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Psychiatric Morbidity and Functional Impairments in Survivors of Burns, Traumatic Injuries, and ICU Stays for Other Critical Illnesses: A Review of the Literature

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Abstract

Severe burns, traumatic injuries and other critical illnesses are a substantial source of morbidity in the United States. As more patients survive these conditions, there has been increasing interest in psychiatric and functional outcomes of these individuals. In this article, we reviewed the literature on the prevalence of psychiatric conditions, with particular emphasis on posttraumatic stress disorder (PTSD) and depression, as well as functional impairments, in adult and pediatric survivors of burns, trauma and intensive care unit stays for other critical illnesses. We found that PTSD and depressive symptoms are quite prevalent in these patient groups. We also examined potential risk factors for psychiatric morbidity and impaired function in all three patient groups, and conclude that patient-specific and acute care factors, in addition to early post-acute care psychiatric symptoms, may convey risk for subsequent psychopathology and diminished function. Finally, we discussed limitations in the literature as well as possible directions for future research, particularly in clarifying risk factors for psychiatric disorders as well as potential preventative and treatment interventions that may improve outcomes.

Keywords

burns; injuries; critical care; intensive care unit; stress disorder; posttraumatic; depression; quality of life; outcome assessment (health care)

INTRODUCTION

Serious burns and traumatic injuries, as well as other critical illnesses, represent a considerable public health burden for the United States. Every year, there are over one million burn injuries sustained resulting in over 45,000 acute care hospital admissions (Brigham & McLoughlin 1996; Esselman, Thombs, Magyar-Russell, & Fauerbach 2006). Approximately 2.5 million individuals are injured so severely that they require acute care hospital admissions (Bonnie *et al.* 1999), and over half a million require intensive care unit (ICU) admission (Nathens *et al.* 2006). Over 200,000 children require ICU admissions

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annually (Odetola *et al.* 2005). Fire is the third leading cause of unintentional injuries in children (Public Health Policy Advisory Board 1999).

With advances in medical and surgical care, increasing numbers of patients are surviving severe burn injuries, trauma, and ICU stays generally (Angus & Carlet 2003; Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; Ornato, Craren, Nelson, & Kimball 1985). Severe trauma, burns and other critical illnesses, as well as their requisite ICU therapies expose patients to extreme physiological and psychological stressors. Therefore, psychiatric morbidity and functional limitations are potential concerns in these patients.

In this article, we will provide an overview of the literature on psychiatric morbidity and functional limitations in adult and pediatric survivors of burns, trauma, and ICU stays for other critical illnesses, with specific emphasis on the prevalence of specific psychiatric disorders following these conditions and potential risk factors for subsequent psychopathology. We will highlight risk factors for psychiatric morbidity that are present in more than one group. In order to ensure a comprehensive review, we performed a literature search of Medline (1966–2009) using the MeSH subject headings “mental disorders,” “psychometrics,” “injuries,” “burns,” “critical care,” “intensive care units,” “respiratory distress syndrome, adult,” and “sepsis.” We also used the text words “depress*,” “stress,” and “anxi*.” The search was limited to English-language articles. In addition, we examined relevant review articles as well as their bibliographies.

PREVALENCE OF PSYCHIATRIC MORBIDITY IN SURVIVORS OF BURNS, TRAUMA AND ICU STAYS FOR OTHER CRITICAL ILLNESSES

An important methodological consideration must be taken into account prior to reviewing the prevalence of psychopathology in these patient populations. Most studies of burn, trauma and ICU survivors relied exclusively on questionnaires (i.e., screening instruments) to estimate the burden of subsequent psychiatric symptoms. While more practical, questionnaires do not allow for a definitive diagnosis of a disorder to be made. Therefore, we report separate prevalences based on whether psychopathology was ascertained with diagnostic interviews or questionnaires.

