENT

#### Institutional Review Board (IRB) Authorization Agreement

|  |                          |
|--|--------------------------|
| Institution Providing IRB Review (IRB of Record) | OhioHealth Corporation   |
| IRB of Record Registration #                     | IRB00002929 (IRB #2)     |
| IRB of Record Federalwide Assurance # (FWA)      | FWA00014752              |
| Relying Institution                              | East Carolina University |
| Relying Institution's Federalwide Assurance #    | FWA00000658              |

The officials signing below agree that East Carolina University may rely on the designated IRB of Record for review and oversight of its human subjects research described below:

This agreement is limited to the following specific protocol(s):

|                               |   |
|-------------------------------|---|
| Name of Research Project      | The Effect of Health & Well-Being of Physical Trauma Survivors and Their Primary Support Persons in Relation to Patient Outpatient Follow-Up Attendance |
| Protocol Number               | IRBNet ID #1066908  |
| Funding Agency (Award Number) | N/A   |

| Point of Contact                           | Name  | Phone        | Email  |
|--|---|--------------|--|
| OhioHealth Principal Investigator          | Teresa Wood, PhD, RN, NEA-BC                                  | 614-566-3068 | <a href="mailto:Teresa.Wood@ohiohealth.com">Teresa.Wood@ohiohealth.com</a>         |
| OhioHealth IRB Point of Contact            | Adam McClintock, MBA, CIP, Human Subjects Protections Manager | 614-566-1748 | <a href="mailto:Adam.McClintock@ohiohealth.com">Adam.McClintock@ohiohealth.com</a> |
| Relying Institution Principal Investigator | Mary Moran  | 614-364-3717 | <a href="mailto:moranma14@students.ecu.edu">moranma14@students.ecu.edu</a>         |
| Relying Institution IRB Point of Contact   | Kenneth W. Briley, MSW, CIP                                   | 252-744-5313 | <a href="mailto:kbrileyk@ecu.edu">kbrileyk@ecu.edu</a>                             |

The review performed by OhioHealth Corporation will meet the human subject protection requirements of the relying institution's OHRP-approved FWA. The IRB at OhioHealth Corporation may serve as the HIPAA privacy board as necessary. The IRB at OhioHealth Corporation will follow standard procedures for reporting its findings and actions to appropriate officials at the relying institution. Relevant minutes of IRB meetings will be made available to the relying institution upon request. The relying institution remains responsible for ensuring compliance with the IRB's determinations and with the Terms of its OHRP-approved FWA. This document must be kept on file by both parties and provided to OHRP upon request.

Signature of Signatory Official of OhioHealth Corporation (IRB of Record):

|                          |   |
|--------------------------|---|
| Institution              | OhioHealth  |
| Signatory Official Title | Doug Krasner, MD<br>System Vice President, Academic Affairs<br>Chief Academic Officer |
| Phone                    | 614-514-3353  |
| Email                    | <a href="mailto:doug.krasner@ohiohealth.com">doug.krasner@ohiohealth.com</a>          |
| Signature                |    |
| Date                     | 8/2/2017  |

Signature of Signatory Official of the East Carolina University (Relying Institution)

|                          |   |
|--------------------------|---|
| Institution              | East Carolina University  |
| Signatory Official Title | Michael Van Scott, PhD<br>Senior Associate Vice Chancellor and Chief Research Officer |
| Phone                    | 252-328-9479  |
| Email                    | <a href="mailto:vanscottmi@ecu.edu">vanscottmi@ecu.edu</a>                            |
| Signature                |    |
| Date                     | 8/2/2017  |

APPENDIX D.1: SURVEY  
DEMOGRAPHIC SURVEY

Confidential

Page 1 of 18

## Demographics

Thank you for taking the time to participate in this study. Please complete the survey below.

- 1) How old are you? \_\_\_\_\_
- 2) To which gender identity do you most identify?
- Male
  - Female
  - Transgender Female
  - Transgender Male
  - Gender Variant/Non-conforming
  - Not listed
- 3) Which of the following races, you may select more than one, best represents you?
- White
  - Asian
  - Black or African American
  - American Indian or Alaska Native
  - Native Hawaiian or Pacific Islander
  - Other
- 4) Are you Hispanic or Latino in your ethnic origin?
- Yes
  - No
- 5) What is the highest level of school you have completed or the highest degree you have received?
- Less than high school degree
  - High school graduate (high school diploma or GED)
  - Some college but no degree
  - Associate degree in college (2-year)
  - Bachelor's degree in college (4-year)
  - Master's degree
  - Doctoral degree
  - Professional degree (JD, MD)
- 6) Information about income is important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in 2016 before taxes.
- Less than \$10,000
  - \$10,000 to \$19,000
  - \$20,000 to \$29,000
  - \$30,000 to \$39,000
  - \$40,000 to \$49,000
  - \$50,000 \$59,999
  - \$60,000 \$69,999
  - \$70,000 \$79,999
  - \$80,000 \$89,999
  - \$90,000 \$99,999
  - \$100,000 \$149,999
  - \$150,000 or more
- 7) What is your relationship status?
- Single
  - Married
  - Widowed
  - Divorced
  - Separated

