

PTSD SCREENING IN HOSPITALIZED TRAUMA PATIENTS WITH MILD
TRAUMATIC BRAIN INJURY: BARRIER IDENTIFICATION

by

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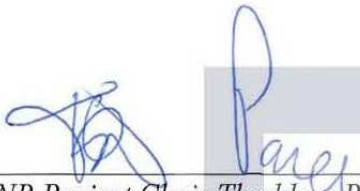
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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by *Justin Hall*, titled *PTSD Screening in Hospitalized Trauma Patients with Mild Traumatic Brain Injury: Barrier Identification* and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.



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Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.



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ABSTRACT

Background: Posttraumatic stress disorder (PTSD) has a significant impact on psychological and physical rehabilitation following a traumatic injury with mild traumatic brain injury (mTBI). PTSD presents a significant challenge that necessitates the screening process in the acute care hospital setting to better identify this at risk population. **Purpose:** Identify behavioral barriers amongst trauma service providers that impact the potential implementation of an evidence-based PTSD screening process for inpatients with mTBI at Desert Regional Medical Center located in Palm Springs, CA. **Theoretical framework:** Theoretical Domains Framework (TDF) and the Self-Determination Theory informed this project with the Ottawa Model of Research Use (ORMU) used as an intervention strategy recommendation. **Methods:** Descriptive study using a Likert-scale type questionnaire taken by providers caring for trauma patients with mild traumatic brain injury. **Results:** There were 6 participants that completed the 31-item questionnaire. Important barriers were identified in the following 5 domains of behavioral practice change: Knowledge, Skills, Optimism, Intentions, and Environmental context & resources. **Conclusion:** Behavioral practice change barriers of knowledge, skills, optimism, intentions, and environmental context & resources were identified in the potential adoption of a practice change behavior for the screening of PTSD in trauma patients with mTBI. Potential implementation of PTSD screening in the hospital setting has a unique set of potential barriers and facilitators to long-term adoption. Future targeted implementation strategies can be used to effectively address behavioral change barrier patterns in support of current practice guidelines and recommendations.

BACKGROUND

Psychological effects of traumatic injury, including mild traumatic brain injury (mTBI), can have a significantly deleterious influence on far reaching-aspects of a person's life. Post-traumatic stress disorder (PTSD) is considered a stressor-related disorder, characterized by negative alterations in mood and cognition, intrusion, avoidance, and alteration in arousal and reactivity following a traumatic physical injury and lasting greater than 30 days (Bahraini et al., 2014). Diagnosis of PTSD according to the Diagnostic and Statistical Manual of Mental Disorders Version 5 (DSM-V) requires several criteria including: (A) patient was exposed to death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence; (B) traumatic event is persistently re-experienced in the following ways: intrusive thoughts, nightmares, flashbacks, emotional distress, and physical reactivity; (C) avoidance of trauma-related stimuli after the trauma; (D) negative thoughts or feelings that began or worsened after the trauma; (E) trauma related arousal and reactivity that began or worsened after the trauma; (F) symptoms lasting more than one month; (G) symptoms create distress or functional impairment; (H) symptoms are not due to medication, substance use or other illness (Stein et al., 2014). Brief screening tools designed for medical settings target symptoms of avoidance, anxiety, and detachment to identify early development of PTSD after acute traumatic events. Lack of early identification of PTSD in the acute hospital setting can lead to chronic PTSD that is associated with an impaired sense of well-being, unemployment, mood and anxiety disorders, substance abuse disorders, higher suicide rates, and poor physical health; co-morbidities place a large burden on the public health care system when PTSD persists undetected (Gallagher & Brown, 2015).

Mild traumatic brain injury can be difficult to identify, relying oftentimes on mechanism of injury and symptom presentation to accurately diagnose (Blyth & Bazarian, 2010). Diagnosis of mTBI can be made when there is a traumatic insult to the head in combination with a Glasgow Coma Scale of 13-15 with reported loss of consciousness lasting not longer than 30 minutes and posttraumatic amnesia not lasting longer than 24 hours (Blyth & Bazarian, 2010; Levin & Diaz-Arrastia, 2014). Variability in opinion exists amongst consensus experts regarding the presence of acutely positive neuroimaging findings via computed tomography and magnetic resonance imaging techniques (Levin & Diaz-Arrastia, 2014). Positive neuroimaging findings for mTBI would most likely include: subdural hematoma, subarachnoid hemorrhage, and diffuse axonal injury.

Each year nearly 2.3 million people in the United States are admitted with a traumatic injury, with trauma being the number one cause of death from ages 1 to 46 (National Trauma Institute, 2015). PTSD accounts for a total lifetime prevalence of 8% in the United States (PTSD statistics, 2015). When occurrence of traumatic injury is considered, mTBI is often present and increases the estimates of PTSD prevalence in this population to between 11% and 40% (Haarbauer-Krupa et al., 2016). Economic burden due to related medical and non-medical costs is nearly \$43 billion; half of these costs are attributed to high rates of healthcare utilization in which persons with PTSD often have the highest rates of use due to overlooked or under-diagnosed events related to the original traumatic injury (Sidran Institute, 2016).

Wiseman, Foster, and Curtis (2013) concluded that PTSD frequently occurs several days to several months after injury and is a direct mental health result of traumatic injury that is poorly identified in the acute care hospital setting, resulting in significant reduction in quality of

life outcomes. Hoffman et al. (2014) reported that measuring health outcomes after major trauma are inconsistent, and very few concern themselves with mental health outcome measures. Zatzick et al. (2013) identified both the Clinician-Administered PTSD Scale (CAPS) and the PTSD Checklist Civilian Version (PCL-C) as specific early screening measures used to identify characteristics of PTSD, allowing for subsequent guideline based interventions that successfully reduced PTSD prevalence 12 months after injury. Shalev et al. (2016) determined that evidence-based early intervention therapy accelerated recovery from acute PTSD; prevalence persisted three years after injury highlighting a major challenge in health care.

The American College of Surgeons' Committee on Trauma (ACS/COT) is the governing board that determines verification requirements for trauma centers in the United States and develops national best practice recommendations and guidelines in trauma care (American College of Surgeons Committee on Trauma, 2014). There are no current requirements for PTSD screening from the ACS/COT, however there are several recommendations based on evolving research and standard quality of life measures after injury rehabilitation. The ACS/COT recommends the following: early screening in the inpatient setting and referral with available resources for at-risk patients; screening for both PTSD and depression given the strong correlation between the two disorders; and a plan to evaluate, support, and treat PTSD should be a consideration in any comprehensive rehabilitation program for traumatically injured patients (American College of Surgeons Committee on Trauma, 2014). A recent survey of level I and level II trauma centers (n=391) in the United States reported only 7% of trauma centers routinely screened for PTSD compared to 23% screening for depression, 49% screening for suicide, and 90% screening for alcohol and drug use (Love & Zatzick, 2014). Use of a standardized protocol

and screening tool could increase rates of PTSD identification in the trauma population with mTBI, thus improving the depth of evidence that screening for PTSD in trauma centers become a mandate versus a recommendation.

VA/DOD Practice Guideline

The VA/DOD clinical practice guideline for management of PTSD (update 2010) can assist the clinician in identifying at risk trauma populations that present with co-morbidities. Methods of early population-based screening are supported with algorithm style therapeutic approaches on a continuum. The VA/DOD clinical practice guideline for management of post-traumatic stress is necessary for the recognition and complex management that clinicians often face in a large population base with the potential for several present co-morbidities (Susskind, Ruzek, & Friedman, 2012).

In a variety of settings, recognition can be complicated by several factors that lead to poorer outcomes. If appropriate screening is conducted and patients are at risk for PTSD, clinicians are presented with multiple levels of therapy that have varying grades of evidence to complicate treatment. This clinical practice guideline contains extensive algorithms to assist the clinician in early recognition and pathways of evidence-based treatment options for any population consideration in acute, primary, and military practice settings (Susskind et al., 2012).

Local Problem

PTSD screening practices at Desert Regional Medical Center, a Level II Trauma Center in Palm Springs, CA, currently are not a standard of practice to identify traumatically injured patients at risk for future development of PTSD, including patients who have experienced mTBI.

Desert Regional Medical Center is currently one of three trauma centers located in Riverside County, California. Located in southern California, the trauma center serves Riverside, San Bernardino, and Imperial counties with a population of approximately 4.5 million people. Using the EpiCenter California Injury Data Online interactive database, TBI statistics were identified for Riverside County that included the following variables: TBI as primary or secondary diagnosis, non-fatal hospitalization, all races above 15 years of age, male and female gender, and all mechanisms of injury reported. With the selected array of variables included, a total of 7,771 cases between 2010 and 2014 were reported in Riverside County (California Department of Public Health: Epicenter California Injury Data Online, 2017). Table 1 depicts the variables selected for the database calculation and the distribution of results from 2010-2014. Statistics reveal a significant number of TBIs in Riverside County alone, with incidents increasing on a yearly basis. Even though these statistics are not hospital specific, Desert Regional Medical Center along with the Desert Trauma Services treats a large TBI patient population and plays a major role in coordinating care during and after the acute hospitalization.

TABLE 1. *TBI statistics for Riverside County, California, 2010-2014*

Year	# of Cases	Variable filters include:
2010	1291	
2011	1402	<ul style="list-style-type: none"> • Non-fatal hospitalization • All races above 15 years of age • Both male and female • All mechanisms of injury • TBI as primary or secondary diagnosis
2012	1553	
2013	1706	
2014	1819	
TOTAL:	7,771 cases	

For the current project, barrier evaluation regarding the lack of screening was conducted on providers responsible for the care of traumatically injured patients directly admitted from the emergency department. The trauma population varies widely with non-violent and violent mechanisms of injury that leave patients susceptible to significant injury leading to deleterious

effects on psychological health. Without proper education, awareness, and resources, the inpatient trauma population will be discharged from the hospital setting without any potential resources to prevent or address developing psychological distress. Advanced practice registered nurses can serve to further evaluate trauma patient's psychological well-being in the hospital setting as part of an inter-disciplinary team structure with the goals of improving physical outcomes and reducing psychological sequela associated with traumatic injury. Structured inter-disciplinary care involving mental health can also better ensure transitional care of trauma patients into other facilities for rehabilitation or into the community where long-term surveillance is crucial.