Prevalence of psychiatric morbidity in burn survivors

Symptoms of acute stress disorder (ASD) and posttraumatic stress disorder (PTSD) are very common in the aftermath of severe burn injury (Patterson *et al.* 1993). Using diagnostic interviews such as the Clinician-Administered PTSD Scale or the Structured Clinical Interview for DSM (SCID), ASD has been found to be present in 11–32% of adult burn injury survivors in the acute care setting (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006). PTSD has been found in 20–45% of adult survivors of serious burns when ascertained through diagnostic interviews; when using screening questionnaires, the point prevalence of clinically significant PTSD symptoms has ranged from 19–33% (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; McKibben, Bresnick, Wiechman Askay, & Fauerbach 2008). Over 25% of children have symptoms suggestive of the diagnoses of ASD and/or PTSD following severe burns (Tarnoski, Rasnake, Gavaghan-Jones, & Smith 1991).

Studies of adult survivors of serious burns have found that the prevalence of major depression was 4% during the acute hospitalization when assessed by a clinician administering the SCID, and clinically significant depressive symptoms ranged from 8–35% when assessed with questionnaires (Thombs, Bresnick, & Magyar-Russell 2006). After hospital discharge, the point prevalence of clinician-diagnosed major depression was 7–10% and symptoms suggestive of major depression ranged from 2–28% (varying based upon timing of assessment, questionnaire used and threshold employed) (Thombs, Bresnick, &

Magyar-Russell 2006). Comorbidity between PTSD and major depression in adult burn survivors appears highly prevalent (Dyster-Aas *et al.* 2008). Approximately 13% of pediatric burn survivors have clinically significant depressive symptoms (Stoddard, Stroud, & Murphy 1992; Pope *et al.* 2007).

Prevalence of psychiatric morbidity in survivors of traumatic injury

ASD and PTSD in adult survivors of a traumatic injury are extremely common. Numerous studies have reported a 10–42% point prevalence of questionnaire-ascertained clinically significant ASD and/or PTSD symptoms in adult survivors of a traumatic injury (Holbrook *et al.* 1999; Michaels *et al.* 1999; Zatzick *et al.* 2002a; Zatzick *et al.* 2007); the prevalence of clinician-diagnosed PTSD has ranged from 18–39% (Blanchard *et al.* 1996; Ursano *et al.* 1999). In traumatically injured children and adolescents, the prevalence of PTSD diagnosed by semi-structured interview has ranged from 13–34% (Stallard, Velleman, & Baldwin 1998; Daviss *et al.* 2000; Winston *et al.* 2003), and the point prevalence of symptoms suggestive of PTSD when assessed with questionnaires has ranged from 19–32% (Aaron, Zaglul, & Emery 1999; Zatzick *et al.* 2006).

Major depression is an additional mental health concern for survivors of traumatic injuries. Clinician-diagnosed major depression has been reported in 4–19% of adult survivors of physical injuries (Shalev *et al.* 1998; O'Donnell, Creamer, & Pattison 2004), and questionnaire-ascertained clinically significant depressive symptoms have ranged from 6–16% (Schnyder *et al.* 2001; Matsuoka *et al.* 2008). Comorbidity between PTSD and major depression in adult trauma survivors is also highly prevalent (Shalev *et al.* 1998; Schnyder, Moergeli, Klaghofer, & Buddeberg 2001; Schnyder *et al.* 2001).

Prevalence of psychiatric morbidity in survivors of ICU stays for other critical illnesses

