Rehabilitating a Missed Opportunity: Integration of Rehabilitation Psychology Into the Care of Critically Ill Patients, Survivors, and Caregivers

James C. Jackson Vanderbilt University

Jennifer E. Jutte University of Washington School of Medicine

Objective: Rehabilitation psychologists are specifically trained to work with individuals across the spectrum of health care settings and they have only recently begun to wade into the often deep and challenging waters of the critical care environment and intensive care unit (ICU) setting. **Method:** In the commentary that follows, we will provide a brief historical perspective on the involvement of rehabilitation psychologists in medical settings and we will describe and interact with the various topics raised in this current special section, all of them pertaining to the intersection of psychology and critical illness. **Results:** These topics concern the potential role of psychologists in the ICU, the identification and treatment of conditions such as **Post-Intensive Care Syndrome**, the clinical nuances of cognitive impairment and psychologists to become involved in the critical care arena is "now" and we discuss practical opportunities for such involvement.

Keywords: critical care, intensive care units, rehabilitation, psychosocial

Rehabilitation psychology is a discipline that was forged in the fire of providing clinical services to individuals with chronic illness and disability, whether acquired or congenital in nature. Since the early days of the field, rehabilitation psychologists have assisted individuals returning from war, adjusting to newly acquired spinal cord injuries, or coping with traumatic brain injuries. In time, the scope of practice broadened to include a greater diversity of populations-notably, individuals with nonneurologic injuries such as burn injuries or other types of physical trauma. Still, large clinical cohorts have been almost entirely unengaged by rehabilitation psychologists, including individuals undergoing medical and surgical critical illness (e.g., transplant) as well as survivors of critical illnesses such as a sepsis and acute respiratory distress syndrome. This state of affairs-in many ways, identified in a "call to arms" by Robert Frank nearly 20 years ago (Frank, 1999)-is rapidly changing and this "change" is the impetus for this special section in Rehabilitation Psychology, entitled The Role of Rehabilitation Psychology in Critical Care and Acute Medical Settings.

Survivors of critical illness are large in number and evergrowing because of the aging population and advances in lifesaving therapies resulting in reduced mortality rates (Chelluri,

Grenvik, & Silverman, 1995; Desai, Law, & Needham, 2011; Needham et al., 2005; Spragg et al., 2010). These survivors often experience wide ranging but until recently, unrecognized, cognitive, mental, and physical function deficits that can last months to years after hospital discharge (Hopkins & Jackson, 2006; Needham et al., 2012). Efforts to treat, study, and understand the nuances and unique vagaries of patients undergoing or recovering from critical illness are still embryonic. Within the pages of this special section of Rehabilitation Psychology, Stucky, Jutte, Warren, Jackson, and Merbitz (2016, pp. 201-209) report the results of an online survey of psychologist involvement in the intensive care unit (ICU). They found that rehabilitation psychologists and neuropsychologists were most frequently involved in the care of critically ill patients in the ICU, as compared with other psychology specialties, though the majority did not self-identify as rehabilitation psychologists specifically. It also is important to note that the majority of these specialists were in Level 1 Trauma Centers that suggests that smaller hospital settings or those without an emphasis on physical trauma may overlook the growing need for psychologist involvement in critical illness. It is quite plausible that smaller hospitals or settings without psychology infrastructure already in place may not allocate the necessary financial resources to employ psychologists as integrated members of a critical care medical team or as consultants.

Models of treatment are developing, theoretical frameworks are emerging, professional boundaries are being clarified, appropriate clinical outcomes are being identified and a distinct area of emphasis at the intersection of rehabilitation psychology and critical care is emerging. These developments, in the form of theoretical reviews and original research articles, are engaged in the pages of

James C. Jackson, Department of Medicine, Vanderbilt University; Jennifer E. Jutte, Department of Rehabilitation Medicine, University of Washington School of Medicine.

Correspondence concerning this article should be addressed to Jennifer E. Jutte, MPH, PhD, Department of Rehabilitation Medicine, University of Washington Medical Center, 325 9th Avenue, Box 359740, Seattle, WA 98104. E-mail: jesteven@uw.edu

this special section and the key themes of this section are discussed and synthesized in the paragraphs below.

Critically III Patients and Survivors of Critical Illness: A Statement of the Problem

Every year, more than <u>6 million people</u> in North America are admitted to a general medical or general surgical ICU (Society of Critical Care Medicine, 2011). Hospitalizations for the most common life-threatening critical illnesses such as sepsis and Acute Respiratory Distress Syndrome (ARDS) are significantly increasing (Dombrovskiy, Martin, Sunderram, & Paz, 2005; Mayr, Yende, & Angus, 2014). At the same time, because of advances in critical care medicine, mortality rates have significantly declined for many critical illness diagnoses, bolstering the ranks of ICU survivors. However, the cost of this survivorship is high. These individuals are alive, yet have new and persistent deficits related to delirium, inflammation, metabolic dysregulation, and hypoxia, among others (Pandharipande et al., 2013). Their postcritical illness challenges are challenges of "survivorship" marked by burdens and legacies of critical illness, including physical, functional, mental health, and cognitive deficits and a cycle of rehospitalizations, frequently culminating in premature death (Jackson et al., 2003; Mikkelsen et al., 2009; Nickel et al., 2004). Such difficulties, identified in dozens of peer reviewed publications, are increasingly described in forums such as the New York Times (Hoffman, 2013) and the Wall Street Journal (Landro, 2013), resulting in increased awareness of, and interest, in this problem in the community at large and in the rehabilitation psychology community.

Postintensive Care Syndrome

Several of the manuscripts included in this special section address "Postintensive Care Syndrome" (PICS), a term coined at a conference of multidisciplinary experts in 2011 (Needham et al., 2012). PICS refers to deficits in three realms of function—physical, cognitive, and mental health—and while the syndrome is yet to be found in the pages of diagnostic manuals, it deserves further study for many reasons, not least of all because it reflects the beginning of the development of a common language and because it may prove to be a valuable way to conceptualize cases. PICS phenotypes manifest during the course of ICU hospitalization and persist, sometimes for years, beyond hospitalization. PICS not only affects patients, but also their family members and caregivers, in important ways as described in further detail below.

Obviously, key questions remain. If we assume for a moment that a well-defined syndrome impacting ICU survivors exists, then what are the implications for treatment and management? Are the long-term outcomes observed among individuals with PICS different (worse?) than outcomes of survivors of critical illness without PICS? How do we best engage patients and family members with PICS? Should we implement post-ICU clinics and, if so, should each clinic have a rehabilitation psychology presence? These and other questions need to be thoughtfully engaged, both by clinicians and academicians alike.

Persistent Cognitive Impairment and Its Remediation

One of the three pillars of PICS pertains to cognitive functioning and data show that one in two ICU survivors experience newly acquired cognitive impairment that can, and often does, persist for vears (Pandharipande et al., 2013). The severity of such impairment varies, yet 40% of survivors will have disruptions in attention, memory function, and executive functions equal to, or worse than, those with moderate traumatic brain injury (mTBI), and nearly <u>30%</u> will have impairments of a severity comparable to mild Alzheimer's disease (AD), though these impairments have more in common with acquired brain injuries than with dementia. They develop abruptly rather than gradually, they only rarely progress, they are not largely conditions of older age, and, as noted, they exist across domains and are not particularly "memorycentric." For these reasons, it may be the case that cognitive training and rehabilitation are appropriate methods of treatment, although currently, these approaches are far from standard of care, even as they increasingly appear to be effective in the treatment of other cognitively impaired medical populations. What these approaches ultimately include remains to be seen, though neuroimaging biomarkers may provide a road map with regard to which brain regions should be addressed in the creation and implementation of therapies, as suggested by Hopkins, Suchyta, Beene, and Jackson (2016, pp. 151-164) in this special section.

Psychological Difficulties Among Patients and Families

The complaints reported by ICU survivors are not only cognitive. Evidence from over 25 investigations demonstrates that symptoms of depression, general anxiety, and posttraumatic stress disorder (PTSD)—all components of PICS—are common (Davydow, Desai, Needham, & Bienvenu, 2008; Parker et al., 2015). Of these, PTSD has been studied most widely and is, perhaps, most controversial. While there has been broad recognition for decades that PTSD can be precipitated by physical traumas; there is increasing evidence that individuals (patients and family members) can experience posttraumatic stress symptoms as the result of "trauma" experienced during the course of ICU hospitalization (e.g., "imagined" experiences and delusions related to delirium or "traumatizing" ICU procedures; Jones et al., 2007; Jones, Griffiths, Humphris, & Skirrow, 2001). McGiffin, Galatzer-Levy, and Bonanno (2016, 120-131) highlight the variety of stressors associated with ICU hospitalization that could precipitate the onset of acute and posttraumatic stress symptoms. Jackson and colleagues (2016, pp. 132–140) delineate the unique constellation of posttraumatic symptoms experienced by individuals in the context of critical illness, with avoidance and re-experiencing predominating the clinical profile—often affecting patients' propensity to seek future services. Furthermore, Elliott and colleagues (2016, pp. 141-150) highlight the association between posttraumatic stress symptoms in former ICU patients and depression scores and pain intensity at baseline, recollection of "frightening" experiences in the ICU, and poorer sleep quality 6 months after discharge. Questions abound regarding the specific aspects of critical illness that may constitute a "trauma," and whether treatment practices found to be efficacious and effective in other settings, may also find an evidence base here. These efforts will likely take many forms but one key endeavor will be to determine whether, and in what ways, traditional strategies for the treatment of PTSD should be tailored to address the potentially unique symptom profile that unfolds in the lives of people after critical illness.

Rehabilitation psychologists are adept at taking a broad vantage point, beyond simply assessing and treating the patient, but also determining environmental and work-related concerns and areas of intervention, and working with family members and caregivers, to provide holistic care designed to positively impact the recovery trajectory. Indeed, in some instances, families battle the ghosts of critical illness more so than former patients (e.g., Garrouste-Orgeas et al., 2012). For instance, although posttraumatic stress symptoms are common in patients (~20%; Davydow, Gifford, Desai, Needham, & Bienvenu, 2008), the extant literature has reported rates as high as 33% among family caregivers (Azoulay et al., 2005). The contributors to family distress are likely multifactorial and may include the trauma associated with having a loved one critically ill and, at times on the verge of death; poor provider communication; sleep disruption; and the burdens often associated with assuming a caregiver role (Day, Haj-Bakri, Lubchansky, & Mehta, 2013; Rabow, Hauser, & Adams, 2004). Family members often overestimate their loved ones' recovery trajectory and, therefore, tend to <u>underestimate</u> the amount of <u>support</u> they will need to provide after hospitalization (Cox et al., 2009; Nelson, Cox, Hope, & Carson, 2010; Unroe et al., 2010). In this special section of Rehabilitation Psychology, van den Born-van Zanten and colleagues (2016, pp. 173-178) report that a high percentage of family caregivers experience caregiver strain up to 3 months after their loved one's discharge from the ICU. Warren and colleagues (2016, pp. 179-185) found that psychological distress, as measured by the PHO-8 and PC-PTSD, was frequent among family caregivers with 39% of the sample endorsing depressive symptoms and 24% endorsing posttraumatic stress symptoms. They also found that these symptoms were more likely to be longer lasting among family caregivers of patients who had sustained a traumatic brain injury (TBI) as compared with those who had not sustained a TBI. Family caregivers have been shown to experience acute and longer-lasting signs of distress (Azoulay et al., 2005; Pochard et al., 2001), as described in the extant literature and based on our clinical experiences. We have had many encounters with former patients, months removed from their ICU stays, who have told us that they are largely <u>unaffected</u> by their experiences of critical illness, as they have no memory of them; only to have their family members report being haunted by vivid memories of intensive care. Investigating and being attentive to the specific needs of family members of ICU survivors and proactively addressing these after needs, not only through therapy but through psychoeducation, support groups, and programming must eventually become a cornerstone of any comprehensive effort to positively affect the human experience occurring after critical illness.

Integrating and Developing Identities: Expanding the Roles of Rehabilitation Psychologists

The nearly ubiquitous nature of the cognitive and mental health difficulties encountered by ICU survivors suggests an obvious role for psychologists to play and yet, as we have noted, psychologists have historically been only minimally engaged in the care and management of medical and surgical ICU patients. Evidence from survey data suggests that these circumstances are slowly changing, as rehabilitation psychologists, already ensconced into many med-

ical environments and well-versed in treating a diversity of patient populations, are increasingly becoming more involved in the care of medical intensive care patients (e.g., Stucky et al., 2016). These patients represent a new frontier-an opportunity to engage the vital and heretofore largely unmet needs of a large cohort of patients who, sadly, "fall between the cracks." Dettling-Ihnenfeldt and colleagues (2016, pp. 165-172) suggest a role for psychologists in the rehabilitation setting to assist the team in understanding a patient's coping style and psychological resiliency, thereby enhancing treatment planning and, thus, patient recovery. As noted by Merbitz and colleagues (2016, pp. 186–200), there are several rites of passage through which critical illness survivors transition, each of which may be optimal timepoints for rehabilitation psychology intervention. A parallel process is occurring in the outpatient climate, where treatment centers designed to address the long-term needs of survivors of critical illness have begun to form, with clinics currently in existence at Vanderbilt University, University of Indiana, University of California San Diego, and Massachusetts General Hospital.

Whether in North America or in Europe, in large hospitals or small ones, it appears that a "missed opportunity" is becoming a golden opportunity, as rehabilitation psychology principles are increasingly applied as the integration of rehabilitation psychology and critical illness accelerates. The principles that undergird rehabilitation psychology transcend cultures and clinical populations and are relevant in addressing the many challenges experienced in the context of critical illness, though they were developed while working with other cohorts. Consider, for instance, the classic work of Beatrice Wright, *Physical Disability: A Psychological Approach.* Wright likely was not writing with survivors of critical illness in mind, yet her observations can be directly applicable to survivors of critical illness.

Rehabilitation psychologists are well-trained to work in a broad array of clinical contexts, yet formal training that prepares rehabilitation psychologists to work in critical care settings specifically is so sparse as to almost be nonexistent. There are smatterings of these training programs around the country, though the funding for these programs is highly variable and largely dependent on the foci of hospital administration. There are many questions that need to be engaged as we think about how to ensure a growing resource of well-trained and well-equipped providers to address the many needs of the increasing population of critically ill patients and survivors. Several key questions deserve our focus: if programs pertaining to rehabilitation psychology and critical illness were standard practice, what would be included in a standardized training program? When would be the optimal time point for provision of such training? Who would provide training focused on critical care psychology? And would the training involve specialized assessment as well as intervention practices? What about research strategies specific to the critical care environment? Are there psychologists working in critical care settings right now who could identify crucial training needs? What are the career opportunities and pathways by which psychologists would engage in careers providing service to critically ill patients and survivors?

Perhaps not surprisingly, few psychologists are aware of the very enthusiastic embrace of our discipline by inhabitants of the critical care world. More recently, however, this interaction has become increasingly reciprocal, as psychologists working in critical care have hosted well-attended symposia on the integration of psychology into the critical care and postcritical care arena during the last two midwinter conferences of the APA Division of Rehabilitation Psychology. These symposia and subsequent educational offerings in 2015 and 2016 provided the impetus for this special section on *The Role of Rehabilitation Psychology in Critical Care* and Acute Medical Settings.

Now is the time for rehabilitation psychologists to begin to "think outside the box" and extend beyond the typical rehabilitation environments to assist patients, family caregivers, and providers throughout the many years of survivorship that often ensue after critical illness. This special section of *Rehabilitation Psychol*ogy is meant to be a broad introduction to the postintensive care issues we must engage across the continuum of critical care environments. Throughout its pages, readers can expect to develop a clearer understanding of the issues faced by critical illness survivors and of the assessment and treatment practices being performed by psychologists. We anticipate that this special section will foster rich discussion hopefully highlighting the growing need for funded rehabilitation psychology practice—beginning in the ICU—and extending far beyond the spectrum of critical illness environments.