Purpose

The purpose of this quality improvement project is to identify behavioral barriers to practice change amongst trauma service providers prior to the implementation of an evidence-based PTSD screening evaluation in traumatically injured hospitalized patients with mTBI at Desert Regional Medical Center. The intended outcome includes identification of behavioral change strategies to inform a future PTSD screening initiative with long-term sustainability efforts. Stakeholders for the initiative involve trauma service providers, social work, multidisciplinary medical team members, and administrators at Desert Regional Medical Center.

Study Question

This project worked to identify behavioral practice change barriers that exist for implementation of PTSD screening at Desert Regional Medical Center prior to implementation of any screening implementation programs at the site.

CONCEPTUAL FRAMEWORK

Theoretical Domains Framework

The Theoretical Domains Framework (TDF) is a comprehensive theory-based spectrum of domains that influence behavior change (Phillips et al., 2015). Researchers are able to use the TDF to systematically understand barriers and enablers that influence implementation outcomes in the healthcare setting (Wong, 2017). Refinement of the framework in 2012 identified 14 domains: Knowledge, Skills, Social/Professional Role and Identity, Beliefs about Capabilities, Optimism, Beliefs about Consequences, Reinforcement, Intentions, Goals, Memory, Attention and Decision Processes, Environmental Context and Resources, Social Influences, Emotions, and Behavioral Regulation (Cane, O'Connor, & Michie, 2012). Revision of the TDF framework has established improved links between theories of behavior change techniques that serve to address implementation problems (Cane et al., 2012).

Broad identification of barriers and enablers at the individual and organizational level within the 10 domains aided in developing a targeted intervention that is site specific based on behavioral patterns (Phillips et al., 2015). The TDF is capable of being implemented within multiple disciplines that are typically considered potential adopters of innovation in the hospital setting (Phillips et al., 2015). Barrier identification in the inpatient hospital setting required a dynamic and full-breadth assessment of behaviors that influenced change and uptake of adoption.

Providers require a broad base of knowledge in the care of patients with formal training tying together several disciplines in order to provide a holistic level of care for their patients and families. The theoretical domains framework is capable of understanding the underpinning

motivation for each facet of care that is provided by physicians and what barriers exist to inhibit effective care. Addressing of barriers to professional practice with those directly involved in the care of trauma patients will enhance the long-term adoption of innovation to improve patient outcomes.

Self-Determination Theory

Self-determination theory (SDT) is the meta-theoretical approach to human motivation and personality that highlights the importance of an individual's inner resources for personality development and self-regulation of behavior (Ryan & Deci, 2000). SDT posits an individual's inherent growth and basis for self-motivation and personality integration is fostered by positive processes based on three needs: (1) perceptions of competence, (2) relatedness to others, and (3) feelings of personal autonomy (Ryan & Deci, 2000). The SDT lies on a continuum where the most self-determined goals are driven by intrinsic motivation, performed for the pure enjoyment of the activity. Extrinsic motivation consists of three variants that differ in strength of self-determination: (1) identified regulation to achieve internal goals, (2) introjected regulation to avoid negative emotion or for ego enhancement, and (3) external regulation to achieve tangible awards or avoid punishment from external influence (Ryan, Patrick, Deci, & Williams, 2008).

Self-awareness deficits seen in traumatic brain injury due to limited adaptation time has been reported to impact intrinsic methods of self-determination, influencing psychological and physical outcomes (Bach & David, 2006; Rabinowitz & Lewin, 2014). Cognitive and behavioral executive functions disturbed by mTBI threaten an individual's ability to engage in independent goal-oriented behavior, thus the breakdown in self-motivation and positive fostering of needs required for self-determination in the setting of health related outcomes (Rabinowitz & Lewin,

2014). Screening for PTSD in hospitalized trauma patients with mTBI supports the Self-Determination Theory by identifying potentially deleterious alterations in intrinsic motivation that impact recovery.

Ottawa Model of Research Use

The OMRU is an interdisciplinary framework with both descriptive and prescriptive components supported by research utilization, diffusion of innovations, and health behavior change (Logan & Graham, 2010). Each component dynamically influences the other while the model operates under the assumption that the client outcomes are the main goal, research use is ethical, and consideration of the societal environment influencing all aspects of the process (Logan & Graham, 2010). All components of the descriptive and prescriptive framework exist within continuous feedback loops that are capable of interacting with any other component within the model, leading to the capacity at any time to flexibly evaluate and adjust to current circumstances or conditions.

Goals of this quality improvement project were to conduct a thorough behavioral barrier assessment of trauma service providers that informed practice change recommendations regarding PTSD screening in hospitalized trauma patients with mTBI. Within the OMRU model, extensive barrier assessment using the TDF informed the far left (prescriptive and descriptive) side of the model that focuses on assessment of the innovation, potential adopters and practice environment. Completion of the barrier assessment provided the foundational work for targeted intervention recommendation strategies based on the OMRU model.

The adoption component constitutes the initial or sustained use of an innovation that can vary amongst adopters and their level of experience or willingness to adapt to change (Logan &

Graham, 2010). Conducting a thorough assessment of behavioral barriers established an understanding of provider characteristics leading to adopted change. Presentation of this quality improvement project to stakeholders will provide the platform for successful intervention planning based on the final results.

SYNTHESIS OF EVIDENCE

The purpose of this project was to assess physician barriers to potential utilization of an evidence-based posttraumatic stress disorder (PTSD) screening tool in traumatically injured patients with mild traumatic brain injury (mTBI) in the inpatient hospital setting. Levels of evidence overall represent the prospective longitudinal design (Level 4), aiding in determination of prevalence, trajectories, and demographics associated with PTSD in the study population. Several studies draw from the experience of military populations and the significant frequency of co-occurring PTSD and mTBI in military personnel suffering a blast injury during deployment. There is limited randomized controlled trial support of screening and early intervention within the hospital setting, largely due to limited resource availability. Prospective evaluation has provided a great deal of insight into the correlation between early identification and long-term outcomes, even with the drawbacks of self-report and attrition commonly occurring.

Inpatient Screening

Initiating a defined screening procedure at the inpatient level is the first step in identifying potential PTSD in trauma patients with mTBI. Frank, Schroeter, and Shaw (2017) described the use of a standardized tool by nursing to screen patients for the presence of PTSD in the hospital setting. Response rates were high, indicating ease of use of the screening tool matches the time-restricted demands of staff. The relatively small sample revealed no increase in

health psychology consults and identified variability in the implementation of the screening tool, revealing gaps in knowledge of PTSD in the traumatically injured population by staff (Frank, Schroeter, & Shaw, 2017).

Conversely, automated screening using the electronic medical records can effectively detect early PTSD at a population level amongst trauma patients (Russo, Katon, & Zatzick, 2013). Efficiency of electronic medical record screening tools can identify sub-populations at risk for PTSD, as well as, reach more individuals due to wider applicability. Russo, Katon, and Zatzick (2013) determined good sensitivity and specificity to detect PTSD in a trauma population, but caution the resource intensive nature of screening more individuals that will require follow-up with mental health professionals. Strategies for screening of PTSD in trauma patients will likely be a facility specific decision due to variability amongst all trauma centers in regards to available resources.

Predisposing Factors

Studies in both the military and civilian population have described methods of determining characteristics that lead to PTSD development after injury. Deployment acquired mTBI in military personnel consistently increased the odds and severity of PTSD or other co-morbid psychiatric conditions in the months following injury during deployment (Yurgil et al., 2014; Stein et al., 2015; Manners et al., 2016). These studies limited the time frame to no longer than nine months post-injury; therefore, extended trajectory of chronic or latent PTSD could not be explored. Pre-deployment mTBI was an inconsistent predictor of PTSD, revealing the need for long-term studies in the military population to understand the behavioral relationship of PTSD on military veterans with mTBI. Stein et al. (2015) and Yurgil et al. (2014) were two very

large cohort studies that had significant power to predict relationships between deployment characteristics and PTSD development.

Prospective studies attempting to identify pre-disposing factors to the development of PTSD after traumatic injury are widely variable. Just as current mTBI in the military population is a predictor of developing PTSD, mTBI in the civilian population presenting with traumatic injury is a predictor of PTSD symptom development (Haarbauer-Krupa et al., 2016; Warren et al., 2015). Inconsistencies among demographic predictors of PTSD in the studies, enhances the argument for site-specific population screening to identify the trauma population most at risk. Data reveals the strength of considering mTBI in acutely injured patients as a risk factor for long-term psychological distress (Haarbauer-Krupa et al., 2016; Warren et al., 2015).

PTSD Trajectory

Bryant et al. (2015) explored the long-term trajectory of PTSD in trauma patients within the civilian population. Identification of several categories of PTSD symptom presentation is described as: chronic class (4%), recovery class (6%), worsening/recovery class (8%), worsening class (10%), and resilient class (73%) (Bryant et al., 2015). Most troubling was the sub-group of patients with unrelenting symptoms of PTSD during the six-year study period. Chronic and worsening PTSD groups were noted to utilize mental health services more often and had more psychological impairment than other groups (Bryant et al., 2015).

Extended timeframe analysis allowed pattern recognition that could not be seen in short-term studies. It is well understood that delayed onset PTSD can manifest greater than six months after injury, highlighting the importance of long-term trajectory identification (O'Donnell et al., 2013). Bryant et al. (2013) indicates that mTBI was the highest risk factor for unrelenting PTSD,

thus suggesting the importance of early post-injury screening of PTSD in the acute care setting. The proposed gap in trajectory identification is determining the linear relationship between acute and long-term psychological responses to traumatic injury. Linking more severe acute PTSD to long-term impairments experienced will require more extensive PTSD screening in the hospital setting to identify those at risk.

Physical and Mental Health Outcomes

Understanding the effects of mTBI and PTSD on physical and mental health is beneficial to the supplementary understanding of PTSD development trajectories following injury. Several studies have investigated outcomes in both military and civilian populations (Haarbauer-Krupa et al., 2016; MacDonald et al., 2016; Schweininger et al., 2014; Stein et al., 2015). Both Stein et al. (2015) and MacDonald et al. (2016) identified major depressive disorder in military patients with mTBI and PTSD compared to those without mTBI. Over a five-year period, MacDonald et al. (2016) determined that disability, PTSD symptoms, and depression severity only marginally improved. These results indicate the greater level of risk for long-term disability and psychological pathology in persons with mTBI and PTSD. Tracking of the mTBI and PTSD population early and initiating evidence-based treatment could reduce long-term effects of PTSD in the mTBI population.