Survivors of ICU stays for critical illnesses have a substantial burden of psychopathology. The point prevalence of clinically significant questionnaire-ascertained PTSD symptoms in adult general ICU (i.e., those patients treated in a general vs. a specialty ICU) survivors up to 10 years after discharge in a systematic review of fifteen studies was 22%, while the point prevalence of clinician-diagnosed PTSD was 19% (Davydow *et al.* 2008). In survivors of acute lung injury/acute respiratory distress syndrome (ALI/ARDS), a common critical illness, the point prevalence of symptoms suggestive of the diagnosis of PTSD has ranged from 21–35%, and the prevalence of clinician-diagnosed PTSD ranged from 24–44% (Davydow, Desai, Needham, & Bienvenu 2008). Additionally, 23–48% of ALI/ARDS survivors have clinically significant nonspecific anxiety symptoms (Davydow, Desai, Needham, & Bienvenu 2008). The point prevalence of symptoms suggestive of PTSD in pediatric ICU (PICU) survivors has ranged from 10–28% (Judge, Nadel, Vergnaud, & Garralda 2002; Shears, Nadel, Gledhill, & Garralda 2005; Bronner *et al.* 2008; Colville, Kerry, & Pierce 2008).

A systematic review of fourteen studies found that symptoms suggestive of the diagnosis of major depression have been found in 28% of adult general ICU survivors. (Davydow *et al.* 2009). One study in this review used the SCID to make diagnoses of depressive disorder (major depression and depressive disorder NOS), finding a point prevalence of 33% at 2 months after ICU discharge (Weinert & Meller 2006). The point prevalence of clinically significant depressive symptoms in ALI/ARDS survivors has ranged from 17–43% (Davydow, Desai, Needham, & Bienvenu 2008). Only two studies have assessed depression in PICU survivors; 7% and 13% of patients, respectively, in these studies had clinically significant depressive symptoms (Rees, Gledhill, Garralda, & Nadel 2004; Muranjan *et al.* 2008).

POTENTIAL RISK FACTORS FOR PSYCHIATRIC MORBIDITY

Potential risk factors in burn survivors

Several studies have examined potential risk factors for psychiatric morbidity in burn survivors. Acute stress symptoms in the aftermath of the burn, prior psychiatric history, and premorbid personality (particularly high neuroticism) have been fairly consistent predictors of PTSD following a serious burn injury (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; McKibben, Bresnick, Wiechman Askay, & Fauerbach 2008; Dyster-Aas *et al.* 2008). In children, potential risk factors for PTSD following a burn injury include increased total body surface area (TBSA) burned, increased pain from the injury, separation anxiety and peritraumatic dissociation (Saxe *et al.* 2005). In studies of burn survivors, female gender, pre-burn affective and anxiety disorders, burn injury characteristics (e.g., TBSA burned, location of burn), personality characteristics (particularly trait anxiety), and coping styles have been found to be fairly consistent predictors of subsequent depressive symptoms (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; Thombs, Bresnick, & Magyar-Russell 2006; Dyster-Aas *et al.* 2008).

Potential risk factors in traumatic injury survivors

Numerous studies have assessed predictors of PTSD in survivors of traumatic injuries. Potential risk factors for PTSD have included increased acute stress symptoms in the immediate aftermath of the injury, a history of prior trauma, female gender, ICU admission following the trauma, stimulant intoxication pre-trauma, pre-injury benzodiazepine use, increased heart rate at the time of hospital presentation and the subjective sense of life threat from the trauma (Shalev *et al.* 1998; Holbrook, Hoyt, Stein, & Seiber 2001; Schnyder *et al.* 2001; Holbrook, Hoyt, Stein, & Seiber 2002; Zatzick *et al.* 2002a; Zatzick *et al.* 2007; Matsuoka *et al.* 2008). Pulmonary artery catheter insertion, an invasive procedure, was a predictor of symptoms suggestive of the diagnosis of PTSD in a study of traumatically injured ICU survivors (Davydow *et al.* In Press). A pre-injury history of major depression and subjective sense of life threat from the trauma have been found to be associated with clinically significant depressive symptoms following traumatic injuries (Shalev *et al.* 1998; Schnyder *et al.* 2001; Matsuoka *et al.* 2008).