References

- Azoulay, E., Pochard, F., Kentish-Barnes, N., Chevret, S., Aboab, J., Adrie, C., . . . the FAMIREA Study Group. (2005). Risk of posttraumatic stress symptoms in family members of intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, 171, 987–994. http://dx.doi.org/10.1164/rccm.200409-12950C
- Chelluri, L., Grenvik, A., & Silverman, M. (1995). Intensive care for critically ill elderly: Mortality, costs, and quality of life. Review of the literature. Archives of Internal Medicine, 155, 1013–1022. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7748043; http://dx.doi.org/ 10.1001/archinte.1995.00430100033004
- Cox, C. E., Martinu, T., Sathy, S. J., Clay, A. S., Chia, J., Gray, A. L., . . . Tulsky, J. A. (2009). Expectations and outcomes of prolonged mechanical ventilation. *Critical Care Medicine*, 37, 2888–2894. http://dx.doi .org/10.1097/CCM.0b013e3181ab86ed
- Davydow, D. S., Desai, S. V., Needham, D. M., & Bienvenu, O. J. (2008). Psychiatric morbidity in survivors of the acute respiratory distress syndrome: A systematic review. *Psychosomatic Medicine*, 70, 512–519. http://dx.doi.org/10.1097/PSY.0b013e31816aa0dd
- Davydow, D. S., Gifford, J. M., Desai, S. V., Needham, D. M., & Bienvenu, O. J. (2008). Posttraumatic stress disorder in general intensive care unit survivors: A systematic review. *General Hospital Psychiatry*, 30, 421–434. http://dx.doi.org/10.1016/j.genhosppsych.2008.05.006
- Day, A., Haj-Bakri, S., Lubchansky, S., & Mehta, S. (2013). Sleep, anxiety and fatigue in family members of patients admitted to the intensive care unit: A questionnaire study. *Critical Care*, 17, R91. http://dx.doi.org/10 .1186/cc12736
- Desai, S. V., Law, T. J., & Needham, D. M. (2011). Long-term complications of critical care. *Critical Care Medicine*, 39, 371–379. http://dx .doi.org/10.1097/CCM.0b013e3181fd66e5
- Dettling-Ihnenfeldt, D. S., de Graaff, A. E., Beelen, A., Nollet, F., & van der Schaaf, M. (2016). Coping style and quality of life in Dutch intensive care unit survivors. *Rehabilitation Psychology*, 61, 165–172. http://dx .doi.org/10.1037/rep0000084
- Dombrovskiy, V. Y., Martin, A. A., Sunderram, J., & Paz, H. L. (2005). Facing the challenge: Decreasing case fatality rates in severe sepsis despite increasing hospitalizations. *Critical Care Medicine*, *33*, 2555– 2562. http://dx.doi.org/10.1097/01.CCM.0000186748.64438.7B
- Elliott, R., McKinley, S., Fien, M., & Elliott, D. (2016). Posttraumatic stress symptoms in intensive care patients: An exploration of associated

factors. *Rehabilitation Psychology*, *61*, 141–150. http://dx.doi.org/10 .1037/rep0000074

- Frank, R. G. (1999). Rehabilitation psychology: We zigged when we should have zagged. *Rehabilitation Psychology*, 44, 36–51. http://dx.doi .org/10.1037/0090-5550.44.1.36
- Garrouste-Orgeas, M., Coquet, I., Périer, A., Timsit, J. F., Pochard, F., Lancrin, F., . . . Misset, B. (2012). Impact of an intensive care unit diary on psychological distress in patients and relatives. *Critical Care Medicine*, 40, 2033–2040. http://dx.doi.org/10.1097/CCM.0b013e31824e1b43
- Hoffman, J. (2013, July 22). Nightmares after the I. C. U. *The New York Times*. Retrieved from http://well.blogs.nytimes.com/2013/07/22/nightmares-after-the-i-c-u/?_r=0
- Hopkins, R. O., & Jackson, J. C. (2006). Long-term neurocognitive function after critical illness. *Chest*, 130, 869–878. http://dx.doi.org/10 .1378/chest.130.3.869
- Hopkins, R. O., Suchyta, M. R., Beene, K., & Jackson, J. C. (2016). Critical illness acquired brain injury: Neuroimaging and implications for rehabilitation. *Rehabilitation Psychology*, 61, 151–164. http://dx.doi .org/10.1037/rep0000088
- Jackson, J. C., Hart, R. P., Gordon, S. M., Shintani, A., Truman, B., May, L., & Ely, E. W. (2003). Six-month neuropsychological outcome of medical intensive care unit patients. *Critical Care Medicine*, 31, 1226– 1234. http://dx.doi.org/10.1097/01.CCM.0000059996.30263.94
- Jackson, J. C., Jutte, J. E., Hunter, C. H., Ciccolella, N., Warrington, H., Sevin, C., & Bienvenu, O. J. (2016). Posttraumatic Stress Disorder (PTSD) after critical illness: A conceptual review of distinct clinical issues and their implications. *Rehabilitation Psychology*, *61*, 132–140. http://dx.doi.org/10.1037/rep0000085
- Jones, C., Bäckman, C., Capuzzo, M., Flaatten, H., Rylander, C., & Griffiths, R. D. (2007). Precipitants of post-traumatic stress disorder following intensive care: A hypothesis generating study of diversity in care. *Intensive Care Medicine*, 33, 978–985. http://dx.doi.org/10.1007/ s00134-007-0600-8
- Jones, C., Griffiths, R. D., Humphris, G., & Skirrow, P. M. (2001). Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care. *Critical Care Medicine*, 29, 573–580. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/ 11373423; http://dx.doi.org/10.1097/00003246-200103000-00019
- Landro, L. (2013, Nov 25). Hospitals take on post-ICU syndrome, helping patients recover. *The Wall Street Journal*. Retrieved from http://www .wsj.com/articles/SB10001424052702304465604579219932327341004
- Mayr, F. B., Yende, S., & Angus, D. C. (2014). Epidemiology of severe sepsis. Virulence, 5, 4–11. http://dx.doi.org/10.4161/viru.27372
- McGiffin, J. N., Galatzer-Levy, I. R., & Bonanno, G. A. (2016). Is the intensive care unit traumatic? What we know and don't know about the intensive care unit and posttraumatic stress responses. *Rehabilitation Psychology*, 61, 120–131. http://dx.doi.org/10.1037/rep0000073
- Merbitz, N. H., Westie, K., Dammeyer, J. A., Butt, L., & Schneider, J. (2016). After critical care: Challenges in the transition to inpatient rehabilitation. *Rehabilitation Psychology*, 61, 186–200. http://dx.doi .org/10.1037/rep0000072
- Mikkelsen, M. E., Shull, W. H., Biester, R. C., Taichman, D. B., Lynch, S., Demissie, E., . . . Christie, J. D. (2009). Cognitive, mood and quality of life impairments in a select population of ARDS survivors. *Respirology*, 14, 76–82. http://dx.doi.org/10.1111/j.1440-1843.2008.01419.x
- Needham, D. M., Bronskill, S. E., Calinawan, J. R., Sibbald, W. J., Pronovost, P. J., & Laupacis, A. (2005). Projected incidence of mechanical ventilation in Ontario to 2026: Preparing for the aging baby boomers. *Critical Care Medicine*, *33*, 574–579. http://dx.doi.org/10.1097/01 .CCM.0000155992.21174.31
- Needham, D. M., Davidson, J., Cohen, H., Hopkins, R. O., Weinert, C., Wunsch, H., . . . Harvey, M. A. (2012). Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders'

conference. Critical Care Medicine, 40, 502–509. http://dx.doi.org/10 .1097/CCM.0b013e318232da75

- Nelson, J. E., Cox, C. E., Hope, A. A., & Carson, S. S. (2010). Chronic critical illness. American Journal of Respiratory and Critical Care Medicine, 182, 446–454. http://dx.doi.org/10.1164/rccm.201002-0210CI
- Nickel, M., Leiberich, P., Nickel, C., Tritt, K., Mitterlehner, F., Rother, W., & Loew, T. (2004). The occurrence of posttraumatic stress disorder in patients following intensive care treatment: A cross-sectional study in a random sample. *Journal of Intensive Care Medicine*, 19, 285–290. http://dx.doi.org/10.1177/0885066604267684
- Pandharipande, P. P., Girard, T. D., Jackson, J. C., Morandi, A., Thompson, J. L., Pun, B. T., . . . the BRAIN-ICU Study Investigators. (2013).
 Long-term cognitive impairment after critical illness. *The New England Journal of Medicine*, 369, 1306–1316. http://dx.doi.org/10.1056/NEJMoa1301372
- Parker, A. M., Sricharoenchai, T., Raparla, S., Schneck, K. W., Bienvenu, O. J., & Needham, D. M. (2015). Posttraumatic stress disorder in critical illness survivors: A metaanalysis. *Critical Care Medicine*, 43, 1121– 1129. http://dx.doi.org/10.1097/CCM.0000000000882
- Pochard, F., Azoulay, E., Chevret, S., Lemaire, F., Hubert, P., Canoui, P., . . . the French FAMIREA Group. (2001). Symptoms of anxiety and depression in family members of intensive care unit patients: Ethical hypothesis regarding decision-making capacity. *Critical Care Medicine*, 29, 1893–1897. http://dx.doi.org/10.1097/00003246-200110000-00007
- Rabow, M. W., Hauser, J. M., & Adams, J. (2004). Supporting family caregivers at the end of life: "they don't know what they don't know". *Journal of the American Medical Association*, 291, 483–491. http://dx .doi.org/10.1001/jama.291.4.483

- Society of Critical Care Medicine. (2011). *Critical care units: A descriptive analysis* (2nd ed.). Des Plaines, IL: Society of Critical Care Medicine.
- Spragg, R. G., Bernard, G. R., Checkley, W., Curtis, J. R., Gajic, O., Guyatt, G., . . . Harabin, A. L. (2010). Beyond mortality: Future clinical research in acute lung injury. *American Journal of Respiratory and Critical Care Medicine*, 181, 1121–1127.
- Stucky, K., Jutte, J. E., Warren, A. M., Jackson, J. C., & Merbitz, N. (2016). A survey of psychology practice in critical-care settings. *Rehabilitation Psychology*, 61, 201–209. http://dx.doi.org/10.1037/ rep0000071
- Unroe, M., Kahn, J. M., Carson, S. S., Govert, J. A., Martinu, T., Sathy, S. J., . . . Cox, C. E. (2010). One-year trajectories of care and resource utilization for recipients of prolonged mechanical ventilation: A cohort study. *Annals of Internal Medicine*, 153, 167–175. http://dx.doi.org/10 .7326/0003-4819-153-3-201008030-00007
- van den Born–van Zanten, S. A., Dongelmans, D. A., Dettling-Ihnenfeldt, D., Vink, R., & van der Schaaf, M. (2016). Caregiver strain and posttraumatic stress symptoms of informal caregivers of intensive care unit survivors. *Rehabilitation Psychology*, 61, 173–178. http://dx.doi.org/10 .1037/rep0000081
- Warren, A. M., Rainey, E. E., Weddle, R. J., Bennett, M., Roden-Foreman, K., & Foreman, M. L. (2016). The intensive care unit experience: Psychological impact on family members of patients with and without traumatic brain injury. *Rehabilitation Psychology*, *61*, 179–185. http:// dx.doi.org/10.1037/rep0000080

Received March 7, 2016 Accepted March 17, 2016 ■

Is the Intensive Care Unit Traumatic? What We Know and Don't Know About the Intensive Care Unit and Posttraumatic Stress Responses

Jed N. McGiffin Columbia University Isaac R. Galatzer-Levy New York University

George A. Bonanno Columbia University

The intensive care unit (ICU) has been portrayed as psychologically stressful, with a growing body of research substantiating elevated rates of depression, posttraumatic stress disorder (PTSD), and other psychological disruptions in populations of critical care survivors. To explain these psychopathology elevations, some have proposed a direct effect of ICU admission upon the later development of psychopathology, whereas others highlight the complex interaction between the trauma of a life-threatening illness or injury and the stressful life-saving interventions often administered in the ICU. However, the conclusion that the ICU is an independent causal factor in trauma-related psychological outcomes may be premature. Current ICU research suffers from important methodological problems including lack of true prospective data, failure to employ appropriate comparison groups, sampling bias, measurement issues, and problems with statistical methodology. In addition, the ICU literature has yet to investigate important risk and resilience factors that have been empirically validated in the broader stress-response literature. The authors propose the application of these important but complex research question of whether the ICU confers risk for psychological distress above and beyond the traumatic impact of the serious health events that necessitate ICU treatment.

Impact and Implications

Does the ICU contribute to psychopathology above and beyond the traumatic nature of the serious health events that necessitate ICU treatment? The current review raises important methodological concerns about the extant scientific literature linking ICU exposure with psychopathology in populations of critical illness survivors. We suggest empirically validated risk and resilience factors for future application to research in the ICU setting. Addressing fundamental research questions such as who is at risk for ICU-related psychopathology and why will have important clinical and policy implications.

Keywords: intensive care unit, trauma, posttraumatic stress disorder, critical care

Introduction

Recent media coverage has drawn attention to elevated rates of posttraumatic stress disorder (PTSD) following treatment in the intensive care unit (ICU; e.g., Hoffman, 2013; Johns Hopkins Medicine, 2013; Lamas, 2013). In addition to these popular char-

acterizations, a growing body of empirical evidence associates ICU treatment with increased risk for later development of psychopathology in critical illness survivors (Boer et al., 2008; Griffiths, Fortune, Barber, & Young, 2007; Schelling et al., 1998). Yet it is difficult to adjudicate whether observed elevations in psychopathology among ICU-treated individuals reflects the effects of specific ICU treatments, the impact of the life-threatening event that brought the individual to the ICU, or an interaction between the two. To complicate matters further, there are many different types of ICUs (e.g., cardiac, vs. neurological, vs. medical) and a diversity of medical events serious enough to precipitate ICU admission (e.g., cardiac events vs. traumatic injuries vs. bacterial infections). These complexities notwithstanding, some investigators have concluded that ICU admission is an independent risk factor for the development of PTSD, even when controlling for other important disease-related factors (e.g., O'Donnell et al., 2010). In this review, we examine the existing evidence related to

Jed N. McGiffin, Department of Counseling and Clinical Psychology, Teachers College, Columbia University; Isaac R. Galatzer-Levy, Department of Psychiatry, New York University School of Medicine; George A. Bonanno, Department of Counseling and Clinical Psychology, Teachers College, Columbia University.

Correspondence concerning this article should be addressed to Jed N. McGiffin, MA, PhD Student, Clinical Psychology, Loss, Trauma, and Emotion Laboratory, Department of Counseling and Clinical Psychology, Teachers College, Columbia University, 525 West 120th Street, Box 102, New York, NY 10027. E-mail: jnm2150@tc.columbia.edu

post-ICU stress and symptom responses, highlight methodological gaps in the literature, and recommend avenues for future research to better determine if aspects of ICU treatment provide additive risk for psychopathology over and above other trauma-related factors.

Isolating the ICU Experience as a Stressor

In spite of evidence associating ICU exposure with increased risk for psychopathology, significant methodological issues have impeded the field's ability to parse the effects of distinct ICU risk factors on psychological outcomes. For instance, it is extremely difficult to disentangle the potentially traumatic impact of the ICU patient's presenting problem-a life-threatening injury or infirmity—from the unique impact of ICU treatment conditions. Given that a stay in the ICU often involves debilitating physical states (e.g., organ failure or coma) as well as intense sedation and other acute medical procedures, such circumstances may minimize, obscure, or distort how patients experience or recall their ICU stay. Moreover, a significant proportion of ICU-treated individuals report little or no recollection of the actual time spent in the ICU (Granja et al., 2005), provoking fundamental questions as to how the purported traumatic impact of the ICU environment might be transmitted in the first place.

Interest in the ICU as a research site has grown rapidly in recent years, with a search for scholarly journal articles using keywords *ICU* and *PTSD* yielding a more than fivefold increase in references when comparing the past decade to the previous decade (i.e., 2005–2015 with 1995–2005). However, the current ICU literature remains unsystematic and derives from a diversity of disciplines including emergency medicine, medical psychiatry, psychology, critical care nursing, anesthesiology, and other areas of medical specialization (e.g., cardiology). Further, across these disciplines, ICU studies commonly use different measurement techniques, examine different causal and predictive factors, and use different methodological conventions, that vary widely according to study design, timing of inquiry, and outcomes of interest. For example, the literature has referred to post-ICU psychological distress as divergent syndromes including ICU psychosis (Misak, 2005), postintensive care syndrome (PICS; Davidson, Harvey, Schuller, & Black, 2013), traditional PTSD (Davydow, Gifford, Desai, Needham, & Bienvenu, 2008), and post-psychosis PTSD (Wade et al., 2014).