Haarbauer-Krupa et al. (2016) determined civilian mTBI patients that developed PTSD had increased psychological distress scores, increased post-concussion symptoms, decreased cognitive function, and decreased quality of life scores 12-months post injury. Similarly, Schweininger et al. (2014) determined the presence of PTSD after mTBI significantly impacted both mental health and disability 12-months after injury. Civilian studies reveal the relationship

between PTSD in mTBI patients and long-term disability and psychological distress. Improved development of screening the mTBI population in the acute care setting is warranted, strengthening the argument for early recognition and intervention to reduce long-term sequelae of injury. Significantly, persons with PTSD or delayed onset PTSD tend not to seek treatment once they are discharged.

In-Hospital Early Interventions

Early intervention for PTSD can be conducted at the inpatient level and be followed through discharge into the outpatient setting. Shalev et al. (2016) and Zatzick et al. (2013) both conducted randomized controlled trials starting in the inpatient setting, with patients suffering from mTBI, other injuries, and PTSD. Shalev et al. (2016) determined that treatment effect by 3-years post-injury was equal to that of the no treatment arms. This study describes the positive benefits of therapy soon after injury, yet reveals the lingering effects of PTSD in persons after a traumatic injury long after therapy has stopped. As reported by Bryant et al., (2016) trajectories of PTSD after mTBI can fall under several categories, making it difficult to predict the extent and length of therapy necessary. The Shalev et al. (2016) study was conducted on previously healthy individuals in a stable community environment; PTSD symptom presentation persisted over three years even after intervention in an ideal population, underscoring the importance of screening in trauma centers where many injured persons have high-risk history and unfavorable demographics.

Zatzick et al. (2013) explored a stepped-care intervention trial in patients with PTSD and mTBI within a Level I trauma center. Statistically significant reductions in PTSD symptoms and increased levels of physical function occurred up to one year after injury (Zatzick et al., 2013).

Findings support the use of early identification and treatment in persons with mTBI and PTSD to reduce long-term physical disability and poor mental health outcomes as described by previously mentioned studies. The Zatzick et al. (2013) study was limited to higher PTSD symptom scores, indicating that delayed-onset PTSD patients could be missed. This point brings attention to risk stratification in combination with scoring based tools. Identification is best accomplished by screening tools and population risk evaluation in order to identify persons at risk for delayed-onset PTSD.

Strengths

Inpatient screening can properly identify those trauma patients most at risk for developing PTSD. Use of the electronic medical record can quickly identify patient demographics that are most correlated with PTSD in a population. Studies have evaluated the trajectory of PTSD development and psychological effects well beyond the typical time of onset, improving the overall recognizable spectrum of onset and impact that can be encountered after trauma both in the military and civilian populations.

Weaknesses

Electronic medical record use for screening can require an initial investment that is too costly for the organization. Existing sample sizes of screening to define patient demographics within the hospital are small and are not easily generalizable. Limitations consistently identified include: self-reported measures, under-diagnosed mTBI, limited generalizability, and lack of accounting for co-occurring physical injuries (Yurgil et al., 2014; Stein et al., 2015; Manners et al., 2016). Several studies only investigate data six months beyond injury, making it difficult to account for delayed PTSD development. Both civilian and military studies encounter similar

levels of attrition over time that potentially underestimate the prevalence of PTSD on a longer time frame.

Gaps

Exploration of remote mTBI history and prevalence or PTSD in the civilian population is not well understood and warrants further investigation and correlation with the military cohort. Wide ranging patient demographics in trauma centers highlights the need for routine screening based on the at risk population to make best use of resources while improving patient outcomes. Continuum of care is important in the inpatient trauma population, where primary care services are often utilized after discharge. Early screening for PTSD in at-risk populations followed by early intervention can improve the long-term outcomes. Hospital screening of at-risk populations could reduce the number of persons slipping through the cracks and never receiving adequate mental health care after discharge.

There is evidence to support screening of patients in the hospital setting for PTSD that suffer a traumatic injury with mTBI. Longitudinal studies have identified several risk factors in both the military and civilian population, resulting in a better understanding of the trajectory and prevalence of PTSD. Even with limited generalizability of the studies, mTBI at time of injury is seen as highly predictive of PTSD development and long-term patient outcomes. However, PTSD screening at trauma centers is done with infrequent regularity, limiting the ability of extensive data collection to contribute to the development of a guideline for trauma centers to sustain a screening program.

METHODS

Ethical Issues

Consideration of ethics for a trauma provider staff questionnaire that explores barriers to care is highlighted by the need to ensure confidentiality, informed consent, and autonomy. Confidentiality protected the identification of participants willingly partaking in the study (Terry, 2015). Informed consent explains the ratio of risk to benefit in participating in the research process; autonomy states that there is no coercion to enter the study and the decision to enter the study is based on a participant's own willingness given the information provided (Terry, 2015).

Participants were ensured that any identifiers and answers would remain confidential during and after the data collection and analysis process. Protecting anonymity was accomplished by omitting any identifying information regarding the participant on the survey and by providing a secure location for survey submission. The informed consent form was signed prior to completion of the questionnaire that provided: (1) an outline with explanation of aims and purposes, (2) facility authorization, (3) and risk to participants. Informed consent forms signed by the participants were kept in a locked file cabinet that were kept separate from any results or data related to this study. Access to information was restricted to the primary investigator and will not be discussed outside the context of the study. Protecting against psychological distress was accomplished by providing adequate time for question and answer sessions during the PowerPoint presentations and by ensuring the questions in the survey most effectively measure practice change behavior only.

Institutional Review Board

The application for human research was submitted to the University of Arizona and Desert Regional Medical Center institutional review boards. A full institutional review board (IRB) application was submitted to Desert Regional Medical Center and approved in January 2018. A ceded IRB agreement was subsequently signed in May 2018 between the University of Arizona and Desert Regional Medical Center stating that Desert Regional Medical Center would be the IRB of record for the project. CITI, HIPAA, conflict of interest training, and financial disclosure statements were completed prior to submission (Appendix D).

Setting

Desert Regional Medical Center is a 385-bed, Level II tertiary care trauma center in Palm Springs, CA providing comprehensive trauma services to a large local population and extending to the Mexican and Arizona border. Influential characteristics unique to the setting most likely to influence innovation include: organizational change culture, availability of resources, leadership structure, stakeholder involvement, and well-established support for clinical improvement.

Participants

Trauma patient providers were the primary stakeholder group and are the potential adopters of screening for PTSD in mTBI patients, thus barrier identification is critical within this group. Participants included five trauma physicians and 1 trauma nurse practitioner that admit traumatically injured patients with traumatic brain injury to the inpatient units within the hospital. All trauma service providers recruited for the project completed questionnaires to best represent behavioral characteristics within the practice caring for the traumatically injured patient population.

Intervention Planning

Barrier identification has been selected due to the known, limited amount of mental health screening being performed on this population at the inpatient level. Analysis of limited data in the civilian population reveals gaps in practice for screening of potential PTSD in mTBI in hospitals, contributing to the complexity of post-hospital mental health care. Research was unable to identify any studies that identified barriers to successful and long-term screening for PTSD among hospitalized trauma patients with mTBI.

Developed by Huijg et al. (2014), the theoretical domains framework questionnaire consists of 31 questions covering 10 domains. Huijg et al. (2014) evaluated the domains and questions relevant to each domain, concluding adequate construct validity and discriminate measurement reliability that support the constructs of the theoretical domains framework. The questionnaire was developed as a template for any researcher to potentially adapt their quality improvement research to the format desired for evaluation of behavioral barriers. Skoien et al. (2016) successfully adapted the questionnaire developed by Huijg et al. (2014) in their investigation of perceived barriers after implementing a chest pain risk evaluation program. Questions in the study by Skoien et al. (2016) had to be altered for context of the study, deviating slightly from the universal questions presented by Huijg et al. (2014). A 5-point Likert scale was used in the Skoien et al. (2015) study to measure participant responses and ensure reliability was positively measured in similar and related constructs, complementary to the study done by Huijg et al. (2014). This quality improvement project used a descriptive questionnaire with a 5-point Likert-scale response.

Recruitment and Implementation

The principal investigator has a professional relationship with the Desert Trauma Service providers as part of the ICU nursing team caring for trauma patients, thus enabling access for recruitment. The principal investigator initiated recruitment by approaching each individual trauma service provider present during daily interdisciplinary rounds in the trauma ICU at Desert Regional Medical Center. Once all trauma service providers had been approached for participation, providers that verbally agreed to participate were subsequently approached by the primary investigator prior to interdisciplinary rounds at the office of Desert Trauma Services in order to establish time slots that were convenient for participation in a 30-minute informative PowerPoint session required before completing the survey. Trauma service providers were informed on the purpose of the study and methodology with an informative 30-minute PowerPoint session during morning and afternoon sign-out. The information session consisted of a PTSD information document (Appendix C) and a PowerPoint presentation based on the document to support recruitment of the providers. PowerPoint sessions were conducted over four days during the third week of May 2018. Following the information sessions, providers were given the opportunity to sign the informed consent document approved by Desert Regional Medical Center. Consent forms submitted to the primary investigator were stored in a locked filing cabinet separate from questionnaire submission to ensure anonymity. Desert Regional Medical Center IRB does not require submission of consent forms to the Desert Regional Medical Center IRB directly, but forms were required to be securely stored with the records of the study. Upon completion of the information sessions and signing informed consents, participants filled-out a 31-item questionnaire that took approximately 10 minutes to complete.

The questionnaire consisted of an adaptation of questions to the clinical problem of identifying barriers to screening for PTSD in the inpatient trauma population with mTBI using the questionnaire developed by Huijg and colleagues (2014).

Questionnaires were handed directly to providers after signing the informed consent form. Providers who consented to participation were required to fill out the questionnaire and place it in sealed, unmarked envelope that was provided. Participants were instructed to place the envelopes in secured boxes, clearly identified for this project, in the on-campus clinical office of Desert Trauma Services at their convenience no later than seven days from initial agreement to participate.