- 8) Which statement best describes your current employment status?
- Working (paid employee)
  - Working (self employed)
  - Not working (temporary layoff from a job)
  - Not working (looking for work)
  - Not working (retired)
  - Not working (disabled)
  - Not working (other)
  - Not working (student)
- 9) What is your relationship to the patient OR primary support person? For example: friend, parent, partner, etc.
- \_\_\_\_\_
- 10) Do you and the patient OR primary support person reside together?
- Yes
  - No
- 11) Which option most accurately represents your health care insurance deductible amount?
- Less than \$1,000
  - \$1,000 - \$2,000
  - \$2,001 - \$3,000
  - \$3,001 - \$4,000
  - \$4,001 - \$5,000
  - \$5,001 - \$6,000
  - \$6,001 - \$7,000
  - \$7,001 - \$8,000
  - Greater than \$8,000

APPENDIX D.2: SURVEY  
RESEARCH SURVEY

Confidential

Page 3 of 18

**GAD7**

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**Over the last 2 weeks, how often have you been bothered by the following problems?**

|   | Not at all sure       | Several days          | Over half the days    | Nearly every day      |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| 12) Feeling nervous, anxious, or on edge              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 13) Not being able to stop or control worrying        | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 14) Worrying too much about different things          | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 15) Trouble relaxing                                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 16) Being so restless that it's hard to sit still     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 17) Becoming easily annoyed or irritable              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 18) Feeling afraid as if something awful might happen | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## PHQ8

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**Over the last 2 weeks how often have you been bothered by any of the following problems? (Click the circle to indicate your answer)**

19) Little interest or pleasure in doing things

- Not at all
- Several days
- More than half the days
- Nearly every day

20) Feeling down, depressed, or hopeless

- Not at all
- Several days
- More than half the days
- Nearly every day

21) Trouble falling or staying asleep, or sleeping too much

- Not at all
- Several days
- More than half the days
- Nearly every day

22) Feeling tired or having little energy

- Not at all
- Several days
- More than half the days
- Nearly every day

23) Poor appetite or overeating

- Not at all
- Several days
- More than half the days
- Nearly every day

24) Feeling bad about yourself -- or that you are a failure or have let yourself or your family down

- Not at all
- Several days
- More than half the days
- Nearly every day

25) Trouble concentrating on things, such as reading the newspaper or watching television

- Not at all
- Several days
- More than half the days
- Nearly every day

- 26) Moving or speaking so slowly that other people could have noticed? Or the opposite -- being so fidgety or restless that you have been moving around a lot more than usual
- Not at all
  - Several days
  - More than half the days
  - Nearly every day

## PC-PTSD-5

In your life, have you ever had any experience that was so frightening, horrible or upsetting that, IN THE PAST MONTH, you:

- 27) Had nightmares about the event(s) or thought about the event(s) when you did not want to?
- Yes  
 No
- 28) Tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)?
- Yes  
 No
- 29) Were constantly on guard, watchful, or easily startled?
- Yes  
 No
- 30) Felt numb or detached from people, activities, or your surroundings?
- Yes  
 No
- 31) Felt guilty or unable to stop blaming yourself or others for event(s) or any problems the event(s) may have caused?
- Yes  
 No

Developed and permission to use granted by:  
Prins, A., Bovin, M. J., Smolenski, D. J., Marx, B. P., Kimerling, R., Jenkins-Guarnieri, M. A., . . . Tiet, Q. Q. (2016). The primary care PTSD screen for DSM-5 (PC-PTSD-5): Development and evaluation within a veteran primary care sample. *Journal of General Internal Medicine*, 31(10), 1206-1211. doi:10.1007/s11606016-3703-5

**MOS-SSS**

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**People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? Select one option for each question.**