To facilitate the organization of this literature,¹ we put forth a conceptual overview (see Figure 1), parsing areas of empirical inquiry into three main domains: (a) ICU-specific factors (predictors), which have been suggested as potentially harmful influences on post-ICU psychological health, (b) psychological outcomes, explored in the literature as putative downstream consequences of ICU treatment and critical illness, and (c) risk and resilience factors, including many constructs yet to be explored in the context of the ICU, but which present promising avenues to future research.

Evidence for Predictors of Post-ICU Psychopathology

Estimates of the prevalence of PTSD following ICU treatment vary greatly, with a recent systematic review citing rates ranging from 5–64% (Griffiths et al., 2007). Other post-ICU psychological outcomes explored in the literature include depression and anxiety (Davydow, Gifford, Desai, Bienvenu, & Needham, 2009; Rattray, Johnston, & Wildsmith, 2005), delirium (Pandharipande et al., 2006), PTSD (Davydow, Gifford, et al., 2008), sleep abnormalities (Fanfulla et al., 2011), cognitive impairments (Jackson et al., 2007; Carr, 2007), family and social network distress (Jones et al., 2004; Myhren et al., 2009), quality of life (QOL; Dowdy et al., 2005; Granja et al., 2005), and trans-diagnostic general distress (Myhren et al., 2009). Although there is variability across studies, this research has generally focused on a set of medical predictor variables and their relationship with a single type of psychopathology (or cluster of related psychopathologies).

ICU-Specific Factors

The largest body of existing research focuses on ICU medical factors (e.g., medical therapies or interventions), and the relationship such variables play in predicting poor psychological outcomes. A sampling of ICU-specific factors commonly researched for their potential association with psychopathological outcomes include the following: ICU length of stay (LOS), sedation practices (e.g., benzodiazepines or propofol), analgesic practices (generally opioids in the case of pain management), delusional and/or hallucinatory experiences (either related to in-ICU sedative or analgesic therapies and/or consistent with primary medical condition), intubation and reintubation, tracheostomy, MV, pulmonary artery catheter insertion (PAC), and use of physical restraints during ICU treatment (Davydow, Gifford et al., 2008; Davydow, Desai, Needham, & Bienvenu, 2008; Griffiths et al., 2007; Wade, Hardy, Howell, & Mythen, 2013). Across a wide range of studies, including several systematic reviews (Davydow, Gifford, et al., 2008; Griffiths et al., 2007; Wade et al., 2013), a handful of medical factors have emerged as specific features of the ICU environment consistently associated with an array of negative outcomes: sedation regimens, MV (and related intubation practices), and in ICU hallucinations or delusional memories.

Sedation Practices

Sedation practices are a hallmark of ICU medicine and are closely related to the core principals of patient comfort and distress mitigation (Sessler & Varney, 2008). Historically, following the ethos and methodology of the field of general anesthesia, common practice favored deep sedation for ICU patients (Shehabi, Bellomo, Mehta, Riker, & Takala, 2013). Generally speaking, it was thought that the medical induction of amnestic states while in the ICU was more humane for patients than allowing them to be lucid enough to permit cogent memories of their time in the ICU (Kress et al., 2003). Of course the primary reason for heavy sedation in the ICU has always been a pragmatic one; medically complex patients necessitate adequate sedation in order to prevent the

¹ For the preparation of this article, we reviewed a large number of empirical studies, the vast majority of which have been discussed elsewhere in either systematic reviews or meta-analyses.



Figure 1. Risk and resilience factors, intensive care unit (ICU)/critical care factors and post-ICU psychological outcomes.

rejection of life-saving medical therapies such as the placement of endotracheal tubes, which facilitate MV.²

In the early to mid-nineties, however, empirical findings began linking excessive sedation with adverse clinical outcomes (e.g., deeper sedation was shown to prolong the length of time patients spent on MV), prompting the publication of the first systematic analgesia and sedation guidelines in 1995 by a joint venture of the American College of Critical Care Medicine (ACCM) and the Society of Critical Care Medicine (SCCM; Shapiro et al., 1995). These guidelines sought to emphasize adequate sedation rather than deep, and advocated for balancing the in-ICU benefits of sedation and analgesia (i.e., management of agitation and pain) with potential downstream risks for adverse outcomes. Subsequent publications of practice parameters (Jacobi et al., 2002; Barr et al., 2013) bolstered previous guidelines with empirical data and began to heavily emphasize not only the medical risks associated with overadministration of in-ICU sedatives (and analgesia), but also adverse psychiatric outcomes, most notably delirium. Despite the changing landscape of sedation theory and practice, the various medical and psychological risks associated with sedation and analgesia administration in the ICU continue to be problematic.

For instance, in a multisite study of ICU patients, Jones et al. (2007) found a direct relationship linking sedation (and analgesic) administration with the development of PTSD at 3-month follow-up. In a study of 43 patients on MV, total dosage of the benzodiazepine lorazepam, was associated with increased risk for elevated PTSD symptom levels at 6-month follow-up (Girard et al., 2007). In another ICU sample of MV patients, individuals who met stringent criteria for high PTSD symptomatology at 2 months were more likely to have been administered midazolam, a benzodiazepine (Samuelson, Lundberg, & Fridlund, 2007). Interestingly, this study found no such association between PTSD symptoms and an alternative sedative, propofol. This finding underscores a broader debate within the literature pitting benzodiazepines as a class against newer sedatives like propofol, which have different neural mechanisms of action and arguably fewer side effects (Lonardo et al., 2014). In one of the few randomized controlled trials comparing deep sedation with light sedation, Treggiari et al. (2009) found that individuals with deep-sedation group were marginally more likely to have PTSD at 4-weeks. In a sample of ICU survivors of acute lung injury (ALI), depression was found to be associated with a greater mean dosage of benzodiazepines (Dowdy et al., 2009).

Not all studies have found evidence for the putative relationship between sedation and psychopathology. For instance, Weinert and Sprenkle (2008) examined MV patients and failed to find a significant relationship between sedation intensity score and PTSD symptomatology. Given that sedation and analgesia scores in this study were weighted aggregates across drug class (e.g., benzodiazepines vs. opioids) and drug type (e.g., lorazepam, propofol, midazolam), it is possible that the researcher's aggregation methods may have obscured such a relationship.

Recently, strategies for mitigating sedation-related psychopathological risk have emerged, including daily sedationinterruption techniques. These interruption strategies essentially consist of halting a patient's sedation or analgesia for a short period each day, until the patient regains wakefulness or crosses an intolerable pain threshold. Several studies have demonstrated that interruption techniques have positive outcomes, including earlier

² Interestingly, some European ICUs forgo sedation entirely, using padded restraints to achieve toleration of endotracheal intubation and mechanical ventilation (Jones et al., 2007). The risks or benefits of this practice are currently unknown, given the lack of studies comparing United States versus European cohorts matched on similar characteristics.

liberation from MV and decreased risk for PTSD and other psychopathologies (Kress et al., 2003; Parker et al., 2015).

Intubation and MV

(MV, the facilitation of human breathing by a mechanical apparatus, is often achieved via endotracheal tube and sometimes by tracheostomy, and has been identified as a separate risk factor for the development of post-ICU psychopathology. Although the therapies being discussed here are often used in conjunction with one another (e.g., MV generally necessitates sedation in order to be tolerated by patients), MV has been isolated as a unique psychopathology risk factor. In a sample of general ICU survivors, Cuthbertson, Hull, Strachan, and Scott (2004) found a direct correlation between PTSD symptomatology and number of days patients spent on MV. However, the researchers did not find support for a significant relationship between MV and those meeting the clinical cutoff for PTSD diagnosis. In a mixed sample of general, medical, and coronary ICU patients, MV was found to be a predictor of psychological distress, yet MV only predicted shortterm distress in this sample, and not long-term PTSD symptomatology at 12-month follow-up (Myhren et al., 2009). In a sample of ICU patients all of whom were intubated and MV, Girard et al. (2007) found that number of days of MV did not significantly predict greater incidence of PTSD symptomatology.

Hallucinations, Delusions, and Memory Problems

At the heart of recent sensationalized coverage of the ICU as psychologically stressful (e.g., Hoffman, 2013), has been the observation that a significant proportion of ICU patients report hallucinatory episodes, consisting of frightening, psychotic, or nightmarish experiences while in the ICU (Jones, Griffiths, Humphris, & Skirrow, 2001). The nature of the relationship between hallucinations or delusions and the eventual development of psychological trauma symptoms is not well understood, although a direct etiologic link to psychological morbidity has been proposed (for a review, see Kiekkas, Theodorakopoulou, Spyratos, & Baltopoulos, 2010). Prevalence rates of hallucinations and delusions vary widely, ranging between <u>26% and 73%</u> (Kiekkas et al., 2010), with one recent study focusing on ICU hallucinatory and delusional experiences reporting the presence of delusional or distorted in-ICU memories in <u>88%</u> of their sample (Wade et al., 2014).

In one of the first studies to substantiate delusional memories as a psychological risk factor, patients with delusional memories related to their ICU stay (as measured by the ICU memory tool), but without factual memories of their time in the ICU were significantly more likely to evidence symptoms of anxiety and depression at 2-weeks postdischarge (Jones et al., 2001). The authors proposed that since those with factual memories were less likely to present with psychological symptoms, perhaps the presence of in-ICU factual memories might buffer patients from later psychological risk. However, future studies have failed to substantiate this claim (e.g., Granja et al., 2008; Weinert & Sprenkle, 2008), and factual memories are no longer presumed to be protective. In another prospective study, the presence of delusional memories in a sample of ICU survivors was significantly correlated with increases in both anxiety and trauma symptoms at 6-month follow-up (Jones et al., 2003).

Both the ICU environment (noises, bells, emergency signals, etc.) and the heavy administration of sedatives (especially benzodiazepines) have been proposed as causal factors for hallucinations and delusions. Weinert and Sprenkle (2008) found a positive linear association between sedation and analgesia administered to a sample of MV patients, and the frequency of delusional memories while in the ICU. These authors also found that patients with the presence of delusional memories were at greater risk for PTSDlike symptoms.

What is perhaps most perplexing for researchers attempting to substantiate the ICU as psychologically stressful is the revelation that many individuals admitted to the ICU report virtually no memory that they were ever in the ICU (Wade et al., 2014). Two recent studies evidenced total amnestic states for approximately 18% of patients (Samuelson, Lundberg, & Fridlund, 2006; Weinert & Sprenkle, 2008), whereas another study cited rates of total in-ICU amnesia at a striking 38% (Granja et al., 2005). A study investigating in-ICU amnesia as a possible etiologic factor in ICU-related PTSD found that amnestic states during the ICU predicted posttraumatic stress symptomatology (Granja et al., 2008). However, given that in-ICU amnesia was also associated with longer ICU length of stay, greater illness severity, and greater previous hospital admissions, the authors cautioned that the relationship between ICU-amnesia and PTSD might be a statistical artifact, proposing instead that ICU-amnesia might be a proxy for trauma severity. The absence of in-ICU memories reported by a significant number of study participants presents an interesting problem in the identification of a unique stress profile for the ICU. The question remains as to how the traumatic impact of medical therapies might be transmitted if not at the level of the ICU patient's conscious experience.

Other Evidence: Demographic Risk Factors and Individual History Variables

Consistent with other areas of stress research, demographic and prior biographical characteristics have been examined for their association with psychopathology after ICU exposure.

Demographic variables: Age and gender. Consistent with the broader stress psychopathology literature, both younger age and female gender have been associated with increased risk for **PTSD** after ICU discharge in many but not all studies (Scragg, Jones, & Fauvell, 2001; Girard et al., 2007). For example, one prospective cohort study of MV patients found that women had significantly higher scores on a measure of posttraumatic stress symptomatology (PTSS) compared with men (Girard et al., 2007, p. 3). In addition, the same study revealed a significant curvilinear relationship with age and PTSS, such that PTSS increased on average between the ages of 30 to 50 years, after which PTSS scores tended to fall off sharply between the ages of 50-80 (Girard et al., 2007, p. 6). The authors speculated that since older individuals are typically less likely to receive aggressive medical care, PTSD might be less likely in older individuals because they receive less "traumatizing" medical care. This hypothesis remains untested in the literature, although it has been substantiated that older individuals are more likely to withhold from surgery, ventilation, and dialysis while in the hospital (e.g., Hamel et al., 1999).

Female gender was a consistent predictor of stress psychopathology in another sample of MV patients 2-months postdischarge (Samuelson, Lundberg, & Fridlund, 2007). In another sample, 15% of ICU survivors suffered from clinical levels of PTSD, and among those who met criteria for the disorder there were twice as many symptomatic women as men (subsample ratio 2:1; Scragg et al., 2001, p. 12). Scragg et al. (2001) also found evidence for a negative relationship between age and PTSD confirming the association of younger age with greater risk for post-ICU PTSD. Such data is consistent with larger, population-based epidemiological data suggesting women suffer PTSD more than men (Brewin et al., 2000).

There are, however, some data suggesting no relationship between gender and PTSD post-ICU. In a sample of nearly 1,500 traumatically injured ICU survivors, Davydow, Zatzick, et al. (2009) found no evidence that female gender was associated with an increased risk for PTSD.

Psychopathological history: Previous depression, anxiety. Evidence from the broader literature on aversive life events suggests that previous psychopathology is a consistent predictor of new, stress-related psychopathology (e.g., Ozer et al., 2008), and this relationship has also been observed in samples of ICU-treated individuals (Parker et al., 2015). In a sample of ALI survivors (N = 186), Bienvenu et al. (2013) found that previous history of depressive illness was a significant predictor of risk for post-ICU PTSD. Davydow, Zatzick, et al. (2009) also found pre-ICU depressive illness to be a risk factor for PTSD in a sample of nearly 1,500 ICU patients admitted for traumatic injury. Similarly, Cuthbertson et al. (2004) found that treatment-seeking behaviors for psychological distress prior to ICU predicted eventual development of PTSD. It is important to note, however, that each of these studies assessed previous psychiatric history using retrospective accounts, calling into question the extent to which patient reports of previous psychopathology may have been colored by current psychological distress.

Of note, in one study that looked at previous psychological history but did not examine that history's relationship with post-ICU psychopathology, previous psychological problems were a predictor of increased or prolonged sedative administration while in the ICU (Jones et al., 2007). Whereas the authors could only speculate as to why previous history predicted amount of sedative administration, this finding presents an important potential link for future investigation, sparking questions about the variance accounted for by sedation alone (without prior history of psychopathology) in the prediction of PTSD.

Null Findings in the Literature

Amid a number of factors that are <u>not predictive</u> of later psychopathology in ICU samples, two variables stand out as particularly relevant to the current review and to the question of whether the ICU carries a unique stress profile: <u>ICU length of stay</u> and <u>illness severity</u>.

ICU length of stay. Across a host of studies examining the variable length of stay (LOS) for its potential relationship with post-ICU psychological distress, only a handful of studies have found evidence for such a link. In one systematic review of post-ICU risk factors for the development of PTSD, Davydow, Gifford, et al. (2008) found that only one of the nine studies assessing LOS reported any association with later development of PTSD. A number of studies have reported an association between

ICU LOS and the development of PTSD or depression, but these findings appear more consistently in populations of patients with Acute Respiratory Distress Syndrome (ARDS; e.g., Davydow, Desai, et al., 2008; Hauer et al., 2009). The isolation of these findings may be related to the specific pathophysiology of ARDS, but this hypothesis has yet to be empirically substantiated. More broadly, however, the variable LOS represents one of the clearest instances of null findings in the general ICU literature.

This finding suggests interesting implications. If the ICU environment were itself a traumatic stressor, it might be expected that incremental increases in exposure would approximate a doseresponse relationship, corroborating a link between additive ICU exposure and further adverse outcomes. However, in the general ICU literature, there is little empirical support for the notion that spending more time in an ICU predicts worse outcomes.