Methods of Evaluation and Analysis

Questionnaire data was collected manually on a hard copy/ paper form and then transferred to the secure Qualtrics server. Calculation of median scores for each question was completed using Microsoft Excel. A 5-point Likert-scale from 1 (very unlikely) to 5 (very likely) was used to collect responses for each item. The median score of each question was calculated in order to best summarize the distribution and variability experienced within the small sample size while accounting for outliers in the questionnaire. Qualtrics was used to determine the frequency of each response possibility, which helped identify patterns of responses in each domain.

Analysis served to identify behavioral change variables in providers that care for the inpatient trauma population with mTBI. The theoretical domain framework and associated questionnaire developed by Huijg et al. (2014) served to quantify the domains associated with behavioral change factors. Calculating the medians helped identify which domains of behavior change that are characteristic in this provider population. Response rate patterns aided in

identifying overall distribution patterns of answers that supported interactions between and within domains. Once characteristics and patterns were identified, practice change recommendations for a provider guided screening intervention for traumatically injured in patients suffering from mTBI were summarized.

Communication of Results

Results of this quality improvement initiative at Desert Regional Medical Center located in Palm Springs, CA have been presented to the stakeholders during interdisciplinary grand rounds as a means to easily diffuse the results of the initiative. PowerPoint presentation meetings have been arranged with trauma services to provide a result summary and discussion of suggested future intervention strategy. Other members of the interdisciplinary team have been invited to the meeting in order to establish a well-rounded interpretation of results and discussion toward an effective intervention plan. Printed documents regarding the results and discussion of the initiative have been made readily available to stakeholders.

RESULTS

A 31-item questionnaire was used to evaluate behavioral practice change barriers that would impact a future practice change initiative for the screening of PTSD in hospitalized trauma patients with mTBI. The six trauma service providers recruited for this project successfully completed the questionnaires in their entirety. After responses were collected, questions were grouped into behavioral change domains. Response item frequencies and median scores for each individual question were calculated (Table 1). Questions and domains identified as neutral and/or unfavorable according to median scores were designated as barriers. Of note, the questionnaire used both negatively and positively worded questions, which led to reversal of responses for

some questions. Table 2 depicts each question exactly as it is worded on the questionnaire, and shows the pattern of median score based on wording of the question. Questionnaire results are discussed below by domain.

Knowledge

Overall, this domain included barriers regarding the awareness, knowledge, and familiarity with the content and objectives for screening of PTSD in hospitalized trauma patients with mTBI. The most significant barrier identified in this domain was related to the lack of knowing how to screen this patient population for PTSD, where 83% of responses indicated a “somewhat unlikely” to “very unlikely” knowledge regarding screening practices (Table 2).

Skills

Most participants felt that they suffered from a lack of training and from a lack of practice when it came to screening for PTSD in trauma patients. Eighty-three percent of the responses in this category were scored as being “somewhat unlikely” to “very unlikely” that providers possessed the necessary training and practice to screen for PTSD in the mTBI patient population. A more neutral view was held by most participants in regards to possessing the necessary medical skills to screen for PTSD in the mTBI patient population during a future implementation initiative (Table 2).

Social/Professional Role and Identity

There were no important barriers related to social/ professional role and identity (Table 2). The majority of responses indicated the participants felt it was consistent with their profession and the responsibility as trauma service providers to screen for PTSD in the mTBI patient population. Eighty-three percent of the responses in this category were scored as

“somewhat likely” to “very likely.” Participants indicated that screening for PTSD in mTBI patients should be part of their job and daily work as providers, where 67% of the responses in this category was scored as being “somewhat likely” to “very likely” (Table 2).

Belief About Capabilities

Though participants did not see the entire domain as a significant barrier, responses indicated a lack of confidence in ability to perform screenings for PTSD when they are very restricted on time. Fifty percent of participants scored their confidence to screen during periods of limited time as “somewhat unlikely” and 33% scored their confidence as “neutral.” This suggests that belief about capabilities when restricted on time is a significant barrier to practice change that involves PTSD screening in the mTBI patient population. Conversely, 83% of participants scored “somewhat likely” to “very likely” in their general confidence to be able to screen for PTSD in the mTBI patient population. This suggests that the overall confidence to perform PTSD screening in the mTBI patient population is not a barrier to practice change among the participants (Table 2).

Optimism

Responses indicated that 67% of participants felt it “very unlikely” to “somewhat unlikely” that desired goals would be attained for the implementation of PTSD screening in mTBI patients. Responses also indicated that 67% of participants felt “neutral” to “somewhat unlikely” about their optimism in the benefit of PTSD screening for the trauma population with mTBI. The responses in this category suggests that optimism is a significant barrier to practice change among the participants when considering PTSD screening for trauma patients with mTBI (Table 2).

Belief About Consequences

Participants scored the question regarding screening for PTSD in the trauma population and its benefit to public health as 66% “very likely” and 33% as “somewhat likely.” Participants scored the question regarding relationship disadvantages with patients while screening them for PTSD as 83% “very unlikely” and 16% as “somewhat unlikely.” The responses in this category suggest that belief about consequences is not a barrier to practice change among the participants (Table 2).

Intentions

Data collected in this domain is a significant barrier in regards to strength of intentions and certainty for which respondents said they would screen for PTSD in the next set of trauma patients admitted with mTBI. Participant scores indicated an overall “neutral” median response frequency to questions regarding intention to screen next several patients admitted with mTBI, strength of intention, and certainty of performing the intended screening. Participant scores indicated a slightly favorable intent to screen a single patient for PTSD that has been admitted with a mTBI. Half (50%) of the responses in this category were scored as being “somewhat likely to “very likely.” It was noted that participant response frequency in this domain were the most widely variable in comparison to all other domains in this questionnaire (Table 2).

Environmental Context and Resources

Data collected on questions about sufficient financial support for PTSD screening and good networks between parties involved in screening for PTSD in the trauma population with mTBI, suggest environmental context and resources are barriers. A large percentage (83%) of participants supported the “very unlikely” belief that there is sufficient financial support for a

PTSD screening program in the hospital setting, while 50% of participants found it “very unlikely” and 50% of participants found it “somewhat unlikely” that there are good networks between parties potentially involved in a screening program for PTSD in trauma patients with mTBI. This data represents the strongest barrier identified by participants based on response frequency and median scores (Table 2).

Social Influences

Data collected from participants did not identify people who are important to them or the opinions of others as barriers to conducting PTSD screening for trauma patients with mTBI. Fifty percent of participants found it “somewhat likely” and 50% of participants found it “very likely” that others would approve of the trauma service providing PTSD screening for trauma patients with mTBI (Table 2).

TABLE 2. TDF survey: Domain distribution, response frequency, and median scores

TDF Behavioral Change Domain	TDF Survey Question	Response Frequency (%)					Median Score
		Very Unlikely (1)	Somewhat Unlikely (2)	Neutral (3)	Somewhat Likely (4)	Very Likely (5)	
Knowledge	I am aware of the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	0	50	0	50	0	3
Knowledge	I know the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	0	16.67	50	33.33	0	3
Knowledge	I am familiar with the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	0	16.67	66.67	16.67	0	3
Knowledge	I am aware of how to screen for PTSD in hospitalized trauma patients with mTBI.	16.67	66.67	0	16.67	0	2
Skills	I have been trained how to screen for PTSD in hospitalized trauma patients with mTBI.	50	33.33	16.67	0	0	1.5
Skills	I have the skills to screen for PTSD in hospitalized trauma patients with mTBI.	0	0	66.67	16.67	0	3
Skills	I have practiced screening for PTSD in hospitalized trauma patients with mTBI.	50	33.33	0	16.67	0	1.5
Social/Professional Role & Identity	Screening for PTSD in hospitalized trauma patients with mTBI is part of my work as a provider.	0	16.67	16.67	66.67	0	4
Social/Professional Role & Identity	As a provider, it is my job to screen for PTSD in hospitalized trauma patients with mTBI.	0	16.67	16.67	50	16.67	4
Social/Professional Role & Identity	It is my responsibility as a provider to screen for PTSD in hospitalized trauma patients with mTBI.	0	0	16.67	83.33	0	4
Social/Professional Role & Identity	Conducting screening for PTSD in hospitalized trauma patients with mTBI is consistent with my profession.	0	0	16.67	50	33.33	4
Belief About Capabilities	I am confident that I can screen for PTSD in hospitalized trauma patients with mTBI even when patients with mTBI are not motivated.	0	0	50	33.33	16.67	3.5
Belief About Capabilities	I am confident that I can screen for PTSD in hospitalized trauma patients with mTBI even when there is little time.	0	50	33.33	0	16.67	2.5
Belief About Capabilities	I am confident that if I wanted, I could screen for PTSD in hospitalized trauma patients with mTBI.	0	0	16.67	66.67	16.67	4
Optimism	With regard to screening for PTSD in hospitalized trauma patients with mTBI in uncertain times, I usually expect the best outcome.	16.67	50	16.67	16.67	0	2
Optimism	With regard to screening for PTSD in hospitalized trauma patients with mTBI, I am always optimistic about the future.	0	16.67	50	33.33	0	3