32) Someone you can count on to listen to you when you need to talk

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

33) Someone to give you information to help you understand a situation

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

34) Someone to give you good advice about a crisis

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

35) Someone to confide in or talk about yourself or your problems

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

36) Someone whose advice you really want

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

37) Someone to share your most private worries and fears with

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

38) Someone to turn to for suggestions about how to deal with a personal problem

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

39) Someone who understand your problems

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

40) Someone to help you if you were confined to bed

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

41) Someone to take you to the doctor if you needed it

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

42) Someone to prepare your meals if you were unable to do it yourself

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

43) Someone to help with daily chores if you were sick

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

44) Someone who shows you love and affection

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

45) Someone to love and make you feel wanted

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

46) Someone who hugs you

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

47) Someone to have a good time with

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

48) Someone to get together with for relaxation

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

49) Someone to do something enjoyable with

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

50) Someone to do things with to help you get your mind off things

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

**HWBQ**

51) Do you have, or are you being treated for, any of the following conditions?

- Anxiety
- Arthritis
- bronchitis, or emphysema
- Back or spinal problems
- Cancer
- Depression or bipolar disorder
- Diabetes
- Heart disease
- High blood pressure
- High cholesterol
- Migraine Headaches
- Sinusitis or allergic rhinitis (hayfever)
- Any other serious health problem for which you are receiving medical treatment

52) On average how many units of alcohol do you consume PER WEEK

- I do not drink alcohol
- 0-7
- 8-14
- 15-20
- 21 or more

53) Do you smoke EVERY DAY?

- Yes
- No

54) How much bodily pain have you experienced in the LAST 3 MONTHS?

- None
- Mild
- Moderate
- Severe
- Very Severe

55) Which of the following 5 statements best describes your usual level of physical activity?

- I avoid exerting myself whenever possible. I use the elevator rather than taking the stairs and drive rather than walk.
- I often walk places and occasionally exercise enough to cause myself to breathe more heavily than usual, but do this for less than 30 minutes per day.
- I take regular moderate intensity activity (such as cycling, brisk walking, playing golf, or gardening) that causes me to breathe more heavily than usual and sweat. On average I do this for 30 minutes a day on most days of the week.
- I regularly do high intensity physical activity, such as running, swimming lengths, or gym work. I do this for between 30 and 60 minutes a week.
- I regularly do high intensity physical activity, such as running, swimming lengths, or gym work. I do this for more than an hour a week.

56) How many portions of fiber do you eat A DAY?

- 1 or none
- 2 or 3
- 3 or 4
- 5
- 6 or more

57) How often do you eat a portion of fruit or vegetables?

- Rarely or never
- less than once per day
- 1-2 times per day
- 3-4 times per day
- 5 or more times per day

58) When choosing foods for your meal, do you usually select high-fat or low-fat foods?

- I choose high-fat foods nearly all the time
- I choose high-fat foods most of the time
- I choose both high and low-fat foods equally often
- I choose low-fat foods most of the time
- I choose low-fat foods all of the time

59) On a scale of 1-5 how satisfied are you with your current job?

- Not very satisfied
- A little satisfied
- Moderately satisfied
- Satisfied
- Very satisfied

60) How much of the time during the LAST 3 MONTHS have you felt calm and peaceful?

- Not at all
- A little
- A moderate amount
- Most of the time
- All of the time

61) How much of the time during the LAST 3 MONTHS did you have a lot of energy?

- Not at all
- A little
- A moderate amount
- Most of the time
- All of the time

62) How much of the time during the LAST 3 MONTHS have you felt depressed or sad?

- Not at all
- A little
- A moderate amount
- Most of the time
- All of the time

63) How much of the time during the LAST 3 MONTHS have you felt happy?

- Not at all
- A little
- A moderate amount
- Most of the time
- All of the time

64) How do you feel about the COMING 6 MONTHS?

- Very concerned and worried, the coming six months are going to be very difficult for me and I'm not sure how well I'll cope.
- Moderately concerned and worried, the coming six months are going to be difficult, but I'm sure I'll cope.
- Neither concerned nor optimistic, the coming six months are going to be pretty much the same as usual for me.
- Moderately optimistic, I think the coming six months are going to be good for me.
- Very optimistic, I am looking forward to the coming six months, everything is going right for me.