Illness severity. Another curious example of null findings is found in studies of severity of illness. In United States ICUs, illness severity is most commonly indexed using a revised version of the Acute Physiology and Chronic Health Evaluation system (APACHE II; Knaus, Draper, Wagner, & Zimmerman, 1985), a disease classification system designed to help more accurately predict hospital mortality rates. To achieve a numerical rating, the disease classification system uses 12 physiologic markers (including temperature, blood pressure, heart rate, white blood-cell count, and the Glasgow Coma Score) as well as chronic health status and age. Three recent systematic reviews examining ICU-related PTSD found little support for a direct relationship between illness severity as indexed by APACHE II sores, and the eventual development of PTSD (Davydow, Gifford, et al., 2008; Griffiths et al., 2007; Wade et al., 2013).

At first glance, this aggregate evidence seems definitive and an argument might be made for dispensing with the examination of illness severity and its impact on post-ICU psychological outcomes. However, this conclusion seems both premature and lacking in sound theoretical basis when considering evidence from the broader PTSD literature, in which trauma severity has been associated with the development of PTSD (e.g., Brewin et al., 2000). The answer as to why illness severity has not been more effective in predicting downstream psychological morbidity may very well rest with problems attendant to the measurement of the construct. When the APACHE II scoring system is scrutinized more closely—especially as it pertains to the type of sensitivity and precision required for research—some major flaws become apparent.

The APACHE II system was designed to facilitate the comparison of different medical therapies for groups of similarly ill individuals, and to better predict mortality rates in the hospital (Knaus et al., 1985). However, despite its widespread use, little is known about the reliability and validity of the APACHE II (Polderman, Girbes, Thijs, & Strack van Schijndel, 2001). The APACHE II has come under criticism for excessive false positive rates when used to predict individual mortality (with overprediction rates as high as 25%), and critics suggest that it should not be used to predict outcomes at the individual level (Wong, Barrow, Gomez, & McGuire, 1996). Even more disconcerting, one rigorous study of APACHE II implementation in the ICU found APACHE II scores were <u>overestimated</u> in a striking <u>51%</u> of ICU cases (N =186; Polderman et al., 2001). In addition, it was found that another 26% of the sample's APACHE II scores were underestimated, leading the authors to conclude that as implemented in everyday ICU clinical practice, wide variability exists in the accuracy of **APACHE** II estimates. These findings fundamentally call into question the instrument's reliability, the justification of its use for the prediction of downstream psychological outcomes, and the trustworthiness of the conclusion that in-ICU illness severity does not meaningfully predict variance in later psychological outcomes.

Although empirical evidence supports the view that certain ICU-specific medical factors, demographic variables, and previous psychopathology confer greater risk for post-ICU psychopathology, there has been virtually no investigation into underlying psychological variables which may be protective in the face of the acute stress of ICU. In the last decade, significant progress has been made in the study of resilience to acute stressors, and a growing body of important risk and resilience factors have been identified. The next section will discuss variables identified in the resilience literature, suggested as important avenues to future research in the ICU.

Protective Factors Associated With Resilient Outcomes

Focusing on ICU-specific risk factors is a priority in the context of the critical care environment, given that such factors may be preventable and within the ability of the larger medical community to curb. For example, in the face of evidence linking sedation regimens with psychopathology, ICU sedation guidelines have been changing in recent years (Shehabi et al., 2013). Although the examination of risk factors associated with the ICU has been extensive and continues to evolve, few studies to date have examined whether individual difference variables (either endogenous psychological variables or exogenous environmental factors) may play a role in how people cope with the stress of the ICU. In addition, there has been little to no ICU research investigating protective factors known to be associated with resilient outcomes in other stress-response contexts. We consider below the application of a growing body of evidence from the literatures focusing on coping, emotional flexibility, and resilience, to the ICU setting to better understand and predict resilient outcomes after ICU exposure. The following is a summary of predictors and protective factors associated with resilient outcomes, now well established in the stress-response literature, which we propose for future directions in ICU research.

Emotion Regulation and Regulatory Flexibility

Emotion regulation refers broadly to the varied ways in which individuals experience, influence, and express their emotions across differing contexts (Gross, 1998). Deficits in emotion regulation have been implicated across many psychopathologies and may play an important etiologic role (Aldao, Nolen-Hoeksema, & Schweizer, 2010). *Expressive flexibility* is a related domain pertaining to an individual's ability to either enhance or suppress emotion across differing contexts (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004). Evidence suggests a relationship between expressive flexibility and resilient outcomes in the face of acute life stress (Bonanno et al., 2004; Westphal et al., 2010). Likewise, difficulties with expressive flexibility have been linked to chronic psychopathology (e.g., Gupta & Bonanno, 2011). The importance of flexibility in emotion regulation has been emphasized by Bonanno and Burton (2013), who proposed an integrative framework

known as *regulatory flexibility* for understanding how different emotion regulation strategies play an adaptive or maladaptive role, depending upon contextual demands.

The study of individual differences in emotion regulation makes sense when feasible in the context of the ICU, given that the ICU presents unique, sometimes stressful demands upon individuals, which likely in turn necessitates the employment of varied regulatory strategies for the management of stress and emotional responsivity. In addition, the study of emotion regulation would likely facilitate the prediction of psychological distress patterns following ICU exposure, as well as the course of those patterns over time. The overall ability to be flexible in emotional expression, for instance, has been shown to predict the resilient outcomes in the face of the stress of spousal loss (Coifman & Bonanno, 2010). The application of the study of emotion regulation to the ICU setting presents an exciting opportunity for advances in the prediction and understanding of who will do well after ICU exposure and why.

Coping Strategies and Cognitive Appraisals

Cognitive appraisal and coping strategies (Lazarus & Folkman, 1984) have a long history of application in the study of stressful life events, and have been shown to predict psychological adjustment. A recent longitudinal study of spinal cord injury (SCI), found that individuals who appraised SCI as a challenge to be overcome (i.e., used challenge appraisals vs. threat appraisals) were more likely to be in the resilient, low-depression symptom trajectory (Bonanno, Kennedy, Galatzer-Levy, Lude, & Elfström, 2012). Similarly, individuals who were less likely to appraise SCI as a threat were more likely to show a trajectory of stable lowanxiety symptoms over time. Bonanno et al. (2012) also found that coping variables predicted outcome trajectories. Specifically, fighting spirit (making the best of life in the face of aversive events) and acceptance were two coping strategies consistently linked with resilient outcomes and a longitudinal trajectory of low anxiety symptoms. Coping and appraisal processes are important variables in the study of adjustment to serious health events like SCI, and application to the ICU seems both relevant and promising.

Coping Flexibility and Coping Self-Efficacy

Coping flexibility has been conceptualized as an individual's ability to choose from a variety of coping strategies and to flexibly use these strategies to meet changing environmental demands (Cheng, Lau, Chan, 2014). Analogously to the regulatory flexibility model of emotion regulation (Bonanno & Burton, 2013), an individual's coping flexibility depends upon access to a diverse repertoire of strategies as well as upon the skillful deployment of coping strategies across contexts. Empirical evidence suggests that coping flexibility has a positive relationship with psychological well-being and predicts decreases in psychological distress (Roussi, Krikeli, Hatzidimitriou, & Koutri, 2007; Cheng et al., 2012; Cheng et al., 2014). In a sample of gastro-intestinal cancer patients, for example, Cheng et al. (2012) found that individuals who varied coping strategies to meet changing contextual demands reported more psychological well-being than individuals who uniformly (i.e., fixedly) applied a passive coping strategy. Similarly, empirical evidence suggests that breast cancer patients who flexibly use varied coping strategies are less likely to be psychologically distressed (Roussi et al., 2007).

Coping self-efficacy is a related domain and refers broadly to an individual's confidence in their ability to cope with the sequelae (both minor and major) of aversive life events. It has recently been shown that coping self-efficacy is associated with resilience to traumatic stress pathology (deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010). In a study of single-incident traumatic injury survivors followed longitudinally after hospital admission, individuals high on a measure of coping self-efficacy were more likely to be in the resilient trajectory, compared with the chronically distressed trajectory (deRoon-Cassini et al., 2010).

Optimism and Other Personality Variables

Optimism has been proposed as a protective factor in the face of acute life stress, with empirical data substantiating an association between optimism and resilient outcomes. In a longitudinal study of psychological distress after breast cancer diagnosis, Lam et al. (2010) found that decreased optimism was associated with a pattern of chronic distress over time. Likewise, Galatzer-Levy and Bonanno (2014) found that optimism predicted longitudinal trajectories of depression after heart attack incidence, with optimistic individuals being more likely to be resilient (i.e., demonstrate a pattern of stable, low depression symptoms over time) compared with other more depressed symptom profiles. Optimism has been examined in a handful of ICU studies, including one in which trait optimism predicted both anxiety and depression scores at 1-year follow up (Myhren et al., 2009). In general, broader personality traits have also been associated with greater resilience to PTSD, including extraversion and conscientiousness, whereas neuroticism and negative emotionality have been positively associated with PTSD development (Jakšić, Brajković, Ivezić, Topić, & Jakovljević, 2012).

Social Support

Social support has been a variable of considerable focus within the stress response literature, and evidence suggests it may play an important protective role against the development of PTSD (Brewin et al., 2000). Social support has been empirically associated with resilient trajectories across a diversity of traumatic events, including natural disasters (Bonanno, Galea, Bucciarelli, & Vlahov, 2007; Bonanno, Brewin, Kaniasty, & Greca, 2010), the SARS bio-epidemic (Bonanno et al., 2008), and combat deployment (Pietrzak et al., 2010). A small handful of studies have examined social support as a protective factor within the ICU setting (e.g., Deja et al., 2006; Jones et al., 2003), although this body of research is still developing. One study found that social support was significantly negatively associated with PTSD symptoms in a sample of ICU patients admitted for ARDS (Deja et al., 2006). This association in ICU-treated individuals between social support and decreased psychological distress presents another promising avenue for future research, though further exploration is needed before broader conclusions may be drawn.

Psychobiology

Without exception, individuals admitted to the ICU are in the throes of a physically life-threatening event requiring both signif-

icant medical treatment and the recruitment of the body's innate immune response. In this way, ICU patients may differ from other types of individuals who are exposed to a life-threatening event but are not physically injured or for whom the physical injury is superficial. Interestingly, the immune system and central nervous system responses to environmental stressors instantiated in the Hypothalamic-Pituitary-Adrenal (HPA) Axis response are closely coupled. Specifically, glucocorticoids are distributed throughout the body through blood following release from the HPA-Axis altering expression patterns of genes that drive inflammation, and ultimately leading to broad suppression of proinflammatory gene networks and antiviral programmed gene responses. Further, the brain's detection of proinflammatory and antiviral cytokines in the periphery stimulates the release of glucocorticoids (Sorrells & Sapolsky, 2007). The close relationship between innate immune and innate stress responses may help to explain why classes of drugs such as steroids suppress both inflammation and alter stress reactivity with the likely mechanism of action being the suppression of the glucocorticoid release from the HPA-Axis (Miller, Cohen, & Ritchey, 2002; Raison & Miller, 2003; Singh, Petrides, Gold, Chrousos, & Deuster, 1999; Wirtz et al., 2007; Yehuda, Yang, Buchsbaum, & Golier, 2006). Indeed, some researchers have already begun to experiment with the administration of glucocorticoids to ICU patients, with the goal of dampening stress responsivity and decreasing the incidence of PTSD following critical care treatment (Schelling et al., 2006; Hauer et al., 2014). The complex relationship between the inflammatory, immune, and innate stress responses via the central nervous system represent another exciting avenue for future exploration, and ICU-treated individuals represent a unique population within which to explore these important psychobiological factors.

Taken together, the above variables represent a sampling of risk and resilience factors from the broader stress-response literature that seem particularly applicable to the ICU environment. Many of the above constructs, which may play a role in buffering or moderating stress responsivity in the context of the ICU, have been designed to be measured both with experimental paradigms as well as self-report instruments (e.g., expressive flexibility has been examined both with a computer-based experimental paradigm, as well as with a validated and reliable questionnaire; Burton & Bonanno, 2015). As such, they present cost-effective and time-efficient constructs for examination in future ICU research protocols. The application and study of these novel constructs in the context of the ICU will also increase the relevance of ICU research to developing theory and methods elsewhere in the literature.

Methodological Issues

Despite evidence associating ICU-specific factors with psychopathology, the question remains of how to adjudicate whether the ICU confers risk for broad ranging psychopathologies above and beyond the risk associated with the traumatic life event that compelled ICU treatment. We propose a number of methodological advances consistent with approaches used to answer similarly complex questions about the etiology of heterogeneous responses to extreme stressors.

True Prospective Data

Access to informative pre-ICU data would represent a significant methodological advance. Exposure to a traumatic life event often temporally precedes the ICU stay itself, in some cases by a significant margin. Patients are often admitted to the ICU following downstream health deterioration arising from complications with a primary medical intervention or health condition (e.g., bacterial infection at a surgical site). True prospective data would help to adjudicate whether such individuals were experiencing psychological distress before the traumatic event, directly in relation to the impact of the traumatic life event, or whether the distress appeared to intensify after exposure to the intensive care setting. These methods might in turn facilitate the arbitration of what portion of variance in psychological outcomes is accounted for primarily by the original stressful life event, additively after ICU exposure, or by previous psychological morbidity.

The necessity of pretraumatic (i.e., true prospective) data on psychological functioning has been emphasized in the broader stress-response and PTSD literatures (Bonanno, 2004; Bonanno, Westphal, & Mancini, 2011). However, although large epidemiological research projects have become more common (e.g., Health and Retirement Study; University of Michigan), these United States data sets have typically not included the necessary variables to address ICU-related questions (i.e., ICU admission, length of stay, and trauma symptom measures). However, at least one European study has used the use of large population-based samples to assess the impact of previous psychological morbidity upon post-ICU psychopathology. Using data from Danish national medical databases, Wunsch et al. (2014) found that MV patients without a prior psychiatric history were at increased risk for psychopathology following ICU treatment.

Equivalent Comparison Groups

Another significant methodological advance would be the employment of an equivalent comparison group. This solution necessitates two groups: one exposed to the ICU and the other a comparison group, consisting of individuals with comparable injuries or health events, yet importantly without ICU admission.³ At least one study has attempted this scientifically rigorous experimental design to good effect by comparing two samples of nonfatal injury patients, one with ICU admission and one without (O'Donnell et al., 2010). This study showed that admission to the ICU was associated with a threefold increase in PTSD risk. An unavoidable limitation of such a design is that statistical control is not the same as experimental control. Among other differences, the two groups differed on illness severity scores and hospital LOS, which while statistically controlled for, may indicate that the samples were different in other important and unmeasured ways. Nevertheless, the authors' rigorous study design allowed them to conclude that ICU admission itself is a risk factor for PTSD (O'Donnell et al., 2010).

A substantial problem in applying this study design more broadly is that most health events necessitating ICU treatment are very serious and are rarely treated elsewhere. Again we consider such cases as a major cardiac event or stroke, or a serious bacterial infection that has entered into the bloodstream (sepsis). These conditions are life-threatening and require specialized and advanced medicine in order to stabilize patients who are suffering from them. A group of patients with these qualifying conditions leaves very little possibility for an adequate comparison group with both the presence of a comparably stressful health event, but without ICU exposure.

One possible solution to this dilemma is to compare two separate samples, both treated in ICUs, but from parts of the country (or the world) where medical interventions differ substantially. Reportedly in parts of Europe, for instance, MV is not achieved by heavy sedation. Rather, these ICUs use physical restraints to ensure that ventilation tubes are not removed by agitated or especially uncomfortable patients (Jones et al., 2007). The comparison of United States and European samples (ideally matched on important subject variables) with these distinct between-subjects differences might significantly improve the ability to answer questions about the relative contribution of sedation and/or physical restraints to patients' psychological distress. However, this scenario also invokes the possibility of problematic cultural confounds (Scandinavian countries, for instance, have a much higher relative standard of living). However, a rigorously designed study with proper matching for important subject variables (e.g., socioeconomic status, ethnicity, etc.) might begin to address such confounds effectively.