TABLE 2. – *Continued*

TDF Behavioral Change Domain	TDF Survey Question	Response Frequency (%)					Median Score
		Very Unlikely (1)	Somewhat Unlikely (2)	Neutral (3)	Somewhat Likely (4)	Very Likely (5)	
Belief About Consequences	If I screen for PTSD in hospitalized trauma patients with mTBI, it will benefit public health.	0	0	0	33.33	66.67	5
Belief About Consequences	If I screen for PTSD in hospitalized trauma patients with mTBI, it will have disadvantages for my relationship with patients with mTBI.	83.33	16.67	0	0	0	1
Intentions	For the next ten trauma patients with mTBI, do you intend to screen for PTSD?	0	33.33	33.33	33.33	0	3
Intentions	I will definitely screen for PTSD in a trauma patient with mTBI during the next admitted hospitalization.	16.67	16.67	33.33	33.33	0	3
Intentions	I intend to screen for PTSD in a trauma patient with mTBI during the next admitted hospitalization.	16.67	16.67	16.67	33.33	16.67	3.5
Intentions	How strong is your intention to screen for PTSD in a trauma patient with mTBI during their hospitalization?	0	33.33	33.33	33.33	0	3
Memory, Attention, & Decision Processes	How often do you not screen for PTSD in hospitalized trauma patients with mTBI.	0	16.67	0	50	33.33	4
Memory, Attention, & Decision Processes	When I need to concentrate on caring for hospitalized trauma patients with mTBI, I have no trouble focusing my attention.	0	0	16.67	50	33.33	4
Memory, Attention, & Decision Processes	When trying to focus my attention on hospitalized trauma patients with mTBI, I have difficulty blocking out distracting thoughts.	100	0	0	0	0	1
Memory, Attention, & Decision Processes	When concentrating on caring for hospitalized trauma patients with mTBI, I can focus my attention so that I become unaware of what is going on around me.	0	16.67	0	66.67	16.67	4
Environmental Context & Resources	Within the socio-political context, there is sufficient financial support for PTSD screening in hospitalized trauma patients with mTBI.	83.33	16.67	0	0	0	1
Environmental Context & Resources	Within the socio-political context, there are good networks between parties involved in screening for PTSD in hospitalized trauma patients with mTBI.	50	50	0	0	0	1.5
Social Influences	Most people who are important to me think that I should screen for PTSD in hospitalized trauma patients with mTBI.	0	16.67	33.33	33.33	16.67	3.5
Social Influences	Most people whose opinion I value would approve me of screening for PTSD in hospitalized trauma patients with mTBI.	0	0	0	50	50	4.5
No Domain Relationship	I would support a team of dedicated professionals responsible for the screening of PTSD in hospitalized trauma patients with mTBI.	0	0	0	16.67	83.33	5

No Domain Relationship

The final question was not associated with any domain and was utilized to understand whether participants would support a dedicated team of professionals responsible for PTSD screening in trauma patients with mTBI. Data indicated that 83% of participants reported a “very likely” response toward the support of a dedicated team of professionals that would provide PTSD screening in the mTBI population (Table 2).

Summary

This project used the TDF to evaluate the potential behavioral practice change barriers amongst trauma service providers regarding early PTSD screening in the hospital setting for traumatically injured patients with mTBI. A brief 30-minute information session was held with a two-page handout (Appendix B) and PowerPoint describing the key points of the study proposal (Appendix C). The information session provided an opportunity to educate trauma service providers about the current problem and as a recruitment strategy to gather their attention and garner their support in completing the questionnaires. Data analysis revealed that participants consistently identified five domains of uncertainty: knowledge; skills; optimism; intentions; and environmental context and resources. This lack of endorsement in these domains suggests the presence of barriers to PTSD screening in this population.

Knowledge and awareness of the content and objectives for PTSD screening in hospitalized trauma patients with PTSD were consistently identified as practice barriers. Not surprisingly, participants identified a lack of training and practice in screening for PTSD in trauma patients as a barrier. This suggests that there may be a lack of knowledge about the topic in participants that participated in this study. Optimism domain items were consistently

identified as barriers to screening for PTSD, alluding to the lack of confidence amongst providers that screening for PTSD in the hospital setting will provide a clear benefit for the patient population and meet the desired goals of sustaining a measurable outcome and tracking method for PTSD in trauma patients with mTBI. There appeared to be a relationship between the barriers of knowledge and skill reported in this study and the decreased level of optimism and confidence that the participants have in response to the proposed practice change. Items in the intentions domain associated with strength of intention to screen for PTSD and the certainty in which screening for PTSD will be performed in the next set of patients were identified as barriers in this study. Intent to participate in practice change among this group of participants had a widely variable response distribution, leading to the suggested relationship between the above-presented barriers and competing priorities that could derail any intention to change the practice of screening for PTSD in trauma patients with mTBI. Environmental context and resource items reported in this study identified financial support and network barriers. Findings in this domain suggested a direct influence that a lack of organization or system level barriers can have on individual practice change beliefs and motivation.

Use of the TDF as a guide for the qualitative and quantitative study of barriers in implementation science has gone through a well-validated process conducted by Cane and colleagues (2012). Several examples in the literature include use of the TDF during project development and implementation stages in the hospital setting to successfully identify barriers in practice. Examples include but are not limited to chest pain risk evaluation (Skoien et al., 2016); management of mTBI in the emergency department (Tavender et al., 2014); early rehabilitation in mechanically ventilated patients (Goddard et al., 2018); sepsis care bundle implementation

(Roberts et al., 2017); and opiate prescribing after curative-intent surgery (Lee et al., 2018).

There have been no studies to date, including no studies with the TDF, that have explored the behavioral factors amongst providers influencing an early PTSD screening program in hospitalized trauma patients with mTBI. Given the reasonably extensive adoption in the hospital setting, use of the TDF to examine practice barriers amongst providers that serve the inpatient trauma population is well supported by the literature with a strong theoretical background for analysis of target behaviors and future recommendations.

Several strengths can be identified in the design of the study. The sample of trauma providers was representative of the population of interest as they are most directly responsible for the care of hospitalized trauma patients with mTBI. Effective efforts were used to recruit the trauma providers in order to maximize the participation rate while minimizing the introduction of researcher subjectivity and bias to the results of the questionnaire. Analysis of responses used simple metrics to interpret data and understand patterns that not only revealed significant barrier patterns, but also provided insight into behavior change beliefs that can be used to facilitate the elimination of barriers and strengthen a future implementation plan. Finally, previous research had been able to effectively use a Likert-based questionnaire to identify practice change barrier domains amongst different provider/stakeholder groups in the hospital setting (Roberts et al., 2017; Skoien et al., 2016). The results of previous research suggest that the survey used in this study could be used across provider/stakeholder groups during future implementation planning and evaluation of a PTSD screening program for trauma patients with mTBI in the hospital setting.

Interpretation

The proceeding section will discuss the domains that are suggestive of barriers followed by those domains that did not suggest the presence of barriers. First-step implementation planning will be introduced and relationships will be discussed in terms of relevance.

Barrier Domains

The *Knowledge* domain had a largely “neutral” median response frequency with the exception being the question regarding awareness of how to screen for PTSD in mTBI patient populations, which had a “somewhat unlikely” median response frequency. These results indicate that participants did not feel confident in their awareness, knowledge, or familiarity with the content and objectives of screening in this population. Significant attention should also be turned to the lacking awareness among respondents of how to screen for PTSD in patients with mTBI. Observations collected from questions in this domain suggest that providers may lack familiarity with validated tools for PTSD screening that contributes to the overwhelmingly neutral response to knowledge about variables that place a patient at risk for PTSD after mTBI. Observations also suggest the lack of knowledge regarding the long-term objectives to screening for PTSD in trauma patients in the acute care hospital as a bridge to supportive care after discharge. Previous research has described the lack of knowledge about the availability of validated tools to screen for PTSD in both the emergency department and intensive care unit that have contributed to barriers during intervention development (Skoien et al., 2016; Tavender et al., 2014).

A targeted implementation based on information obtained about the knowledge domain barriers would involve the information and training/education on PTSD and the correlation of

PTSD in the context of trauma and mTBI. Similarly, the same process would be implemented with a formal PTSD screening tool that is validated for use in the selected population and the importance of utilizing this screening tool would be emphasized.

The *Skills* domain focuses on the skills that have been acquired through practice in order to competently perform at a certain level of proficiency or ability. A median response frequency between “very unlikely” and “somewhat unlikely” on items in the domain revealed the limited exposure on the part of the participants to have practiced or been trained in the screening of PTSD in trauma patients with mTBI. Responses had limited variability, suggesting that medical training was consistent across providers, as were prior experiences the providers have had working with this population or others. While participants indicated low likelihood of prior training and practice, their median response to possessing the overall skills to perform the screening was scored as “neutral.” Previous studies have examined the facilitation of skill in implementation where training and practice experience has been limited (Goddard et al., 2018; Skoien et al., 2016). Improvement of skill can be accomplished by work with an inter-professional team and with availability of proper resource materials that support the objective of the implementation. The relationship between requiring enhanced training and improving knowledge had been described by Tavender and colleagues (2014) as barriers to developing a practice guideline for the workup in mTBI patients that present in the emergency department.

The *Optimism* domain focuses on the confidence that desired goals will be attained and things will happen for the best for improving future care of the patient. Median response frequencies scores were “somewhat unlikely” and “neutral” for items about expectations of best outcomes and optimism for the future, respectively. The participants were most likely driven to

lower confidence by the significant number of other barriers that exist even while in the presence of some known facilitators for successful implementation. Optimism has not been well described in the use of hospital-based implementation barriers. In a mixed methods investigation of the Sepsis-Six care bundle, Roberts and colleagues (2017) reported that respondents were optimistic overall about the benefit for patient care, but were less optimistic on compliance and having a clear strategy for improvement. The results in the Roberts et al. study correspond to the reports of a less than optimistic outlook on compliance in this study. However, the responses in this project were widely variable. It is possible that the interpretation of optimism and motivation for practice change in each participant could directly correlate with other significant barriers described in the results, which in turn may hinder the overall personal outlook on changing practice standards for trauma patients with mTBI. With optimism tied to the success of goals, addressing current barriers and identifying achievable changes at the staff and system level will be needed to convince respondents that the change is beneficial and sustainable. Optimism can be supported with a strong evidence base and positive outcomes as the pilot intervention takes shape.

The *Intentions* domain describes conscious decisions to participate in behavioral practice change that are defined by intention and the stability of those intentions to produce change or resolution to act. Median response frequencies of “neutral” were recorded for items involving the certainty of screening a single trauma patient with mTBI, the intention to screen the next several trauma patients with mTBI, and the strength of intention to perform the screening. The intention domain in this study has the most widely distributed responses, making it clear that there is dissonance amongst providers with their intent to change practice behavior. Roberts and

colleagues (2017) identified this concern while investigating behavior change patterns amongst varying levels of providers at one institution, and they argued that varying groups have competing priorities to other groups. So while this project has identified intentions as a barrier, it seems that this specific group of participants may have competing priorities as identified in the study by Roberts et al. (2017). This factor can independently contribute to difficult implementation with poor sustainability as competing interests conflict with each other over time. Interventions that improve intention will focus on ease of use, minimal impact on workload, and sustainability.