Potential risk factors in survivors of ICU stays for other critical illnesses

Studies of ICU survivors have identified several potential risk factors for subsequent psychiatric morbidity. In a systematic review of 15 studies of general ICU survivors, pre-ICU psychopathology, greater in-ICU benzodiazepine administration, and post-ICU memories of frightening and/or psychotic experiences were potential risk factors for PTSD following hospital discharge (Davydow *et al.* 2008). Pre-PICU behavioral difficulties, invasive in-PICU procedures and post-PICU parental psychiatric symptoms have been found to be possible risk factors for PTSD in PICU survivors (Rennick *et al.* 2002; Shears *et al.* 2005; Bronner *et al.* 2008). Early post-ICU depressive symptoms have been found to be the most consistent potential risk factor for later clinically significant depressive symptoms (Davydow *et al.* 2009); one study has identified pre-ICU depressed mood and poor pre-ICU physical functioning as potential risk factors for post-ICU depression (Weinert & Meller 2006). Studies of ALI/ARDS survivors have found that longer ICU lengths of stay (LOS), duration of sedation and duration of mechanical ventilation are potential risk factors for post-ICU psychopathology (Davydow, Desai, Needham, & Bienvenu 2008); however, studies of general ICU or traumatically injured ICU survivors have not found that longer ICU LOS or duration of mechanical ventilation predispose to post-ICU psychopathology (Davydow *et al.* 2008; Davydow *et al.* 2009; Davydow *et al.* In Press).

FUNCTIONAL IMPAIRMENTS IN SURVIVORS OF BURNS, TRAUMA AND ICU STAYS FOR OTHER CRITICAL ILLNESSES

Functional impairments in burn survivors

Several studies have assessed functional outcomes in burn survivors. Adult burn injury survivors have been found to have impairments in productivity and return to work (Esselman *et al.* 2001; Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; Dyster-Aas, Kildal, & Willebrand 2007). Also, adult burn injury survivors have diminished health-related quality of life (HRQOL) (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; Dyster-Aas, Kildal, & Willebrand 2007). Lack of return to work post-burn has been found to be associated with pre-burn psychiatric history, pre-burn unemployment, burn severity and burn to a limb (Fauerbach, Lawrence, Stevens, & Munster 1998; Brych *et al.* 2001). Prior psychiatric history (particularly traumatic stress symptoms), body image dissatisfaction, longer hospital LOS and amputation predicted diminished HRQOL in burn survivors (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006).

Studies of pediatric burn injury survivors have found that children may experience fewer positive emotions, as well as have increased social withdrawal and somatic complaints (Meyer, Robert, Murphy, & Blakeney 2000; Landolt, Grubenmann, & Meuli 2002). One study of pediatric burn survivors found that TBSA burned and the number of days since hospital discharge were associated with behavioral and social difficulties (Daltroy *et al.* 2000), and another study of pediatric burn survivors found that increased burn size and female gender were associated with diminished HRQOL (Pope *et al.* 2007).

Functional impairments in survivors of traumatic injuries

Survivors of serious traumatic injuries have functional impairments and diminished HRQOL following their injury (Michaels *et al.* 2000; Dimopolou *et al.* 2004). Predictors of impaired function and diminished HRQOL in adult trauma survivors include substantial depressive and PTSD symptoms post-injury, type and severity of injury, pre-injury physical functioning and perceived social support (MacKenzie *et al.* 1986; Anke *et al.* 1997; Mock *et al.* 2000; Zatzick *et al.* 2002b; Zatzick *et al.* 2008a; O'Donnell *et al.* 2009a). Three studies have found that clinically significant PTSD and depressive symptoms post-injury are stronger predictors of not returning to work and diminished HRQOL than other factors such as injury severity (Zatzick *et al.* 2002b; Zatzick *et al.* 2008a; O'Donnell *et al.* 2009a). Additionally, a study of traumatically injured adolescents found that greater levels of early PTSD and depressive symptoms were associated with diminished HRQOL during the year following the injury (Zatzick *et al.* 2008b). A study of traumatically injured ICU survivors found that the majority did not return to their previous usual major activity (defined as working, being a student or homemaker, caretaking for another, or volunteering). Not engaging in usual major activity pre-ICU, a longer ICU LOS, having a tracheostomy during the hospitalization and substantial physical distress 3 months after ICU discharge were associated with lack of return to usual major activity (Davydow *et al.* In Press).