In general, very little current ICU research uses comparison groups of any kind, though there are likely creative ways to counteract this deficit. For instance, it should be possible to select individuals exposed to a particular form of medical intervention and to compare these individuals with similar ICU patients who did not receive such treatments. Within a single ICU site, it should be theoretically possible to compare individuals who received MV therapy with a group of individuals who were not MV. Instead, most studies examining MV in the literature use it as an inclusion criterion (e.g., Samuelson et al., 2007), rather than seeking to find a methodologically sound, meaningful comparison group. The systematic comparison of patients with and without certain ICU medical therapies would substantially contribute to the field's ability to parse the unique contributions of specific ICU medical therapies to downstream psychiatric risk.

Sampling Bias

In terms of ICU sampling procedures, two main problems exist. First, as aforementioned, many published ICU studies have highly specific samples, selected for a specific medical condition (e.g., ARDS or patients requiring MV). Although this makes sense from the perspective of researching the unique profile of specific medical conditions, it does little to advance the field's understanding of the overall prevalence rates of PTSD or other psychological problems after intensive care treatment. Further, without sound population estimates of the risk for the development of these disorders after ICU treatment, it becomes difficult to meaningfully assess which specific medical conditions carry the highest psychological burden.

A second problem with ICU samples rests in the significant mortality rates attendant to this population. In general, ICU studies

³ According to classical experimental theory, this is known as a *non-equivalent comparison group design* (Campbell, Stanley, & Gage, 1963). The lack of random assignment classifies this design as quasi-experimental.

lose approximately 40% of the initial sample due to death. Although no comprehensive solution for addressing mortality rates in this population has been proposed (since this is naturally a very sick population), questions arise as to substantial statistical differences between study completers and individuals who died over the course of the study. At the very least, all research conducted in this context should report differences in the sample of survivors compared with those who die during the course of the study. Instead, very few studies conduct adequate sample comparisons to control for threats to internal validity due to attrition.

Measurement Problems

Problems with the APACHE II system have already been proposed, and the usage of APACHE II as an appropriate measure of subjective illness severity has been called into question earlier in this review. It seems evident that although the APACHE II system may be useful in algorithms predicting hospital mortality rates, it may lack the reliability and sensitivity necessary to be used in the prediction of more distal outcomes such as trauma-related psychopathology. Further, it is also possible that the APACHE system may not be an appropriate metric when assessing the psychological impact of a particular individual's health condition (even were it possible to reduce the sources of systematic error in the implementation). APACHE II scores may instantiate a valid and reliable index of medical severity, but not of how severe these health conditions are on a human scale, either subjectively or as seen by other people. To address this hypothesis, it would be important to contrast ICU-treated individual's self-rated health with a doctor or nurse's rating of illness severity, which might in turn be compared to APACHE II scores to see if the three measurement techniques converge.

Conclusions

The ICU experience has been characterized as psychologically stressful by the popular media while the extant empirical literature has highlighted elevations in PTSD symptoms following ICU exposure. However, little research to date has tried to meaningfully parse the variance in psychopathology associated with the impact of the health event precipitating ICU admission from the variance in outcomes associated with ICU-specific medical therapies. It remains possible that the range of ICU therapies currently associated with increased psychological morbidity in the literature are acting largely as proxies for stressor severity. Although the literature to date does not support the conclusion that illness severity is a predictor of psychopathology, problems with measurement may account for some of this failure. Further, the conclusion that increased exposure to the ICU environment predicts worse outcomes fundamentally lacks empirical basis, given null findings for a dose-response relationship in the general ICU literature.

Although the development of new tools for saving lives is clearly an important priority, individuals are now living longer lives after ICU treatment and thus understanding the psychological impact of the ICU experience becomes an important and worthy research goal. As the area of inquiry surrounding the ICU increases in breadth, the application of new constructs to the ICU environment will facilitate better understanding of how individual differences interact with the ICU treatment factors. These factors should include important risk and resilience factors explored elsewhere in the stress-response literature. Finally, sound methodological improvements such as those reviewed here can substantively contribute to the field's ability to parse such fundamental questions as who will do poorly after a trip to the ICU and why.

References

- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotionregulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30, 217–237. http://dx.doi.org/10.1016/j .cpr.2009.11.004
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gélinas, C., Dasta, J. F., . . . the American College of Critical Care Medicine. (2013). Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine*, 41, 278–306. http://dx.doi.org/10.1097/CCM.0b013e3182783b72
- Bienvenu, O. J., Gellar, J., Althouse, B. M., Colantuoni, E., Sricharoenchai, T., Mendez-Tellez, P. A., . . . Needham, D. M. (2013). Post-traumatic stress disorder symptoms after acute lung injury: A 2-year prospective longitudinal study. *Psychological Medicine*, 43, 2657–2671.
- Boer, K. R., van Ruler, O., van Emmerik, A. A., Sprangers, M. A., de Rooij, S. E., Vroom, M. B., . . . the Dutch Peritonitis Study Group. (2008). Factors associated with posttraumatic stress symptoms in a prospective cohort of patients after abdominal sepsis: A nomogram. *Intensive Care Medicine*, 34, 664–674. http://dx.doi.org/10.1007/ s00134-007-0941-3
- Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, 59, 20–28. http://dx.doi.org/10.1037/ 0003-066X.59.1.20
- Bonanno, G. A., Brewin, C. R., Kaniasty, K., & Greca, A. M. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest*, 11, 1–49. http://dx.doi.org/10.1177/1529100610387086
- Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science*, 8, 591–612. http://dx.doi.org/10 .1177/1745691613504116
- Bonanno, G. A., Galea, S., Bucciarelli, A., & Vlahov, D. (2007). What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal of Consulting and Clinical Psychology*, 75, 671–682. http://dx.doi.org/10.1037/0022-006X.75.5.671
- Bonanno, G. A., Ho, S. M., Chan, J. C., Kwong, R. S., Cheung, C. K., Wong, C. P., & Wong, V. C. (2008). Psychological resilience and dysfunction among hospitalized survivors of the SARS epidemic in Hong Kong: A latent class approach. *Health Psychology*, 27, 659.
- Bonanno, G. A., Kennedy, P., Galatzer-Levy, I. R., Lude, P., & Elfström, M. L. (2012). Trajectories of resilience, depression, and anxiety following spinal cord injury. *Rehabilitation Psychology*, 57, 236–247. http:// dx.doi.org/10.1037/a0029256
- Bonanno, G. A., Papa, A., Lalande, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science*, 15, 482–487. http://dx.doi.org/10.1111/j.0956-7976 .2004.00705.x
- Bonanno, G. A., Westphal, M., & Mancini, A. D. (2011). Resilience to loss and potential trauma. *Annual Review of Clinical Psychology*, 7, 511– 535.
- Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults.

Journal of Consulting and Clinical Psychology, 68, 748-766. http://dx .doi.org/10.1037/0022-006X.68.5.748

- Burton, C. L., & Bonanno, G. A. (2015), Measuring ability to enhance and suppress emotional expression: The flexible regulation of emotional expression (FREE) scale. *Psychological Assessment*. http://dx.doi.org/ 10.1037/pas0000231
- Campbell, D. T., Stanley, J. C., & Gage, N. L. (1963). *Experimental and quasi-experimental designs for research*. Boston, MA: Houghton Mifflin.
- Carr, J. (2007). Psychological consequences associated with intensive care treatment. *Trauma*, 9, 95–102. http://dx.doi.org/10.1177/ 1460408607083963
- Cheng, C., Chan, N. Y., Chio, J. H. M., Chan, P., Chan, A. O. O., & Hui, W. M. (2012). Being active or flexible? Role of control coping on quality of life among patients with gastrointestinal cancer. *Psycho-Oncology*, 21, 211–218. http://dx.doi.org/10.1002/pon.1892
- Cheng, C., Lau, H. P. B., & Chan, M. P. S. (2014). Coping flexibility and psychological adjustment to stressful life changes: A meta-analytic review. *Psychological Bulletin*, 140, 1582–1607. http://dx.doi.org/10 .1037/a0037913
- Coifman, K. G., & Bonanno, G. A. (2010). When distress does not become depression: Emotion context sensitivity and adjustment to bereavement. *Journal of Abnormal Psychology*, 119, 479–490. http://dx.doi.org/10 .1037/a0020113
- Cuthbertson, B. H., Hull, A., Strachan, M., & Scott, J. (2004). Posttraumatic stress disorder after critical illness requiring general intensive care. *Intensive Care Medicine*, 30, 450–455. http://dx.doi.org/10.1007/ s00134-003-2004-8
- Davidson, J. E., Harvey, M. A., Schuller, J., & Black, G. (2013). Postintensive care syndrome: What it is and how to help prevent it. *American Nurse Today*, 8(5). Retrieved from http://www.americannursetoday.com/
- Davydow, D. S., Desai, S. V., Needham, D. M., & Bienvenu, O. J. (2008). Psychiatric morbidity in survivors of the acute respiratory distress syndrome: A systematic review. *Psychosomatic Medicine*, 70, 512–519. http://dx.doi.org/10.1097/PSY.0b013e31816aa0dd
- Davydow, D. S., Gifford, J. M., Desai, S. V., Bienvenu, O. J., & Needham, D. M. (2009). Depression in general intensive care unit survivors: A systematic review. *Intensive Care Medicine*, 35, 796–809. http://dx.doi .org/10.1007/s00134-009-1396-5
- Davydow, D. S., Gifford, J. M., Desai, S. V., Needham, D. M., & Bienvenu, O. J. (2008). Posttraumatic stress disorder in general intensive care unit survivors: A systematic review. *General Hospital Psychiatry*, 30, 421–434. Retrieved from http://www.sciencedirect.com/science/article/ pii/S0163834308000807
- Davydow, D. S., Zatzick, D. F., Rivara, F. P., Jurkovich, G. J., Wang, J., Roy-Byrne, P. P., . . MacKenzie, E. J. (2009). Predictors of posttraumatic stress disorder and return to usual major activity in traumatically injured intensive care unit survivors. *General Hospital Psychiatry*, *31*, 428–435. http://dx.doi.org/10.1016/j.genhosppsych.2009.05.007
- Deja, M., Denke, C., Weber-Carstens, S., Schröder, J., Pille, C. E., Hokema, F., . . . Kaisers, U. (2006). Social support during intensive care unit stay might improve mental impairment and consequently healthrelated quality of life in survivors of severe acute respiratory distress syndrome. *Critical Care (London, England)*, 10(5), R147. http://dx.doi .org/10.1186/cc5070
- DeRoon-Cassini, T. A., Mancini, A. D., Rusch, M. D., & Bonanno, G. A. (2010). Psychopathology and resilience following traumatic injury: A latent growth mixture model analysis. *Rehabilitation Psychology*, 55, 1–11. http://dx.doi.org/10.1037/a0018601
- Dowdy, D. W., Bienvenu, O. J., Dinglas, V. D., Mendez-Tellez, P. A., Sevransky, J., Shanholtz, C., & Needham, D. M. (2009). Are intensive care factors associated with depressive symptoms 6 months after acute lung injury? *Critical Care Medicine*, *37*, 1702–1707. http://dx.doi.org/ 10.1097/CCM.0b013e31819fea55

- Dowdy, D. W., Eid, M. P., Sedrakyan, A., Mendez-Tellez, P. A., Pronovost, P. J., Herridge, M. S., & Needham, D. M. (2005). Quality of life in adult survivors of critical illness: A systematic review of the literature. *Intensive Care Medicine*, 31, 611–620. http://dx.doi.org/10.1007/ s00134-005-2592-6
- Ehring, T., & Quack, D. (2010). Emotion regulation difficulties in trauma survivors: The role of trauma type and PTSD symptom severity. *Behavior Therapy*, 41, 587–598. http://dx.doi.org/10.1016/j.beth.2010.04.004
- Fanfulla, F., Ceriana, P., D'Artavilla Lupo, N., Trentin, R., Frigerio, F., & Nava, S. (2011). Sleep disturbances in patients admitted to a step-down unit after ICU discharge: The role of mechanical ventilation. *Sleep: Journal of Sleep and Sleep Disorders Research*, 34, 355–362.
- Galatzer-Levy, I. R., & Bonanno, G. A. (2014). Optimism and death: Predicting the course and consequences of depression trajectories in response to heart attack. *Psychological Science*, 25, 2177–2188.
- Galatzer-Levy, I., Burton, C. L., & Bonanno, G. A. (2012). Coping flexibility, potentially traumatic life events, and resilience: A prospective study of college student adjustment. *Journal of Social and Clinical Psychology*, 31, 542–567. http://dx.doi.org/10.1521/jscp.2012.31.6.542
- Girard, T. D., Shintani, A. K., Jackson, J. C., Gordon, S. M., Pun, B. T., Henderson, M. S., . . . Ely, E. W. (2007). Risk factors for post-traumatic stress disorder symptoms following critical illness requiring mechanical ventilation: A prospective cohort study. *Critical Care (London, England)*, 11(1), R28. http://dx.doi.org/10.1186/cc5708
- Granja, C., Gomes, E., Amaro, A., Ribeiro, O., Jones, C., Carneiro, A., . . . the JMIP Study Group. (2008). Understanding posttraumatic stress disorder-related symptoms after critical care: The early illness amnesia hypothesis. *Critical Care Medicine*, *36*, 2801–2809. http://dx.doi.org/10 .1097/CCM.0b013e3181866a3e7
- Granja, C., Lopes, A., Moreira, S., Dias, C., Costa-Pereira, A., Carneiro, A., & the JMIP Study Group. (2005). Patients' recollections of experiences in the intensive care unit may affect their quality of life. *Critical Care* (London, England), 9(2), R96–R109. http://dx.doi.org/10.1186/ cc3026
- Griffiths, J., Fortune, G., Barber, V., & Young, J. D. (2007). The prevalence of post traumatic stress disorder in survivors of ICU treatment: A systematic review. *Intensive Care Medicine*, 33, 1506–1518.
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2, 271–299. http://dx.doi .org/10.1037/1089-2680.2.3.271
- Gupta, S., & Bonanno, G. A. (2011). Complicated grief and deficits in emotional expressive flexibility. *Journal of Abnormal Psychology*, 120, 635–643. http://dx.doi.org/10.1037/a0023541
- Hamel, M. B., Teno, J. M., Goldman, L., Lynn, J., Davis, R. B., Galanos, A. N., . . . the SUPPORT Investigators. (1999). Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment. Patient age and decisions to withhold life-sustaining treatments from seriously ill, hospitalized adults. *Annals of Internal Medicine*, 130, 116–125. http://dx.doi.org/10.7326/0003-4819-130-2-199901190-00005
- Hauer, D., Kaufmann, I., Strewe, C., Briegel, I., Campolongo, P., & Schelling, G. (2014). The role of glucocorticoids, catecholamines and endocannabinoids in the development of traumatic memories and posttraumatic stress symptoms in survivors of critical illness. *Neurobiology* of Learning and Memory, 112, 68–74.
- Hauer, D., Weis, F., Krauseneck, T., Vogeser, M., Schelling, G., & Roozendaal, B. (2009). Traumatic memories, post-traumatic stress disorder and serum cortisol levels in long-term survivors of the acute respiratory distress syndrome. *Brain Research*, 1293, 114–120. http:// dx.doi.org/10.1016/j.brainres.2009.04.014
- Hoffman, J. (2013, July 23). Nightmares after the I. C. U. *The New York Times*, p. D1. Retrieved from http://nytimes.com