Circumstances of a participant's situation or environment can serve as a barrier to the development of skills, independence, social competence and adaptive behavior in the *Environmental Context & Resources* domain. With median response frequencies between "very unlikely" and "somewhat unlikely," items regarding sufficient financial support and presence of established networks between parties involved to promote screening are rated as the most significant barrier to screening for PTSD in hospitalized trauma patients. Findings in this domain are consistent with reports in literature that describe evidence of environmental and resource barriers when practice change has been evaluated amongst providers in the hospital setting (Goddard et al., 2018; Lee et al., 2018; Roberts et al., 2017; Skoien et al., 2016; Tavender et al., 2014). Environmental contexts and resources are seen as system level barriers that impact individual adoption and sustainability of practice change. Skoien and colleagues (2016) describe how sufficient funding can offer support for clinicians by providing extra staff and the ability of local networks to collaborate across departments, which can significantly promote implementation efforts. Limited funding from the organization, limited networks within the

organization, and limited time were commonly reported amongst the previous research (Goddard et al., 2018; Lee et al., 2018; Roberts et al., 2017; Skoien et al., 2016; Tavender et al., 2014), and supports findings of this project. Of note, limitation on time fell under the *Belief about capabilities* domain in this project. A median response frequency between “somewhat unlikely” and “neutral” indicated that a limitation on time was a potentially significant barrier in consistently performing PTSD screening in mTBI patients. Pressure within the hospital to discharge patients more quickly and overall increasing workload has been previously described as a barrier to adopting consistent practice change (Tavender et al., 2014). Participants in this project identified overwhelming support for a dedicated team of professionals that would be responsible for the screening of PTSD in hospitalized trauma patients with mTBI. This suggests the significant impact that limitations on time, context, and resources have on practice change in this project can be addressed as a responsibility of the team versus the individual.

Structured meetings with administrative and departmental stakeholders to evaluate barriers will provide effective communication that best determines the most effective strategy for financial and network support. Inclusion of community resource organizations and the local medical school residency program as stakeholders may improve the effort of supporting and sustaining a screening program while addressing identified barriers in this domain. Involvement of the aforementioned stakeholders could enhance the bridging of care beyond the acute care setting where tracking and identification of PTSD symptoms in the trauma population can be challenging and resource intensive.

Non-Barrier Domains

The *Social/professional role & identity* domain includes items about a set of behaviors that display personal qualities of an individual in both social and work settings. The focus of this domain in this study was to direct questions regarding profession practice beliefs. Median response frequencies of “somewhat likely” in all questions within this domain represented a majority belief that screening for PTSD in hospitalized trauma patients with mTBI is within their scope of practice as trauma providers. Results also suggested that participants believe that screening for PTSD is consistent with their profession and part of their overall responsibility in treating the trauma population. In their study exploring barriers to early rehabilitation in mechanically ventilated patients, Goddard and colleagues (2018) reported several beliefs in the social/professional role domain that indicated a positive relationship between teamwork and role clarity in the implementation process. The strength of professional role clarity revealed in this study can be used to influence the network barrier previously identified. Delineating professional responsibilities and identities among providers can be used to strengthen the weakness of networks in order to work toward a common goal of practice change. Concerning the knowledge and skills barriers, the results of this project suggested that interventions targeted to improve knowledge and skills of the providers in relation to PTSD screening in the trauma population should be tailored to the strengths of the role and responsibility beliefs elicited by trauma provider responses.

The *Belief about capabilities* domain consisted of items about the reality of an ability, perceived confidence, and acceptance of the truth under given circumstances. Responses indicated an overall confident belief in the ability to perform screenings for PTSD and the ability

to perform them even when a patient may be resistant or lack motivation. Skoien and colleagues (2016) reported belief about capabilities in previous research and identified a relationship between positive belief about capabilities and positive intent to perform the intervention. Strong belief about capabilities identified in this project should be used to address the intention and optimism barriers previously presented. The practice change design should be simple to use and compete as little as possible with other priorities to avoid abandoning the implementation.

Response to questions in the *Belief about consequences* domain indicated that providers believe that screening for PTSD in the trauma population with PTSD will benefit public health and does not have disadvantages in their relationships with their patients. Previous research has reported positive benefit versus risk ratios that impact the uptake of hospital-based implementation strategies in specific patient populations (Goddard et al., 2018; Roberts et al., 2017). This domain is important, as there will be inevitable challenges that come with implementing practice change. Efforts need to create and maintain a vision that screening for PTSD is worth doing and there is value to the patient, community, and trauma practice.

The *Memory, attention, and decision processes* domain was used to evaluate beliefs about the ability to retain information, focus attention, and ability to make clinical decisions. Respondents indicated that focus of attention and blocking of distracting thoughts was not difficult when concentrating on caring for the traumatically injured hospital patient. These findings suggested that when it comes to making proper decisions for their patients, it is not difficult to focus even when there are several distracting factors. The process of integrating practice change into everyday routine can take time and be difficult to overcome at first. With proper support, training, and ease of use, integrating the screening of PTSD in trauma patients

for the providers will be enhanced by their individual ability to focus their attention on the care of the patient no matter the distracting circumstances.

Response to questions in the *Social influences* domain indicated that providers felt those persons important to them and whose opinion they value professionally, would approve of the screening for PTSD in trauma patients with mTBI. These findings are significant in use of close professional relationships to build stakeholder networks during implementation development. The impact of having positive professional influences on the providers in this project can aid in the more rapid adoption of screening for PTSD, helping to reduce the impact of the individual practice barriers on a systematic practice change.

Limitations

There are several limitations noted in this project. Generalizability is limited to one provider group at one trauma center. The views described in this project may not be similar to those amongst similar provider groups at other trauma centers or amongst different groups within the same hospital. The main purpose of the project was to identify barriers associated with the group of providers most involved in the care and discharge of trauma patients from the hospital. Even with the limited generalizability, findings in this study have helped identify behavioral practice barriers among primary trauma providers at Desert Regional Medical Center regarding the screening of PTSD among hospitalized trauma patients with mTBI. The identification of practice barriers and subsequent strengths, will aid in the development of a practice change implementation plan that addresses the significant barriers and strengths in order to establish a sustainable practice change that improves the outcomes of the trauma population at Desert Regional Medical Center.

The consideration of the overburden of surveys in busy trauma service providers could have led to variability in answers, as their perception of the value of the survey could have been marginalized. In order to account for this limitation, an informative session on the project at the convenience of the providers was conducted along with a convenient location to deposit completed surveys and an adequate time frame to complete them was provided. To enhance recruitment in light of questionnaire limitation, project goals were precisely identified in relation to the pertinent value for trauma provider practice and patient outcomes. Similarly, time commitment and involved risks were clearly stated by the researcher and declared on the Desert Regional Medical Center waiver form. It must also be noted that the participants in this project all have a professional relationship with the primary investigator, leading to potentially skewed results due to this relationship. The participants were ensured that all responses were anonymous and that the objectives of the project serve to benefit the trauma patient population at Desert Regional Medical Center, and in no way could impact professional relationships.

Use of the TDF to evaluate practice barriers is well established, but variations exist amongst many questionnaire items as they target specific content within the theoretical basis. In this project, it is likely that not every combination of determinants and domains were explored as that would lead to an extensive number of questions and would potentially require the use of qualitative interviews to support Likert scale response options. The version of the questionnaire used in this project was developed as a universal format from a previous process that established reliable content validity while exploring the maximal number of domains. We believe that the questionnaire was optimized for the given project aims to enhance barrier identification while reducing the risk of non-participation from the target population. Questionnaire items on the

Likert scale were ranked from “very unlikely” to “very likely” as compared to “strongly disagree” to “strongly agree.” We felt that the terms “unlikely” and “likely” were best aligned with the questions asked in the questionnaire and would enable the participants to find better agreement with the way a question was asked and the selections provided in the scale.

Finally, studies dealing with attitudes and/or beliefs in survey format can introduce threat to internal validity. This threat can occur when the topic has been presented to the participants with details on the objectives of the project prior to participation, thus a form of sensitization may occur that could potentially bias their responses. The questionnaire used in this project addressed attitudes and beliefs in some questions due to the inherent nature of the TDF format of questioning. Information given to potential participants related to the objectives of the project were streamlined enough to ensure buy-in and participation while reducing the risk of sensitization. Also, project designs with pre- post-testing are often the most susceptible to sensitization; this project did not involve pre-testing, but was limited to an information session followed by questionnaire participation.

Conclusion

This project has successfully identified several practice change barriers that exist in a select group of trauma service providers when considering a planned intervention of screening for PTSD in the hospitalized trauma patient with mTBI. The TDF, with a strong theoretical and practical application, was used to identify the following significant barrier domains in this project: knowledge, skills, optimism, intentions, and environmental context and resources. Taking into account the barriers identified in the project, as well as facilitators incidentally

identified, a future intervention plan will be able to target interventions at this facility that enhance behavioral change factors while supporting system-wide sustainability.

Implications

The evaluation of practice change barriers amongst providers that care for the traumatically injured patient with mTBI has implications that range from understanding the behavioral and organizational context in which change occurs, to the understanding of how practice change impacts a select population along a continuum that bridges the levels of care between the hospital and community. The development of a screening program in the hospital with subsequent screenings in the sub-acute and community settings can provide a great deal of insight into the trajectory of PTSD development within this population at Desert Regional Medical Center; ensuring proper follow-up to prevent the complications associated with PTSD in the traumatically injured patient during recovery as supported by previous research.

It is important to understand the admission of a trauma patient to the hospital will not be dependent on the mTBI injury itself, but the poly-trauma nature of the injury with co-occurring internal organ injury, orthopedic injury, spinal cord injury, burn injury, and/or significant alteration in hemodynamics requiring intensive care management. Mild traumatic brain injury alone contributes significantly to PTSD development. Circumstances surrounding a hospitalization due to trauma with significant co-occurring injuries and possible intensive care unit stay with multiple invasive experiences can also significantly contribute to the development of PTSD after trauma.