Functional impairments in survivors of ICU stays for other critical illnesses

Numerous studies have ascertained HRQOL in survivors of ICU stays for critical illnesses. A systematic review of 21 studies that assessed HRQOL in adult ICU survivors found that survivors of ICU stays had diminished HRQOL as compared to general population levels (Dowdy *et al.* 2005). A meta-analysis of 13 studies of ALI/ARDS survivors also found impaired HRQOL compared to the general population (Dowdy *et al.* 2006). Increased age, greater illness severity at ICU admission, and psychiatric symptoms post-ICU have been associated with diminished post-ICU HRQOL (Dowdy *et al.* 2005; Davydow, Desai,

Needham, & Bienvenu 2008; Davydow *et al.* 2008; Davydow *et al.* 2009). One study of ALI/ARDS survivors has found that clinically significant depressive symptoms were associated with diminished return to work (Adhikari *et al.* 2009).

DISCUSSION

This review of psychiatric morbidity and functional impairments in survivors of burn injuries, trauma and ICU stays for other critical illnesses highlights several important points. First, PTSD and depressive symptoms are quite common in both adult and pediatric burn, traumatic injury and ICU survivors. Second, all three patient populations experience diminished HRQOL as well as difficulties in returning to work or other usual major activities. Third, there appear to be several potential risk factors for psychiatric morbidity and diminished function. Many, such as prior psychiatric illness, female gender, prior trauma and early post-acute care psychiatric symptoms, are common predictors of psychiatric and functional difficulties in more than one patient group. Figure 1 displays a model for risk factors in the pre-acute care, acute care and post-acute care settings common in one or more of the patient groups leading to subsequent psychiatric morbidity and functional impairment.

The existing literature has important limitations. It is unclear if the posttraumatic stress symptoms these patients may develop is more a result of the original traumatic event (i.e., burn injury, trauma, critical illness) or of the subsequent treatment. Additionally, PTSD and depression prevalence estimates may have been affected by the use of different assessment methods as well as questionnaire threshold choices in individual studies (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006; Davydow, Desai, Needham, & Bienvenu 2008; Davydow *et al.* 2009). Furthermore, assessment of PTSD and depression is less developed in pediatric burn survivors than in adults (Esselman, Thombs, Magyar-Russell, & Fauerbach 2006), and only three small studies using variable method and timing of assessments have ascertained depressive symptoms in PICU survivors (Rees, Gledhill, Garraida, & Nadel 2004; Shears *et al.* 2007; Muranjan *et al.* 2008).

Additional research is needed into potential risk factors for psychiatric morbidity and functional impairments in all three patient groups. Premorbid psychiatric illness and/or substance abuse are risk factors for traumatic injury (Wan *et al.* 2006; O'Donnell *et al.* 2009b), and may be independent risk factors for psychopathology following acute care, potentially creating a cycle of recurrent injury and impaired function. Also, studies of traumatic injury survivors have found that increased numbers of prior trauma exposures are powerful predictors of PTSD following an injury (Zatzick *et al.* 2002a; O'Donnell *et al.* 2009b). More study is needed into the role that these factors play in the development of psychiatric morbidity following non-injury related critical illnesses. Also, delirium is common in the immediate aftermath of severe burns, in older traumatically injured individuals, and in patients in the ICU (Blank & Perry 1984; Campbell, Degolia, Fallon, & Rader 2009; Girard, Pandharipande, & Ely 2008). However, only one study of burn survivors and one study of ICU survivors have assessed delirium explicitly as a potential risk factor for subsequent psychopathology (Blank & Perry 1984; Girard *et al.* 2007). To our knowledge, no studies of traumatic injury survivors have assessed delirium in the acute care setting as a potential risk factor for later psychiatric morbidity. Since frightening and/or psychotic experiences often occur in the context of delirium, and memories of these experiences, as well as exposure to deliriogenic sedatives such as benzodiazepines are known risk factors for PTSD and depression following ICU discharge, it would seem reasonable that delirium in the acute care setting may be an important risk factor for later psychiatric morbidity. In particular, studies that integrate patient-specific (e.g., prior trauma