- Irwin, M. R., & Cole, S. W. (2011). Reciprocal regulation of the neural and innate immune systems. *Nature Reviews Immunology*, 11, 625–632. http://dx.doi.org/10.1038/nri3042
- Jacobi, J., Fraser, G. L., Coursin, D. B., Riker, R. R., Fontaine, D., Wittbrodt, E. T., . . . Lumb, P. D. (2002). Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Critical Care Medicine*, 30, 119–141.
- Jackson, J. C., Obremskey, W., Bauer, R., Greevy, R., Cotton, B. A., Anderson, V., . . . Ely, E. W. (2007). Long-term cognitive, emotional, and functional outcomes in trauma intensive care unit survivors without intracranial hemorrhage. *The Journal of Trauma*, 62, 80–88. http://dx .doi.org/10.1097/TA.0b013e31802ce9bd
- Jakšić, N., Brajković, L., Ivezić, E., Topić, R., & Jakovljević, M. (2012). The role of personality traits in posttraumatic stress disorder (PTSD). *Psychiatria Danubina*, 24, 256–266.
- Johns Hopkins Medicine. (2013, February 26). PTSD symptoms common among ICU survivors. *ScienceDaily*. Retrieved from www.sciencedaily .com/releases/2013/02/130226081238.htm
- Jones, C., Bäckman, C., Capuzzo, M., Flaatten, H., Rylander, C., & Griffiths, R. (2007). Precipitants of post-traumatic stress disorder following intensive care: A hypothesis generating study of diversity in care. *Intensive Care Medicine*, 33, 978–985.
- Jones, C., Griffiths, R. D., Humphris, G., & Skirrow, P. M. (2001). Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care. *Critical Care Medicine*, 29, 573–580. http://dx.doi.org/10.1097/00003246-200103000-00019
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G. H., Ingleby, S., Eddleston, J., . . . Gager, M. (2003). Rehabilitation after critical illness: A randomized, controlled trial. *Critical Care Medicine*, *31*, 2456–2461. http://dx.doi.org/10.1097/01.CCM.0000089938.56725.33
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G., Ingleby, S., Eddleston, J., . . . Gager, M. (2004). Post-traumatic stress disorder-related symptoms in relatives of patients following intensive care. *Intensive Care Medicine*, 30, 456–460. http://dx.doi.org/10.1007/s00134-003-2149-5
- Jubran, A., Lawm, G., Duffner, L. A., Collins, E. G., Lanuza, D. M., Hoffman, L. A., & Tobin, M. J. (2010). Post-traumatic stress disorder after weaning from prolonged mechanical ventilation. *Intensive Care Medicine*, 36, 2030–2037. http://dx.doi.org/10.1007/s00134-010-1972-8
- Kiekkas, P., Theodorakopoulou, G., Spyratos, F., & Baltopoulos, G. I. (2010). Psychological distress and delusional memories after critical care: A literature review. *International Nursing Review*, 57, 288–296. http://dx.doi.org/10.1111/j.1466-7657.2010.00809.x
- Knaus, W. A., Draper, E. A., Wagner, D. P., & Zimmerman, J. E. (1985). APACHE II: A severity of disease classification system. *Critical Care Medicine*, 13, 818–829. http://dx.doi.org/10.1097/00003246-198510000-00009
- Kress, J. P., Gehlbach, B., Lacy, M., Pliskin, N., Pohlman, A. S., & Hall, J. B. (2003). The long-term psychological effects of daily sedative interruption on critically ill patients. *American Journal of Respiratory* and Critical Care Medicine, 168, 1457–1461. http://dx.doi.org/10.1164/ rccm.200303-455OC
- Lam, W. W., Bonanno, G. A., Mancini, A. D., Ho, S., Chan, M., Hung, W. K., . . . Fielding, R. (2010). Trajectories of psychological distress among Chinese women diagnosed with breast cancer. *Psycho-Oncology*, *19*, 1044–1051. http://dx.doi.org/10.1002/pon.1658
- Lamas, D. J. (2013). Delirium-induced flashbacks plague many former ICU patients. *The Boston Globe*. Retrieved from http://bostonglobe.com
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY: Springer.
- Lonardo, N. W., Mone, M. C., Nirula, R., Kimball, E. J., Ludwig, K., Zhou, X., . . Barton, R. G. (2014). Propofol is associated with favorable outcomes compared with benzodiazepines in ventilated intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, 189, 1383–1394. http://dx.doi.org/10.1164/rccm.201312-2291OC

- Miller, G. E., Cohen, S., & Ritchey, A. K. (2002). Chronic psychological stress and the regulation of pro-inflammatory cytokines: Glucocorticoidresistance model. *Health Psychology*, 21, 531–541.
- Misak, C. (2005). ICU psychosis and patient autonomy: Some thoughts from the inside. *The Journal of Medicine and Philosophy*, 30, 411–430. http://dx.doi.org/10.1080/03605310591008603
- Myhren, H., Tøien, K., Ekeberg, O., Karlsson, S., Sandvik, L., & Stokland, O. (2009). Patients' memory and psychological distress after ICU stay compared with expectations of the relatives. *Intensive Care Medicine*, 35, 2078–2086. http://dx.doi.org/10.1007/s00134-009-1614-1
- O'Donnell, M. L., Creamer, M., Holmes, A. C., Ellen, S., McFarlane, A. C., Judson, R., . . . Bryant, R. A. (2010). Posttraumatic stress disorder after injury: Does admission to intensive care unit increase risk? *Journal* of Trauma and Acute Care Surgery, 69, 627–632. http://dx.doi.org/10 .1097/TA.0b013e3181bc0923
- Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2008, August). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. In *Annual Meeting of the International Society for Traumatic Stress Studies, 14th, Nov, 1998, Washington, DC*. This article is based on a paper presented at the aforementioned meeting (No. 1, p. 3). Educational Publishing Foundation.
- Pandharipande, P., Shintani, A., Peterson, J., Pun, B. T., Wilkinson, G. R., Dittus, R. S., . . . Ely, E. W. (2006). Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology*, 104, 21–26. Retrieved from http://www.ncbi.nlm.nih.gov/ pubmed/16394685
- Parker, A. M., Sricharoenchai, T., Raparla, S., Schneck, K. W., Bienvenu, O. J., & Needham, D. M. (2015). Posttraumatic stress disorder in critical illness survivors: A metaanalysis. *Critical Care Medicine*, 43, 1121– 1129. http://dx.doi.org/10.1097/CCM.0000000000882
- Pietrzak, R. H., Johnson, D. C., Goldstein, M. B., Malley, J. C., Rivers, A. J., Morgan, C. A., & Southwick, S. M. (2010). Psychosocial buffers of traumatic stress, depressive symptoms, and psychosocial difficulties in veterans of Operations Enduring Freedom and Iraqi Freedom: The role of resilience, unit support, and postdeployment social support. *Journal of Affective Disorders, 120*, 188–192. http://dx.doi.org/10.1016/ j.jad.2009.04.015
- Polderman, K. H., Girbes, A. R. J., Thijs, L. G., & Strack van Schijndel, R. J. M. (2001). Accuracy and reliability of APACHE II scoring in two intensive care units Problems and pitfalls in the use of APACHE II and suggestions for improvement. *Anaesthesia*, 56, 47–50. http://dx.doi.org/ 10.1046/j.1365-2044.2001.01763.x
- Raison, C. L., & Miller, A. H. (2003). When not enough is too much: The role of insufficient glucocorticoid signaling in the pathophysiology of stress-related disorders. *The American Journal of Psychiatry*, 160, 1554–1565. http://dx.doi.org/10.1176/appi.ajp.160.9.1554
- Rattray, J. E., Johnston, M., & Wildsmith, J. A. W. (2005). Predictors of emotional outcomes of intensive care. *Anaesthesia*, 60, 1085–1092. http://dx.doi.org/10.1111/j.1365-2044.2005.04336.x
- Roussi, P., Krikeli, V., Hatzidimitriou, C., & Koutri, I. (2007). Patterns of coping, flexibility in coping and psychological distress in women diagnosed with breast cancer. *Cognitive Therapy and Research*, 31, 97–109. http://dx.doi.org/10.1007/s10608-006-9110-1
- Samuelson, K., Lundberg, D., & Fridlund, B. (2006). Memory in relation to depth of sedation in adult mechanically ventilated intensive care patients. *Intensive Care Medicine*, 32, 660–667.
- Samuelson, K. A. M., Lundberg, D., & Fridlund, B. (2007). Stressful memories and psychological distress in adult mechanically ventilated intensive care patients: A 2-month follow-up study. *Acta Anaesthesiologica Scandinavica*, 51, 671–678. http://dx.doi.org/10.1111/j.1399-6576.2007.01292.x
- Schelling, G., Roozendaal, B., Krauseneck, T., Schmoelz, M. D. E. Quervain, D., & Briegel, J. (2006). Efficacy of hydrocortisone in preventing posttraumatic stress disorder following critical illness and major surgery.

Annals of the New York Academy of Sciences, 1071, 46-53. http://dx .doi.org/10.1196/annals.1364.005

- Schelling, G., Stoll, C., Haller, M., Briegel, J., Manert, W., Hummel, T., . . . Peter, K. (1998). Health-related quality of life and posttraumatic stress disorder in survivors of the acute respiratory distress syndrome. *Critical Care Medicine*, 26, 651–659. http://dx.doi.org/10.1097/ 00003246-199804000-00011
- Scragg, P., Jones, A., & Fauvel, N. (2001). Psychological problems following ICU treatment^{*}. Anaesthesia, 56, 9–14.
- Sessler, C. N., & Varney, K. (2008). Patient-focused sedation and analgesia in the ICU. *Chest Journal*, 133, 552–565. http://dx.doi.org/10.1378/ chest.07-2026
- Shapiro, B. A., Warren, J., Egol, A. B., Greenbaum, D. M., Jacobi, J., Nasraway, S. A., . . . the Society of Critical Care Medicine. (1995). Practice parameters for intravenous analgesia and sedation for adult patients in the intensive care unit. *Critical Care Medicine*, 23, 1596– 1600. http://dx.doi.org/10.1097/00003246-199509000-00021
- Shehabi, Y., Bellomo, R., Mehta, S., Riker, R., & Takala, J. (2013). Intensive care sedation: The past, present and the future. *Critical Care* (*London, England*), 17, 322. http://dx.doi.org/10.1186/cc12679
- Singh, A., Petrides, J. S., Gold, P. W., Chrousos, G. P., & Deuster, P. A. (1999). Differential hypothalamic-pituitary-adrenal axis reactivity to psychological and physical stress. *The Journal of Clinical Endocrinol*ogy and Metabolism, 84, 1944–1948.
- Sorrells, S. F., & Sapolsky, R. M. (2007). An inflammatory review of glucocorticoid actions in the CNS. *Brain, Behavior, and Immunity*, 21, 259–272. http://dx.doi.org/10.1016/j.bbi.2006.11.006
- Treggiari, M. M., Romand, J. A., Yanez, N. D., Deem, S. A., Goldberg, J., Hudson, L., . . . Weiss, N. S. (2009). Randomized trial of light versus deep sedation on mental health after critical illness. *Critical Care Medicine*, *37*, 2527–2534. http://dx.doi.org/10.1097/CCM.0b013e3181a5689f
- Wade, D. M., Brewin, C. R., Howell, D. C. J., White, E., Mythen, M. G., & Weinman, J. A. (2014). Intrusive memories of hallucinations and delusions in traumatized intensive care patients: An interview study. *British Journal of Health Psychology*, 20, 613–631.

- Wade, D., Hardy, R., Howell, D., & Mythen, M. (2013). Identifying clinical and acute psychological risk factors for PTSD after critical care: A systematic review. *Minerva Anestesiologica*, 79, 944–963.
- Weinert, C. R., & Sprenkle, M. (2008). Post-ICU consequences of patient wakefulness and sedative exposure during mechanical ventilation. *Intensive Care Medicine*, 34, 82–90.
- Westphal, M., Seivert, N. H., & Bonanno, G. A. (2010). Expressive flexibility. *Emotion*, 10, 92–100. http://dx.doi.org/10.1037/a0018420
- Wirtz, P. H., von Känel, R., Emini, L., Ruedisueli, K., Groessbauer, S., Maercker, A., & Ehlert, U. (2007). Evidence for altered hypothalamuspituitary-adrenal axis functioning in systemic hypertension: Blunted cortisol response to awakening and lower negative feedback sensitivity. *Psychoneuroendocrinology*, 32, 430–436. http://dx.doi.org/10.1016/j .psyneuen.2007.02.006
- Wong, D. T., Barrow, P. M., Gomez, M., & McGuire, G. P. (1996). A comparison of the Acute Physiology and Chronic Health Evaluation (APACHE) II score and the Trauma-Injury Severity Score (TRISS) for outcome assessment in intensive care unit trauma patients. *Critical Care Medicine*, 24, 1642–1648. http://dx.doi.org/10.1097/00003246-199610000-00007
- Wunsch, H., Christiansen, C. F., Johansen, M. B., Olsen, M., Ali, N., Angus, D. C., & Sørensen, H. T. (2014). Psychiatric diagnoses and psychoactive medication use among nonsurgical critically ill patients receiving mechanical ventilation. *JAMA: Journal of the American Medical Association, 311*, 1133–1142. http://dx.doi.org/10.1001/jama.2014.2137
- Yehuda, R., Yang, R. K., Buchsbaum, M. S., & Golier, J. A. (2006). Alterations in cortisol negative feedback inhibition as examined using the ACTH response to cortisol administration in PTSD. *Psychoneuroendocrinology*, 31, 447–451. http://dx.doi.org/10.1016/j.psyneuen.2005.10 .007

Received May 7, 2015 Revision received November 10, 2015

Accepted November 16, 2015

Posttraumatic Stress Disorder (PTSD) After Critical Illness: A Conceptual Review of Distinct Clinical Issues and Their Implications

James C. Jackson Vanderbilt University School of Medicine and Veterans Affairs Tennessee Valley Geriatric Research, Education and Clinical Center, Nashville, Tennessee

Cashuna Huddleston Hunter Houston Veterans Affairs Medical Center, Houston, Texas

> Hillary Warrington Baylor University

Jennifer E. Jutte University of Washington School of Medicine

> Nancy Ciccolella Temple University

Carla Sevin Vanderbilt University School of Medicine

Oscar J. Bienvenu Johns Hopkins University School of Medicine

Purpose/Objective: Posttraumatic stress disorder (PTSD) that develops after critical care may be marked by a unique constellation of symptoms that differ, for example, from the symptoms that develop in response to more traditional traumas such as combat or assault. **Research Method/Design:** We describe ways in which symptoms of PTSD after critical illness can be clinically engaged, drawing from literature pointing to "best treatment" practices in other settings. And, we discuss the relevance of intensive care unit (ICU) related PTSD to rehabilitation psychologists and explain why rehabilitation psychologists are well suited to identify and treat ICU-related PTSD. **Results:** In this conceptual review, drawing from both empirical findings and theoretical models, we surmise that traumatized survivors of critical illness demonstrate 2 central clinical features—avoidance and reexperiencing. **Conclusions/Implications:** The potentially unique clinical profile of ICU-related PTSD likely requires unique assessment and treatment practices. These services may be best provided by providers with expertise in providing coordinated care, such as rehabilitation psychologists. Next steps should include empirical study to determine whether practices that are empirically supported in other settings may be translated to the ICU and post-ICU hospitalization for critical illness survivors.

Impact and Implications

PTSD that is associated with ICU hospitalization and critical illness goes largely unrecognized and untreated. This conceptual review extends literature published to date by offering a robust clinical and conceptual framework to understand the unique expressions of this syndrome in ICU survivors. The literature presented in this review highlights the insight that ICU-related PTSD appears to have a unique clinical profile, which includes avoidance and future-oriented worries about medical condition recurrence, resulting in problematic engagement in recommended health care and medical treatment. Rehabilitation psychologists should be aware that the potentially unique clinical profile of ICU-related PTSD likely requires unique assessment and treatment practices.

Keywords: critical care, posttraumatic stress disorders, intensive care units, psychosocial rehabilitation

James C. Jackson, Division of Allergy/Pulmonary/Critical Care Medicine, Center for Health Services Research, and Department of Psychiatry, Vanderbilt University School of Medicine and Veterans Affairs Tennessee Valley Geriatric Research, Education and Clinical Center, Nashville, Tennessee; Jennifer E. Jutte, Department of Rehabilitation Medicine, University of Washington School of Medicine, Harborview Medical Center; Cashuna Huddleston Hunter, Houston Veterans Affairs Medical Center, Houston, Texas; Nancy Ciccolella, Department of Physical Medicine and Rehabilitation, Temple University; Hillary Warrington, Department of Psychology, Baylor University; Carla Sevin, Division of Allergy/Pulmonary/Critical Care Medicine, Vanderbilt University School of Medicine; Oscar J. Bienvenu, Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine.