While a large database of research exists regarding the trajectory of PTSD development after hospitalization, few studies have investigated the screening for PTSD following traumatic

injury with mTBI beginning in the hospital setting. With hospital-based research limited in mTBI, attention can be turned to several acute hospitalizations that have been associated with PTSD and subsequently have seen development of screening programs in the hospital setting including: cardiac arrest (Presciutti et al., 2018); pain and orthopedic injury (Archer et al., 2016); burn injury (Van Loey et al., 2018); mangled hand injury (Cook et al., 2017); and critical illness with stay in intensive care (Jackson et al., 2016). The overwhelming evidence in the above mentioned studies support the early screening and identification of patients at risk for developing PTSD after hospitalization, thus limiting the negative impacts on psychological and physical recovery. Future study in the field should take into consideration the prior success of screening efforts in the hospital setting, impact of mTBI on recovery outcomes, and the consideration of behavioral practice change barriers that exist in this trauma provider population. These considerations can determine a more systematic approach to screening for PTSD in trauma patients that suffer a mTBI in a facility that has more limited resources compared to Level I academic trauma centers. While it is hard to deny the focus of trauma recovery is often on the physical aspects, significant psychological disturbance via the PTSD spectrum can occur at varying time points during extended physical recovery that makes it progressively more difficult to identify. Further follow-up and future study of patient reported outcomes and quality of life measures are recommended to further understand outcome trajectories in this patient population, as well as contribute to the research database examining the relationship between trauma and adverse outcomes.

Current VA/DOD clinical practice guidelines along with the American College of Surgeons recommendations support the screening for PTSD in hospitalized trauma patients

(American College of Surgeons Committee on Trauma, 2014; The Management of Posttraumatic Working Group, 2010). Aims, outcomes, and findings of this project have provided the necessary first steps to understanding and addressing the practice change barriers that inhibit a sustainable approach to screening for PTSD in the mTBI trauma patient population within the hospital and in subsequent transitional care. The benefit of screening within the hospital serves to establish risk stratification for PTSD development at Desert Regional Medical Center in the trauma population with mTBI. Furthermore, tracking of PTSD symptoms over time will enable the detection of early and late PTSD development, the measuring of the impact on quality of life and rehabilitation outcomes, and the enabling of adequate attention being guided to an at-risk population of patients acquiring the proper assistance from community and/or facility resources. Identification of practice change barriers among the organization and providers will allow Desert Regional Medical Center to take the necessary steps to account for the holistic recovery of the trauma population both during and beyond the acute hospitalization. Once barriers are explored in more depth, a piloted systematic approach to screening for PTSD in mTBI trauma patients should be conducted with feedback mechanisms that readily correct for difficulties during implementation.

APPENDIX A:
LITERATURE REVIEW

Author	Research Question	Theoretical Framework	Design	Sample	Data Collection	Findings
Bryant et al. (2015)	Map 6-year trajectory of PTSD response after traumatic injury		Prospective longitudinal	N=1084 (initial) N=613 (final follow-up)	Collected at 3, 12, 24, and 72 months CAPS, MINI, WHOQOL-Bref, RLEQ	Chronic class- (4%) initially high levels PTSD that increased until 24 months and remains elevated through 6 years. Recovery class- (6%) Initially high levels of PTSD that slowly decline over 6 years. Worsening/Recovery class- (8%) symptoms peak at 24 months then decline. Worsening class- (10%) low symptoms of PTSD at baseline that worsens over 6 years. Resilient class- (73%) Consistently low PTSD levels over 6 years.
Frank et al. (2017)	Utilization of the PC-PTSD screen tool will identify more at risk inpatients after trauma.	Roy Adaptation Model	Pre-/post-descriptive survey	N=40	Pre-intervention Health psychology consult without tool Intervention PC-PTSD	11 consultations triggered by PC-PTSD. 5 consults were recommended outpatient services. Consult number did not increase.
Haarbauer-Krupa et al. (2016)	Identify PTSD symptomatology in patients with mTBI at 6 months post injury.		Multi-center prospective	N=280	TBI-CDE at baseline and 6 months post-injury.	6 month follow-up: PTSD-positive group had higher rates of psychological distress ($p<0.001$), post-

Author	Research Question	Theoretical Framework	Design	Sample	Data Collection	Findings
						concussive symptoms (p<0.001), lower executive function and flexibility (p<0.004), lower verbal learning and memory (p<0.006), and lower satisfaction with life (p<0.001).
MacDonald et al. (2016)	Analyze data across cohorts 6-12 months after military blast injury to identify relationships between disability and clinical measures of neurological and psychiatric symptoms.		Prospective longitudinal 4 cohorts	N=321 (TBI Study group) N=254 (non-TBI Control group)	6-12 month follow-up post-injury: GOS-E, CAPS, neurological testing, depression scale	GOS-E scores significantly worse in TBI group (p<0.0001). Neurobehavioral impairment is significantly worse in TBI group (p<0.0001). TBI group had worse PTSD and depression symptoms compared to control groups (p<0.0001).
Manners et al. (2016)	Determine if pre-morbid conditions, pre-existing PTSD symptoms, and prior mTBI will impact PTSD symptoms after subsequent blast injury with mTBI in military personnel.		Retrospective cohort review	N=276	Sub-acute phase 1 week – 3 months post-injury: PCL, PCSS score found in electronic medical record	Positive PTSD screen with mTBI had higher PCL score (p<0.001) compared to the no PTSD group. Baseline post-traumatic stress, mTBI baseline symptom scores, and positive radiology findings accurately identified PTSD in personnel (p<0.001).

Author	Research Question	Theoretical Framework	Design	Sample	Data Collection	Findings
Russo et al. (2013)	Advance risk prediction for PTSD among trauma patients at a Level I trauma center by using an automated screening tool via electronic medical records.		Prospective cohort	N=878	Conducted just prior to patient discharge: PCL-C All other demographic and medical data was extracted from the medical record	PTSD risk prediction model indicators (95% CI): Female, non-white, self-pay and veterans insurance, ICU stay, prior inpatient hospitalization, intentional injury, tobacco use, positive blood alcohol on admission, substance use disorder, prior PTSD diagnosis, any psychiatric disorder.
Schweininger et al. (2014)	Examine the temporal relationship between disability and psychiatric sequelae of injury.		Multi-site longitudinal cohort	N=1017 (N=882 at 3 month follow-up; N=775 at 12 month follow-up)	Baseline, 3-month, and 12-month: WHODAS II, CAPS, HADS. Other covariates: Injury severity, pain, demographics	PTSD is only mental health variable that significantly contributed to long-term disability ($p<0.001$). PTSD symptoms in hospital were associated with increased levels of depression and anxiety from 3 to 12 months ($p<0.001$). Depression in hospital significantly contributed to short-term disability only ($p<0.001$).
Shalev et al. (2016)	Does long-term benefit of early behavioral therapy for trauma patients, initiated in the inpatient setting,		Randomized controlled trial	N=324 (met criteria for PTSD)	Baseline, 5-month, and 3-year: CAPS, GAF	95% CI at 5 month assessment in psycho-therapy groups sig. differ from other groups. (21.32-37.95 vs 35.72-49.46). However, at 3 years the

Author	Research Question	Theoretical Framework	Design	Sample	Data Collection	Findings
	remain over time compared to those that decline treatment.					confidence intervals show no sig. difference.
Stein et al. (2015)	Examine the relationships between deployment acquired TBI with post-deployment PTSD and related disorders.		Prospective longitudinal survey	N=7742 (Initial evaluation prior to deployment) N=4645 (completed data for all three assessments)	Baseline prior to deployment, 3-months and 6-months after returning to United States: CIDI-SC, PC-PCL, suicidality, deployment stress, TBI status	Deployment-acquired TBI is strongly associated with increased odds of post-deployment (past 30-day) PTSD ($p<0.0005$). Deployment-acquired TBI is strongly associated with increased odds of PTSD at 9-months post-deployment ($p<0.0005$).
Warren et al. (2015)	Examine the presence of PTSD symptoms at multiple time points after traumatic injury with and without TBI at a Level I trauma center.		Prospective cohort	N=494 (Enrolled) N=311 (Completed 3-month follow-up) N=231 (Final analysis)	Baseline (Time of hospitalization), 3-months, and 6-months: PC-PTSD, PCL-C	Patients with TBI had significantly higher rates or PTSD than those who did not have TBI both at 3 and 6 months ($p=0.04$). TBI significantly predicted PTSD at 6 months after injury ($p<0.0001$). Previous history of TBI was not significant.

Author	Research Question	Theoretical Framework	Design	Sample	Data Collection	Findings
Zatzick et al. (2013)	Evaluate the effectiveness of a stepped care protocol with traumatically injured inpatients. Assess for reductions in PTSD, functional impairments, and comorbid conditions.		Randomized controlled trial	N=207	Baseline, 1-, 3-, 6-, 9-, and 12 month: PCL-C, PHQ-9, AUDIT-C, PCS	Clinically and statistically significant reductions in PTSD at 1 year ($p<0.001$). Physical function improvements at 3, 6, and 9 months ($p<0.001$).