exposure, premorbid personality and prior psychiatric history) and acute care service-delivery characteristics (e.g., burn unit or ICU treatment exposures) are desirable.

Moreover, further research into prevention and treatment efforts is needed. For example, if delirium is causally related to later psychiatric morbidity, then minimization of delirium through the use of alternative, potentially less deliriogenic, sedation strategies (Pandharipande *et al.* 2007; Riker *et al.* 2009) in acute care settings could possibly prevent negative mental health outcomes. Additionally, a stepped collaborative care treatment model using evidence-based pharmacotherapy and psychotherapy for PTSD has been studied in survivors of traumatic injuries and has been found to be effective in improving outcomes (Zatzick *et al.* 2004; Katon, Zatzick, Bond, & Williams 2006). Stepped collaborative care treatment of PTSD and/or depression involves collaboration between a patient's primary care physician, a psychiatrist and a non-physician (e.g., care manager) following acute care discharge (Katon *et al.* 1999; Zatzick *et al.* 2004). Care managers provide enhanced education about PTSD and/or depression, track symptoms and adherence to mental health treatment and facilitate referral and recommendations about medications (based on caseload supervision by a psychiatrist) to a primary care physician and referral for evidenced-based psychotherapy to a mental health clinician. Persistent symptoms lead to a progressive, "stepped up" level of care, and intervention can begin in the acute care setting with the delivery of motivational interviewing and/or other evidence-based psychotherapies (Katon *et al.* 1999; Zatzick *et al.* 2004; Katon, Zatzick, Bond, & Williams 2006). Similar studies in survivors of severe burns and ICU stays for other critical illnesses are needed to ascertain if this model can successfully treat PTSD and depression in these patient populations. Additionally, PICU survivors appear to be at risk for psychiatric morbidity following hospital discharge due to increased psychiatric symptoms in their parents, suggesting that parents of children surviving critical illnesses, including severe burns and other traumas, should also be screened for psychopathology. Studies have found that treatment of parental psychiatric disorders can improve the mental health outcomes of their children (Pilowsky *et al.* 2008), and it would be important to find if this holds true for critically ill children.

In conclusion, psychiatric morbidity, particularly PTSD and depressive symptoms, are common in adult and pediatric burn, trauma and other critical illness survivors. In addition to adverse mental health outcomes, these patients are also at risk for impairments in HRQOL and diminished return to work. Patient-related factors such as prior psychiatric illness, acute care characteristics such as benzodiazepine sedation and invasive procedures, and early post-acute care acute stress and depressive symptoms all may convey risk for later substantial psychiatric morbidity and functional impairments in all three patient groups. Future studies should work to develop greater understanding of risk factors for psychopathology, as well as further preventative interventions and/or treatments for psychiatric disorders, in burn, trauma and ICU survivors. In the meantime, clinicians should recognize that substantial psychiatric morbidity and functional limitations are common in survivors of severe burns, traumatic injuries and ICU stays for other critical illnesses, necessitating collaboration between intensivists, surgeons, pediatricians, primary care physicians and psychiatrists to ensure prompt comprehensive evaluation and treatment.

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Figure 1.

A model of potential risk factors for psychiatric morbidity and functional impairment across patient groups

Abbreviations: (in alphabetical order): HRQOL= health-related quality of life; ICU = intensive care unit; PTSD = posttraumatic stress disorder.