Correspondence concerning this article should be addressed to James C. Jackson, PsyD, Center for Health Services Research, Vanderbilt University, 6100 Medical Center East, Nashville, TN 37232-8300. E-mail: james.c.jackson@vanderbilt.edu

Introduction

Traumatic events often yield predictable, problematic psychological consequences. These events are defined by the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013) in the context of death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence (American Psychiatric Association, 2013). Our definition of posttraumatic stress disorder (PTSD) has long focused on survivors of war, and references to the impact of combat on aspects of human functioning are replete in ancient and more contemporary literature, predating the development of the modern DSM. In previous times, terms like "shell shock" and "battle fatigue" anchored the concept of PTSD squarely in the warfare-related domain, and popular understandings of PTSD continue to focus on veteran health. However, more recently, there has been a broad recognition that PTSD develops not only in response to combat but also in response to stressors such as medical events, experiences, and insults. Even a cursory review of the PubMed database reveals dozens of articles about PTSD in patients after myocardial infarction, a diagnosis of cancer or HIV/AIDS, and miscarriage, though none of these have focused on the clinical distinctiveness of PTSD in survivors of critical illness. In this conceptual review, we will discuss potentially unique features of PTSD characteristic of survivors of critical illness, and we will discuss psychotherapeutic issues relevant to this specialized population, while highlighting the role of rehabilitation psychologists in this process.

Critical Illness as Traumatic Stress

Survivors of critical illness and intensive care hospitalization comprise an extremely large group, and one that is increasing as a result of improvements in medical care (Erickson et al., 2009). In North American alone, more than 5 million people are admitted to a general medical or general surgical intensive care unit (ICU; unless otherwise explicitly stated, we are using ICU to refer to general medical and surgical ICU populations and not to burn, trauma, or neuro ICU patients) annually (Society of Critical Care Medicine, 2005). However, because of advances in critical care, mortality rates have significantly declined to 20% (from $\sim 50\%$ just a decade ago), bolstering the ranks of ICU survivors (Zimmerman, Kramer, & Knaus, 2013). These individuals often develop PTSD (Davydow, Gifford, Desai, Needham, & Bienvenu, 2008; Parker et al., 2015) as a reaction to their critical illness, which, for many patients, is marked by both an abrupt *and* intense fear of death and feelings of great helplessness.

Critically ill patients endure a variety of physical and emotional stresses during intensive care hospitalization. These include, but are not limited to, painful procedures, dysregulation of the hypothalamic-pituitary-adrenal axis, and/or delirium and fear of impending death (fear of death is often heightened in the days after ICU discharge when patients realize how close they came to dying). During ICU hospitalization, patients experience reduced autonomy (e.g., feelings of helplessness, extreme dependence, and a perceived inability to make choices), along with difficulty communicating frightening experiences and perceptual disturbances associated with delirium (DiMartini, Dew, Kormos, McCurry, & Fontes, 2007; Jones, Griffiths, & Humphris, 2000; Kiekkas, Theodorakopoulou, Spyratos, & Baltopoulos, 2010). Delirium experienced during ICU hospitalization is thought to be associated with onset of PTSD symptoms. Evidence suggests that sedation (e.g., benzodiazepine and opiate; Arroliga et al., 2008; Kollef et al., 1998; Pandharipande et al., 2006; Payen et al., 2007; Riker et al., 2009), agitation, and physical restraint (Micek, Anand, Laible, Shannon, & Kollef, 2005) in the ICU is associated with delirium and later onset of PTSD symptoms (Girard et al., 2007; Jones et al., 2007; Kress et al., 2003; Nelson, Weinert, Bury, Marinelli, & Gross, 2000; Samuelson, Lundberg, & Fridlund, 2007a). Moreover, memories of frightening psychotic experiences during ICU hospitalization have been associated with later PTSD symptoms (Jones et al., 2003, 2007; Rattray, Crocker, Jones, & Connaghan, 2010; Rattray, Johnston, & Wildsmith, 2005; Samuelson, Lundberg, & Fridlund, 2007b; Weinert & Sprenkle, 2008).

Although PTSD is largely unrecognized in survivors of critical illness, it has been estimated that at least 20% of ICU survivors experience clinically significant symptoms of posttraumatic stress during the first year after ICU discharge (Davydow et al., 2008), and the prevalence may be even higher (up to 33%) in ICU patients' family members (Azoulay et al., 2005). These figures are nearly quadruple the lifetime prevalence of similar symptoms (7%) in the general U.S. population (Kessler & Wang, 2008). Although symptoms of PTSD among survivors tend to be related to delusional memories of their ICU hospitalization (Davydow et al., 2008; Jones, Griffiths, Humphris, & Skirrow, 2001), symptoms experienced by family members and caregivers likely are related to communications and decision-making processes with the health care team (Needham et al., 2012; Stevenson & Dowdy, 2012). Family members are likely also adversely affected by the stress of watching loved ones experience prolonged, life-threatening illnesses.

Acute Stress in Critical Illness Survivors

Acute stress symptoms experienced during the course of ICU hospitalization are a risk factor for later development of PTSD (Davydow, Zatzick, Hough, & Katon, 2013b). Acute stress symptoms are PTSD symptoms that occur within the first month following exposure to a traumatic stressor, which may include exposure to the ICU environment, delirium, or the physical trauma prompting hospital admission (American Psychiatric Association, 2013; Davydow et al., 2013b; Harvey & Bryant, 1998). Among survivors of critical illness, acute stress symptoms during ICU hospitalization and posttraumatic stress symptoms following discharge are common among pediatric intensive care patients (Bronner, Knoester, Bos, Last, & Grootenhuis, 2008; Nelson & Gold, 2012), parents of PICU patients (Bronner et al., 2010; Nelson & Gold, 2012), adult survivors of critical illnesses (Cuthbertson, Hull, Strachan, & Scott, 2004; de Miranda et al., 2011; Jones, Griffiths, Macmillan, & Palmer, 1994; Kapfhammer, Rothenhäusler, Krauseneck, Stoll, & Schelling, 2004; Schelling et al., 1998), relative caregivers of adult patients (Azoulay et al., 2005; de Miranda et al., 2011; Kapfhammer et al., 2004; Siegel, Hayes, Vanderwerker, Loseth, & Prigerson, 2008), and intensive care providers (Mealer, Shelton, Berg, Rothbaum, & Moss, 2007).

Unique Constellation of PTSD Symptoms in Critical Illness

Although risk factors for the development of PTSD in ICU survivors have been well described, much less is known regarding the potentially unique constellation of symptoms characteristic of ICU survivors. Studies of individuals after critical illness suggest that certain psychiatric difficulties-that is, depression-may have distinct expressions. For example, it appears that the depression that occurs so commonly after critical illness may be comprised of somatic symptoms more than cognitive ones, a finding that has potentially important clinical implications (Jackson et al., 2014). Similarly, it may be that PTSD experienced after critical illness has hallmark characteristics, distinguishing it from PTSD experienced after other traumatic events. For instance, the reexperiencing symptoms of PTSD after a medical illness often are focused on preoccupation with future-oriented enduring threats of recurrence of the medical condition and current functional decline, rather than on a discrete event in the past whose danger has passed. Moreover, PTSD symptoms in general may present in a different manner and with different psychological, behavioral, and health consequences among medical populations compared with survivors of other types of trauma (Green et al., 1998). Reexperiencing symptoms may be discernible as fearfulness of attending medical provider appointments or going to clinics that symbolize the burden of being placed, once again, in an unintended and vulnerable ICU admission.

Among individuals with PTSD following critical illness, avoidance and reexperiencing symptoms have been shown to be the most prevalent, with symptoms of avoidance being the most common and debilitating, associated with functional impairment (Davydow et al., 2008). Although symptoms of avoidance in patients with PTSD related to acute life-threatening illness are difficult to conceptualize, avoidant patients with PTSD may display a reluctance to seek help, a denial of difficulties, and apprehension that disclosing problems to health care providers could lead to another ICU admission. Table 1 provides an example of

Table 1

Examples of "Common" Clinical Complaints in ICU Survivors With PTSD

Evervdav	"Expressions"	of	Symptoms
Liveryday	Expressions	01	Symptoms

- Avoidance of medical clinics, hospitals, and participation in medical procedures
- Intense, future-oriented concerns about the reemergence of illness
- · Hypervigilant preoccupation with somatic symptoms large or small
- Preoccupation with thoughts of "delusional memories" from ICU hospitalization
- Confusion over which memories were of critical illness and intensive care were "real"
- Social disengagement and isolation related to fear of "germs" or "getting sick"
- Claustrophobia, related to memories of being restrained or held down in the ICU
- Refusal to watch medically oriented news or television shows that dramatize hospital life – e.g., ER or Grey's Anatomy
- Reactivity related to noises similar to those occurring in an ICU e.g., "beeping" sounds

Note. ICU = intensive care unit; PTSD = posttraumatic stress disorder.

typical PTSD symptoms among ICU survivors based on our anecdotal clinical experience.

Impact of Critical Illness PTSD on Health Care Engagement

A few studies have focused explicitly on the impact of medically related PTSD on health care engagement. In one of the first investigations to date, Newman and colleagues (2011) found that cardiac patients with PTSD took 2.5 times longer to seek emergency assistance than those without PTSD (25.7 hr vs. 10.7 hr, p =.005), and that the cognitive and emotional representations of symptoms were primary contributors (Newman et al., 2011). In another study, stroke survivors with PTSD symptoms were almost 3 times as likely to be nonadherent to their prescribed medications as those without PTSD symptoms years after the index stroke event (Kronish, Edmondson, Goldfinger, Fei, & Horowitz, 2012). Edmondson and colleagues (2013) found among stroke survivors that the association of PTSD to nonadherence was mediated by increased concerns about medications (i.e., "they disrupt my life," fear of side-effects), but not understanding the necessity of those medications for secondary prevention (Edmondson and colleagues, 2013). These studies highlight the impact of forward-focused threats that serve as potent reminders of chronic disease (Edmondson, 2014), thus preventing delivery and maintenance of care for patients who have developed PTSD after critical illness. Ironically, avoidance of care-whether simple care like a visit to the dentist or serious care like surgery or medical hospitalization-may create a maladaptive cycle in which symptoms worsen because care is avoided, a dynamic which may lead to the development of even more severe anxiety (see Figure 1).

PTSD Assessment in the ICU

Given the prevalence and impact of PTSD on survivors of critical illness, it is important to ensure that valid and reliable measures of PTSD are available. Patients in the ICU often experience difficulty communicating verbally, poor sleep, fatigue, pain, limited attention span, and limited time available for mental health assessment. Therefore, assessment measures must be brief, feasible to administer in a chaotic ICU environment, and easily understood. One issue alluded to in the extant literature is that assessment of PTSD in the ICU tends to be nonstandardized, using a variety of measures, limiting our ability to definitively identify appropriate measures to use (Davydow et al., 2008; Jackson et al., 2007). This trend has been improving, however, with more studies using identical measures, allowing for more accurate comparisons across investigations (Parker et al., 2015). Of the measures that have been validated for use in the ICU, only two have been validated against clinician diagnosis-the Impact of Events Scale - Revised and the Post-Traumatic Stress Syndrome 10-question inventory (Bienvenu, Williams, Yang, Hopkins, & Needham, 2013; Stoll et al., 1999). The Posttraumatic Stress Checklist has also been widely employed (Davydow et al., 2013a). Some of the measures that have been used most frequently may result in high false-positive rates, reducing their clinical utility (Jackson et al., 2007); therefore, it is important to continue to seek appropriate measures of PTSD among survivors of critical illness and to assess the psychometric properties and feasibility of their use with patients who are critically ill.



Figure 1. The Cycle of Avoidance in Survivors of the ICU with PTSD. This figure describes the maladaptive ways that avoidance of medical care leads to a panoply of other medical and psychological difficulties. ICU = intensive care unit; PTSD = posttraumatic stress disorder.

PTSD Interventions in the ICU

Despite the high prevalence of critical-illness- and ICU-related PTSD, there have been limited studies of nonpharmacologic interventions (Peris et al., 2011), and there is no standard protocol for acute stress intervention in the setting of critical illness and ICU care. Among the few studies conducted to date, Peris et al. (2011) compared psychological outcomes of two cohorts of patients surviving major trauma, treated before or after the institution of an in-ICU clinical psychologist intervention. Those in the cohort who had the intervention had a significantly lower prevalence of PTSD symptoms (21%; vs. 57% at 12-month follow-up). The intervention addressed the psychoemotional needs not only of patients but also their relative caregivers and providers. In particular, it focused on stress management, which involved cognitive and emotional restructuring, while promoting family-centered decision making as a way of alleviating stress. On average, patients received five or six interventions during their critical illness, all delivered by a clinical psychologist. The structure of the intervention highlights a transition from an independent model of care to an interdisciplinary plan of care that is collaborative and patient centered. Among other potential interventions, one that emerges pertains to the use of clinical protocols designed to facilitate decreased sedation and increased awareness in critically ill patients. This intervention, widely known as "Wake Up and Breathe," has been shown to have clear benefits, and these may include fewer symptoms of anxiety and PTSD (Kress et al., 2003).

Several practice guidelines for the treatment of PTSD have been published internationally in the last decade (Cukor, Spitalnick, Difede, Rizzo, & Rothbaum, 2009; Foa, Keane, Friedman, & Cohen, 2008; Kearns, Ressler, Zatzick, & Rothbaum, 2012), though most of these are focused in the outpatient setting, without studies having been conducted yet in the intensive care environment with patients who are critically ill. Although these outpatient guidelines differ in terms of rigor and focus, there is considerable agreement in terms of their recommendations (Forbes et al., 2010). First, there is strong support across guidelines for the use of early psychological intervention for patients and relative caregivers (Bäckman, Orwelius, Sjöberg, Fredrikson, & Walther, 2010; Cukor et al., 2009; Garrouste-Orgeas et al., 2012; Jones, Bäckman, & Griffiths, 2012; Kearns et al., 2012; Parker et al., 2015). Second, all the guidelines highlight evidence for the use of serotonin reuptake inhibitors as adjunctive treatment to psychological intervention, whereas none of the guidelines recommend benzodiazepines for treatment of PTSD (Bernardy & Friedman, 2015). Lastly, none of the guidelines advocate the routine use of early psychological debriefing to treat or prevent PTSD in individuals exposed to trauma, reflecting the fact that, in general, evidence does not support this practice (Rose, Bisson, Churchill, & Wessely, 2002).

Included in the recommended psychological treatments are cognitive-behavioral based therapies (CBT), eye movement desensitization and reprocessing, and exposure treatments (Forbes et al., 2010). Various forms of CBT, in different combinations, have been used in the treatment of PTSD in the outpatient setting, including exposure, systematic desensitization, cognitive processing therapy, stress inoculation training, cognitive therapy, assertion training, biofeedback, and relaxation therapy. Of these therapies, exposure therapy, or combinations of exposure with cognitive therapy or stress inoculation training, have the strongest evidence and are recommended as a first-line treatment for PTSD (Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010). Several studies have shown that prolonged exposure is an effective treatment approach in the outpatient setting, and also may be effective for treatment of acute stress during ICU hospitalization and, thus, prevention of PTSD posthospitalization (Cukor et al., 2009; Kearns et al., 2012). These approaches have not yet been tested in the ICU, or specifically with survivors of critical illness. However, there are some recent studies to suggest that these strategies, and that exposure techniques, including brief prolonged exposure and virtual reality, may be beneficial for treatment of early signs of PTSD and, therefore, prevention of long-term adverse outcomes (Cukor et al., 2009; Gidron et al., 2001; Kearns et al., 2012; Leaman, Kearns, & Rothbaum, 2013). Because the most salient symptom in critical illness survivors is avoidance, cognitive-behavioral techniques that include exposure therapy could be beneficial. Additional studies of in-ICU psychological interventions that study variables thought to facilitate or hinder recovery from critical illness, utilizing a patient-centered and collaborative team approach, are imperative and needed.