- 65) During the LAST 3 MONTHS how much of the time have you felt overwhelmed with pressure or stress from responsibilities, circumstances or relationships?
- Not at all
  - A little of the time
  - A moderate amount of the time
  - Most of the time
  - All of the time
- 66) On average how many hours of sleep do you get A NIGHT?
- 5 or less hours
  - More than 5 hours but less than 7 hours
  - 7-8 hours
  - More than 8 hours
- 67) In general how happy are you with the amount and quality of sleep that you get?
- Very happy, I sleep well
  - Mostly happy, I usually sleep well but occasionally I have difficulties
  - A little unhappy, I often have sleep difficulties
  - Very unhappy, I regularly have sleep difficulties and usually sleep very poorly
- 68) How refreshed and restored do you feel 1/2 AN HOUR AFTER GETTING UP IN THE MORNING?
- Completely refreshed and restored
  - A little tired but generally refreshed
  - Rather un-refreshed, but able to function
  - Completely exhausted and un-refreshed
- 69) Consider your work responsibilities and how effective you are in accomplishing them. How effective in your work have you been over the LAST 3 MONTHS?
- Not effective
  - A little effective
  - Moderately effective
  - Quite effective
  - Highly effective

## BPI

70) Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these every day kinds of pain TODAY?

- Yes
- No

71) Identify the areas where you feel pain.

72) Identify the area that hurts the most.

\_\_\_\_\_

Please rate your pain by identifying the number that best describes your pain:

73) At its worst in the LAST 24 HOURS.

- 0 (No pain)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Pain as bad as you can imagine)

74) At its least in the LAST 24 HOURS.

- 0 (No pain)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Pain as bad as you can imagine)

75) On the average.

- 0 (No pain)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Pain as bad as you can imagine)

76) Right now.

- 0 (No pain)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Pain as bad as you can imagine)

77) What treatments or medications are you receiving for your pain? Please separate each treatment or medication with a comma.

78) In the LAST 24 HOURS, how much relief have pain treatments or medications provided? Please select the one percentage that most shows how much relief you have received.

- 0% (No relief)
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100% (Complete relief)

Select the one number that describes how, during the past 24 hours, pain has interfered with your:

79) Mood

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9
- 10 (Completely interferes)

80) General activity

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9
- 10 (Completely interferes)

81) Walking ability

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9
- 10 (Completely interferes)

82) Normal work (includes both work outside the home and housework)

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9
- 10 (Completely interferes)

83) Relations with other people

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Completely interferes)

84) Sleep

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Completely interferes)

85) Enjoyment of life

- 0 (Does not interfere)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (Completely interferes)

Developed, copyrighted, and permission to adapt and use granted by:  
Cleeland, C. S. (1991). Pain assessment in Cancer. In Osoba, D. (Eds.), Effect of Cancer on Quality of life (293-305).  
Boca Raton, FL: CRC Press, Inc.

## Opioid Risk Tool (ORT)

Mark each box that applies

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### 1. Family history of substance abuse

- Alcohol  &nbsp;nbsp;nbsp;
- Illegal drugs  &nbsp;nbsp;nbsp;
- Prescription drugs  &nbsp;nbsp;nbsp;

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---

### 2. Personal history of substance abuse

- Alcohol  &nbsp;nbsp;nbsp;
- Illegal drugs  &nbsp;nbsp;nbsp;
- Prescription drugs  &nbsp;nbsp;nbsp;

---

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### 3. Age

- Check box if 16-45 years old  &nbsp;nbsp;nbsp;

---

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### 4. History of preadolescent sexual abuse

- Check box if experienced preadolescent sexual abuse  &nbsp;nbsp;nbsp;

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### 5. Psychological disease

- Attention-deficit disorder, obsessive-compulsive disorder, bipolar, schizophrenia  &nbsp;nbsp;nbsp;
- Depression  &nbsp;nbsp;nbsp;

## Chart Review Information

Patient Info

Age: [age]  
Gender: [gender]

Subject Type

- Patient
- Primary Support

Health Insurance Type

- Medicaid
- Medicare
- Private
- Self Pay
- Other Government
- Workman's Comp
- Other (i.e. Charity)

Modality of Injury (trauma database)

- MVA/MCC (vehicle)
- MVA/MCC (pedestrian)
- GSW/Stabbing
- Assault
- Fall
- Other

Explain:

\_\_\_\_\_

ISS (Raw)

\_\_\_\_\_

ISS

- 1-9 (minor)
- 10-15 (moderate)
- 16-24 (moderate/severe)
- 25+ (severe/critical)

Distance from home to clinic (miles)

\_\_\_\_\_

Substance Use: ETOH

\_\_\_\_\_

Substance Use: Other

- Benzo
- THC
- Amphet
- COC
- OPI
- Other

Describe other:

\_\_\_\_\_

Substance Use: AUDIT (Raw)

\_\_\_\_\_

Substance Use: AUDIT (Risk Category)

- 0-7
- 8-15
- 16-19
- 20-40

Substance Use: CAGE-AID

\_\_\_\_\_

(0-4)

Acute Care Surgery Office follow-up appointment scheduled?

- Yes
- No

Patient Attendance in Outpatient Trauma

- Yes
- No