CAPS = Clinician Administered PTSD Scale

MINI = Mini International Neuropsychiatric Interview

WHOQOL-Bref = World Health Organization Quality of Life

RLEQ = Recent Life Events Questionnaire

PC-PTSD = Primary Care PTSD tool

TBI-CDE = TBI Common Data Elements Outcome Battery

GOS-E = Glasgow Outcome Scale Extended

PCSS = Post-Concussion Symptom Scale

PCL-C = PTSD Checklist

WHODAS II = World Health Organization Disability Assessment Schedule II

HADS = Hospital Anxiety and Depression Scale

GAF = Global Assessment of Function Score

CIDI-SC = Composite International Diagnostic Interview Screening Scale

PHQ-9 = Patient Health Questionnaire

AUDIT-C = Alcohol Use Disorders Identification Test-Consumption Items

APPENDIX B:
SCREENING QUESTIONNAIRE

SCREENING FOR PTSD BARRIER QUESTIONNAIRE

	Very Unlikely	Somewhat Unlikely	Neutral	Somewhat Likely	Very Likely
I am aware of the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I know the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I am familiar with the content and objectives of screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I am aware of how to screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I have been trained how to screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I have the skills to screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I have practiced screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
Screening for PTSD in hospitalized trauma patients with mTBI is part of my work as a provider.	1	2	3	4	5
As a provider, it is my job to screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
It is my responsibility as a provider to screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
Conducting screening for PTSD in hospitalized trauma patients with mTBI is consistent with my profession.	1	2	3	4	5
I am confident that I can screen for PTSD in hospitalized trauma patients with mTBI even when patients with mTBI are not motivated.	1	2	3	4	5
I am confident that I can screen for PTSD in hospitalized trauma patients with mTBI even when there is little time.	1	2	3	4	5
I am confident that if I wanted, I could screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
With regard to screening for PTSD in hospitalized trauma patients with mTBI in uncertain times, I usually expect the best outcome.	1	2	3	4	5
With regard to screening for PTSD in hospitalized trauma patients with mTBI, I am always optimistic about the future.	1	2	3	4	5
If I screen for PTSD in hospitalized trauma patients with mTBI, it will benefit public health.	1	2	3	4	5

	Very Unlikely	Somewhat Unlikely	Neutral	Somewhat Likely	Very Likely
If I screen for PTSD in hospitalized trauma patients with mTBI, it will have disadvantages for my relationship with patients with mTBI.	1	2	3	4	5
For the next ten trauma patients with mTBI, do you intend to screen for PTSD?	1	2	3	4	5
I will definitely screen for PTSD in a trauma patient with mTBI during the next admitted hospitalization.	1	2	3	4	5
I intend to screen for PTSD in a trauma patient with mTBI during the next admitted hospitalization.	1	2	3	4	5
How strong is your intention to screen for PTSD in a trauma patient with mTBI during their hospitalization?	1	2	3	4	5
How often do you not screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
When I need to concentrate on caring for hospitalized trauma patients with mTBI, I have no trouble focusing my attention.	1	2	3	4	5
When trying to focus my attention on hospitalized trauma patients with mTBI, I have difficulty blocking out distracting thoughts.	1	2	3	4	5
When concentrating on caring for hospitalized trauma patients with mTBI, I can focus my attention so that I become unaware of what is going on around me.	1	2	3	4	5
Within the socio-political context, there is sufficient financial support for PTSD screening in hospitalized trauma patients with mTBI.	1	2	3	4	5
Within the socio-political context, there are good networks between parties involved in screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
Most people who are important to me think that I should screen for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
Most people whose opinion I value would approve me of screening for PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5
I would support a team of dedicated professionals responsible for the screening of PTSD in hospitalized trauma patients with mTBI.	1	2	3	4	5

APPENDIX C:
PTSD FACT SHEET FOR PARTICIPANTS

Screening for PTSD in Hospitalized Patients with Mild Traumatic Brain Injury: Why it Matters

- Survey will take approximately 5-10 minutes to complete and consists of 31 questions that evaluate behavioral factors influencing screening practices for PTSD in patients with traumatic brain injury
- Participation is entirely voluntary and there will be no identifying information
- Participation involves no foreseeable risks

Defining PTSD

- Diagnosis of PTSD requires that all criteria be met:

- **Criterion A:** Patient was exposed to death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence
- **Criterion B:** Traumatic event is persistently re-experienced in the following ways: intrusive thoughts, nightmares, flashbacks, emotional distress, physical reactivity
- **Criterion C:** Avoidance of trauma-related stimuli after the trauma
- **Criterion D:** Negative thoughts or feelings that began or worsened after the trauma
- **Criterion E:** Trauma related arousal and reactivity that began or worsened after the trauma
- **Criterion F:** Symptoms last for more than one month
- **Criterion G:** Symptoms create distress or functional impairment
- **Criterion H:** Symptoms are not due to medication, substance use, or other illness

(Stein et al., 2014)

Defining Mild TBI

- Often difficult to identify, relying on mechanism of injury and symptom presentation
- GCS 13-15
- Loss of consciousness not lasting >30 min
- Posttraumatic amnesia not lasting >24 hours
- Variability in opinion of acutely positive neuroimaging findings

(Blyth & Bazarian, 2010; Levin & Diaz-Arrastia, 2015)

Background

- PTSD incidence involving TBI with or without poly-trauma is between 11% and 40%
- Persons with PTSD from traumatic injury have significantly higher healthcare utilization rates
- Long-term sequelae include: substance abuse, poor physical health, mood disorders, higher suicide rates, and inflammatory vascular diseases
- PTSD trajectory is variable with manifestations frequently appearing between 3-6 months after injury, highlighting the need to screen early and track mental health outcomes
- Veterans Affairs/ Department of Defense Clinical Practice Guideline supports screening in high-risk populations

(Haarbauer-Krupa et al., 2016; Susskind, Ruzek, & Friedman, 2012; Zatzick et al., 2013)

American College of Surgeons Committee on Trauma Recommendations

- Early screening in the inpatient setting and referral with available resources (inpatient and/or outpatient)
- Emerging long-term data supports routine trauma center based screening for PTSD and depression
- Screening for both PTSD and depression is prudent due to the significant correlation
- Plan to evaluate, support, and treat PTSD should be considered in any comprehensive rehabilitation program for traumatically injured patients

(American College of Surgeons Committee on Trauma, 2014)

TBI Statistics Riverside County 2010-2014

Variables include:

- Non-fatal hospitalization
- All races above 15 years of age
- All mechanisms of injury
- TBI as primary or secondary diagnosis

<u>Year</u>	<u># of Cases</u>
2010	1291
2011	1402
2012	1553
2013	1706
2014	1819
TOTAL:	7,771 cases

(California Department of Public Health: EpiCenter California Injury Data Online, 2017)

Recommended Outcome Measures

- Based on the American College of Surgeons Trauma Quality Improvement Program
- Standardized data and risk adjustment in trauma is required
- Requirements include: quality of life and level of function achieved after injury rehabilitation
- Mental health outcomes are an integral component in quality of life measures
- Risk adjusted benchmarking system should be in place for individual trauma centers
- PTSD Checklist-Civilian Checklist (PCL-C) and PTSD Checklist for DSM-5 (PCL-5) are easily employed patient self-screening tools validated in the acute care setting

(American College of Surgeons Committee on Trauma, 2014)

Benefits to Screening

- Improve the evaluation of mental health in the trauma population according to recommendations
- Track potential PTSD trajectory in Desert Regional Medical Center's trauma patients from inpatient to several months beyond injury
- Better able to identify demographics in the Desert Regional Medical Center's trauma population that predisposes patients to PTSD
- Improve early recognition of PTSD symptomology
- Promote the long-term mental health of Desert Regional Medical Center's trauma patients while enabling the reduction of negative sequelae from TBI
- Reduce the cost of re-admission due to complications related to recovery and adverse mental health outcomes

Billing for Screening

- CPT code 96127: Brief Behavioral or Emotional Assessment
- Can be billed up to 4 times per hospitalization using different screen tools
- Covered by any major insurance under the Affordable Care Act

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APPENDIX D:

IRB APPROVAL LETTER – DESERT REGIONAL MEDICAL CENTER



INSTITUTIONAL REVIEW BOARD

DESERT REGIONAL MEDICAL CENTER
 IRB CERTIFICATE & NOTIFICATION
 of
Exemption (Waiver of IRB Oversight)

Study Title: PTSD Screening in Hospitalized Trauma Patients with Mild Traumatic Brain Injury

Desert Regional Medical Center IRB Number: DIRB-1802E

Principal Investigator: Justin Hall

Associate Investigator(s): None

Sponsor: None

On January 30, 2018, the Chairman of the Institutional Review Board (IRB) at Desert Regional Medical Center (DRMC) reviewed the research study entitled "PTSD Screening in Hospitalized Trauma Patients with Mild Traumatic Brain Injury." It was deemed that the study does not require ongoing IRB oversight because it is eligible for an exemption.

The study is eligible for an exemption under Federal regulations, namely 45 CFR 46.101(b)(2). The study is eligible for exemption under category 2 since the research involves the use of survey procedures and the information is not recorded in a manner that human subjects can be identified.

The significance of exempt status is that the research activity is not monitored by the IRB. Assuming the research project does not change, it is also not subject to continuing IRB oversight (e.g., annual review).

Please refer to the Desert Regional Medical Center's IRB Number (i.e., DIRB-1802E) in any further communication about any issues related to the research study.

This determination is explicitly granted upon the details of the research study proposal (dated October 9, 2017 - version 1.0), and other supporting documentation.

The accompanying documents were included in the IRB submission:

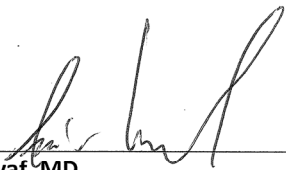
1. DRMC IRB Form #01: Checklist for New Research Study
2. DRMC IRB Form #02: Application for Initial IRB Review of a New Research Study
3. Research Proposal (dated October 9, 2017; version 1.0)
4. DRMC IRB Form #05: Application for IRB Exemption (Waiver)
5. Conflict of Interest Disclosure Statement (Hall)
6. Curriculum Vitae (CVs) (Hall; dated 2018 01 28)
7. CITI Training Certificate for "Health Information Privacy and Security" (Hall; dated 2015 08 21)
8. Letter of Support (from Frank Ercoli, MD, Trauma & Critical Care Surgeon)

 **DESERT REGIONAL
MEDICAL CENTER** **INSTITUTIONAL REVIEW BOARD**

9. California Nursing License (Hall; expires 2019 03 31)
10. PTSD Information Sheet – “Screening for PTSD in Hospitalized Patients with Mild Traumatic Brain Injury: Why it Matters” to be presented to healthcare providers
11. Questionnaire – “Screening for PTSD in Mild Traumatic Brain Injury (MTBI): Barrier Questionnaire”
12. “Information and Staff Consent Form” (dated 2018 01 28; version 1)

The following criteria/stipulations apply to this approval/waiver:

1. To be in compliance with DRMC IRB and Federal regulations, the study must be conducted in accordance to the research proposal.
2. There is no IRB expiration date, and submission of progress reports (continuing reviews) is not required.
3. If identifying information of the research subjects is recorded, the study is no longer eligible for an exemption. Recording of identifying subject information is a modification to the study design that must be submitted and approved by the DRMC IRB.



Amir Lavaf, MD
Chairman
DRMC Institutional Review Board

01/30/2018

Date

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