Dual Diagnosis Affecting Post-ICU PTSD Treatment

One potential confounder to the treatment of PTSD in survivors of critical illness is cognitive impairment. Since the late 1990s, over 25 studies of cognitive outcomes in medical and surgical ICU survivors have been conducted (Jackson et al., 2003; Pandharipande et al., 2013; Wilcox et al., 2013). These studies have included thousands of patients with a tightly defined array of illnesses and have consistently reported the existence of significant cognitive difficulties in between 30% and 50% of individuals. In the large BRAIN-ICU study, researchers evaluated 473 adults 3 and 12 months after ICU discharge, and reported that their performance on a cognitive assessment battery—the Repeatable Battery for the Assessment of Neuropsychological Status (Randolph, 1998)—was worse than in patients with mild cognitive impairment, similar to patients with moderate traumatic brain injury (mTBI), and only slightly better than those with Alzheimer's disease (Pandharipande et al., 2013). Similar to other studies, cognitive deficits were shown to occur in domains of attention, executive functioning, and memory, and to a lesser extent, processing speed (Wilcox et al., 2013).

The practical challenges of treating individuals with comorbid cognitive impairment and PTSD are significant. Their clinical presentations vary widely but the deficits they demonstrate often are of a dysexecutive nature. Evidence increasingly supports the use of metacognitive approaches to the cognitive rehabilitation of executive dysfunction. Metacognitive approaches generally emphasize the importance of developing skills including of selfawareness, self-monitoring, and self-control as a way of improving daily functioning. (Cicerone et al., 2005). Of these, the best known is probably goal management training (GMT; Levine et al., 2000). Based on the theory of "goal neglect," (Duncan, Emslie, Williams, Johnson, & Freer, 1996; Duncan et al., 2008; Nieuwenhuis, Broerse, Nielen, & de Jong, 2004). GMT is a stepwise intervention that uses self-awareness and self-monitoring techniques to train patients to "STOP" and monitor ongoing behavior, and regain cognitive control when behavior becomes incompatible with intended goals. GMT is the one approach to cognitive rehabiliation that has been studied in ICU survivors to date, and it appears promising as a method of improving both objective cognitive performance and self-reported functional ability (Jackson et al., 2012). Preliminary findings suggest that such metacognitive interventions may not only potentially improve cognition but also positively impact symptoms of PTSD by improving cognitive processes involving inhibition and emotional regulation, among others. Interventions that address symptoms of cognitive impairment may also treat symptoms of PTSD, and vice versa.

Although focused treatment of ICU survivors with both PTSD and cognitive impairment has rarely been attempted, clinical interventions that engage these dual conditions are actively used with populations of combat veterans in particular, though little guidance pertaining to optimal treatment of the co-occurring conditions exists (Kennedy et al., 2007). Preliminary evidence suggests that treatments combining cognitive processing therapy with more traditional cognitive rehabilitation may be effective in reducing PTSD symptoms (Chard, Schumm, McIlvain, Bailey, & Parkinson, 2011). Prolonged exposure therapy also appears to improve outcomes among those suffering from mTBI and combatrelated PTSD (Wolf, Strom, Kehle, & Eftekhari, 2012).

PTSD Prevention

Although there is limited research on *treatment* of PTSD in ICU survivors, one intervention that has been studied for *prevention* of ICU-related PTSD is the use of ICU diaries (Parker et al., 2015). ICU diaries are a written daily account of procedures and the patient's progress (Bäckman & Walther, 2001). They are written by hospital staff and family members in everyday language, and are presented to the patient in order to assist with developing an accurate narrative of intensive care hospitalization (Egerod, Christensen, Schwartz-Nielsen, & Agård, 2011; Garrouste-Orgeas et al.,

2012; Jones et al., 2012). Several studies have shown positive effects of ICU diaries for PTSD prevention, and improved quality of life, in survivors of critical illness and their family members, though debate about their effectiveness is ongoing (Bäckman et al., 2010; Bäckman & Walther, 2001; Egerod et al., 2011; Garrouste-Orgeas et al., 2012; Jones et al., 2010, 2012; Knowles & Tarrier, 2009; Perier et al., 2013). Other PTSD-related interventions evaluated for use in the ICU have been less conventional and less direct. As previously described, decreasing sedation and engaging patients in early mobility protocols, to reduce the likelihood of delirium and the risk of developing delusional memories, are both potential contributors to symptoms of PTSD (Kress et al., 2003; Schweickert et al., 2009). In general, interventions aimed at improving psychological functioning in ICU patients have been ineffective. One recent example in this regard is the RECOVER, a 240-patient multicomponent intervention, which largely involved the use of exercise and mobility-related interventions with critically ill patients, and which did not improve mental health functioning and quality-of-life outcomes (Walsh et al., 2015).

Long-Term Outcomes

Few studies of PTSD in ICU survivors have focused on longterm outcomes beyond 1 year. Available information suggests that PTSD often persists for many years after critical illness hospitalization (Kapfhammer et al., 2004) and is associated with a variety of adversities, including cognitive dysfunction (Cohen et al., 2013; Qureshi et al., 2011) and reduced health-related quality of life (Kapfhammer et al., 2004). Patients with delusional memories associated with ICU hospitalization are at particularly high risk of future development of PTSD (Jones et al., 2001). Patients with a history of panic attacks, agoraphobia, general anxiety symptoms, or depressive symptoms have been shown to be at higher risk of experiencing paranoid delusions and hallucinations in the ICU than patients without this history (Jones et al., 2001).

The Unique Stresses of Critical Illness: The Role of the Rehabilitation Psychologist?

Critical illnesses and ICU hospitalization can be particularly stressful to patients, caregivers, and hospital staff, and against this backdrop, the potential role of various clinical psychology disciplines, including rehabilitation psychology, should be considered. Although not entirely unique in this, rehabilitation psychologists are trained to provide ecologically valid assessments and supportive psychological services in a team-based environment, with a focus on assisting individuals with newly acquired disabilities and health-related limitations in adjusting to new limitations and form new identities. Rehabilitation psychologists work at the intersection of cognitive, physical, and psychological domains. Similar to their health psychologist and neuropsychologist colleagues, rehabilitation psychologists provide a diversity of clinical skills that allow them to engage the complexities of ICU survivors-skills in neuropsychological assessment, treatment planning, and in helping individuals develop compensatory strategies for dealing with newly acquired cognitive and emotional changes. To date, there have been limited studies to evaluate the role of the rehabilitation psychologist in intensive care settings-as consultant or member of the treatment team. Additional studies are needed to determine the ideal role of the rehabilitation psychologist and to identify "best practice" guidelines for assessment, prevention, and treatment of PTSD in the critical care environment.

Conclusions

PTSD is common in survivors of critical illness and occurs in between <u>10% and 30%</u> of individuals after discharge. Although research has established the prevalence of this syndrome as well as risk factors (which largely pivot around the fact that age [younger] and gender \bigcirc confer greater susceptibility to PTSD), it remains unclear whether there are clinical distinctives that may be uniquely characteristic in patients after ICU care. One key goal of future research efforts is to engage this question, that is, whether there are specific symptoms of PTSD secondary to critical illness that can be clinical targets. Theoretical suggestions and limited evidence have suggested the potential prominence of avoidant symptoms, coupled with delusional memories and a fixation on future rather than past trauma. Although the nature of PTSD symptoms after critical illness needs to be studied further, it is not too soon to begin thinking critically about the ways that clinical interventions could target specific symptoms, such as intense fear of recurring illness and an irrational fear of hospitalizations or surgery. The potentially <u>unique</u> clinical profile of ICU-related PTSD requires unique assessment and treatment practices for which empirical support at present is sparse, and both current and future patients will be well served by research that focuses on developing innovative approaches to evaluation and tailored approaches to treatment. Rehabilitation psychologists, by virtue of their training, are well equipped to investigate best treatment practices and provide continuity of care services to those who need it most-persons who have endured traumas associated with ICU hospitalization and critical illness (e.g., delirium).

References

- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Arroliga, A. C., Thompson, B. T., Ancukiewicz, M., Gonzales, J. P., Guntupalli, K. K., Park, P. K., . . . Acute Respiratory Distress Syndrome Network. (2008). Use of sedatives, opioids, and neuromuscular blocking agents in patients with acute lung injury and acute respiratory distress syndrome. *Critical Care Medicine*, *36*, 1083–1088. http://dx.doi.org/10 .1097/CCM.0B013E3181653895
- Azoulay, E., Pochard, F., Kentish-Barnes, N., Chevret, S., Aboab, J., Adrie, C., . . . FAMIREA Study Group. (2005). Risk of post-traumatic stress symptoms in family members of intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, 171, 987–994. http://dx.doi.org/10.1164/rccm.200409-1295OC
- Bäckman, C. G., Orwelius, L., Sjöberg, F., Fredrikson, M., & Walther, S. M. (2010). Long-term effect of the ICU-diary concept on quality of life after critical illness. *Acta Anaesthesiologica Scandinavica*, 54, 736– 743. http://dx.doi.org/10.1111/j.1399-6576.2010.02230.x
- Bäckman, C. G., & Walther, S. M. (2001). Use of a personal diary written on the ICU during critical illness. *Intensive Care Medicine*, 27, 426– 429. http://dx.doi.org/10.1007/s001340000692
- Bernardy, N. C., & Friedman, M. J. (2015). Psychopharmacological strategies in the management of posttraumatic stress disorder (PTSD): What have we learned? *Current Psychiatry Reports*, 17, 564. http://dx.doi.org/ 10.1007/s11920-015-0564-2

- Bienvenu, O. J., Williams, J. B., Yang, A., Hopkins, R. O., & Needham, D. M. (2013). Posttraumatic stress disorder in survivors of acute lung injury: Evaluating the Impact of Event Scale–Revised. *Chest*, 144, 24–31. http://dx.doi.org/10.1378/chest.12-0908
- Bronner, M. B., Knoester, H., Bos, A. P., Last, B. F., & Grootenhuis, M. A. (2008). Posttraumatic stress disorder (PTSD) in children after paediatric intensive care treatment compared to children who survived a major fire disaster. *Child and Adolescent Psychiatry and Mental Health*, 2, 9. http://dx.doi.org/10.1186/1753-2000-2-9
- Bronner, M. B., Peek, N., Knoester, H., Bos, A. P., Last, B. F., & Grootenhuis, M. A. (2010). Course and predictors of posttraumatic stress disorder in parents after pediatric intensive care treatment of their child. *Journal of Pediatric Psychology*, 35, 966–974. http://dx.doi.org/10 .1093/jpepsy/jsq004
- Chard, K. M., Schumm, J. A., McIlvain, S. M., Bailey, G. W., & Parkinson, R. B. (2011). Exploring the efficacy of a residential treatment program incorporating cognitive processing therapy-cognitive for veterans with PTSD and traumatic brain injury. *Journal of Traumatic Stress*, 24, 347–351. http://dx.doi.org/10.1002/jts.20644
- Cicerone, K. D., Dahlberg, C., Malec, J. F., Langenbahn, D. M., Felicetti, T., Kneipp, S., . . . Catanese, J. (2005). Evidence-based cognitive rehabilitation: Updated review of the literature from 1998 through 2002. *Archives of Physical Medicine and Rehabilitation*, *86*, 1681–1692. http://dx.doi.org/10.1016/j.apmr.2005.03.024
- Cohen, B. E., Neylan, T. C., Yaffe, K., Samuelson, K. W., Li, Y., & Barnes, D. E. (2013). Posttraumatic stress disorder and cognitive function: Findings from the mind your heart study. *Journal of Clinical Psychiatry*, 74, 1063–1070. http://dx.doi.org/10.4088/JCP.12m08291
- Cukor, J., Spitalnick, J., Difede, J., Rizzo, A., & Rothbaum, B. O. (2009). Emerging treatments for PTSD. *Clinical Psychology Review*, 29, 715– 726. http://dx.doi.org/10.1016/j.cpr.2009.09.001
- Cuthbertson, B. H., Hull, A., Strachan, M., & Scott, J. (2004). Posttraumatic stress disorder after critical illness requiring general intensive care. *Intensive Care Medicine*, 30, 450–455. http://dx.doi.org/10.1007/ s00134-003-2004-8
- Davydow, D. S., Gifford, J. M., Desai, S. V., Needham, D. M., & Bienvenu, O. J. (2008). Posttraumatic stress disorder in general intensive care unit survivors: A systematic review. *General Hospital Psychiatry*, 30, 421–434. http://dx.doi.org/10.1016/j.genhosppsych.2008.05.006
- Davydow, D. S., Zatzick, D., Hough, C. L., & Katon, W. J. (2013a). A longitudinal investigation of posttraumatic stress and depressive symptoms over the course of the year following medical-surgical intensive care unit admission. *General Hospital Psychiatry*, 35, 226–232. http:// dx.doi.org/10.1016/j.genhosppsych.2012.12.005
- Davydow, D. S., Zatzick, D., Hough, C. L., & Katon, W. J. (2013b). In-hospital acute stress symptoms are associated with impairment in cognition 1 year after intensive care unit admission. *Annals of the American Thoracic Society*, 10, 450–457. http://dx.doi.org/10.1513/ AnnalsATS.201303-060OC
- de Miranda, S., Pochard, F., Chaize, M., Megarbane, B., Cuvelier, A., Bele, N., . . . Azoulay, E. (2011). Postintensive care unit psychological burden in patients with chronic obstructive pulmonary disease and informal caregivers: A multicenter study. *Critical Care Medicine*, 39, 112–118.
- DiMartini, A., Dew, M. A., Kormos, R., McCurry, K., & Fontes, P. (2007). Posttraumatic stress disorder caused by hallucinations and delusions experienced in delirium. *Psychosomatics: Journal of Consultation and Liaison Psychiatry*, 48, 436–439. http://dx.doi.org/10.1176/appi.psy.48 .5.436
- Duncan, J., Emslie, H., Williams, P., Johnson, R., & Freer, C. (1996). Intelligence and the frontal lobe: The organization of goal-directed behavior. *Cognitive Psychology*, 30, 257–303. http://dx.doi.org/10.1006/ cogp.1996.0008
- Duncan, J., Parr, A., Woolgar, A., Thompson, R., Bright, P., Cox, S., . . . Nimmo-Smith, I. (2008). Goal neglect and Spearman's g: Competing

parts of a complex task. *Journal of Experimental Psychology: General,* 137, 131–148. http://dx.doi.org/10.1037/0096-3445.137.1.131

- Edmondson, D. (2014). An enduring somatic threat model of posttraumatic stress disorder due to acute life-threatening medical events. *Social and Personality Psychology Compass*, *8*, 118–134. http://dx.doi.org/10 .1111/spc3.12089
- Edmondson, D., Richardson, S., Fausett, J. K., Falzon, L., Howard, V. J., & Kronish, I. M. (2013). Prevalence of PTSD in survivors of stroke and transient ischemic attack: A meta-analytic review. *PLoS ONE*, 8(6), e66435. http://dx.doi.org/10.1371/journal.pone.0066435
- Egerod, I., Christensen, D., Schwartz-Nielsen, K. H., & Agård, A. S. (2011). Constructing the illness narrative: A grounded theory exploring patients' and relatives' use of intensive care diaries. *Critical Care Medicine*, 39, 1922–1928. http://dx.doi.org/10.1097/CCM.0b01 3e31821e89c8
- Erickson, S. E., Martin, G. S., Davis, J. L., Matthay, M. A., Eisner, M. D., & NIH NHLBI ARDS Network. (2009). Recent trends in acute lung injury mortality: 1996–2005. *Critical Care Medicine*, 37, 1574–1579. http://dx.doi.org/10.1097/CCM.0b013e31819fefdf
- Foa, E. B., Keane, T. M., Friedman, M. J., & Cohen, J. A. (2008). Effective treatments for PTSD: Practice guidelines from the international society for traumatic stress studies. New York, NY: Guilford Press.
- Forbes, D., Creamer, M., Bisson, J. I., Cohen, J. A., Crow, B. E., Foa, E. B., . . . Ursano, R. J. (2010). A guide to guidelines for the treatment of PTSD and related conditions. *Journal of Traumatic Stress*, 23, 537– 552. http://dx.doi.org/10.1002/jts.20565
- Garrouste-Orgeas, M., Coquet, I., Périer, A., Timsit, J. F., Pochard, F., Lancrin, F., . . . Misset, B. (2012). Impact of an intensive care unit diary on psychological distress in patients and relatives. *Critical Care Medicine*, 40, 2033–2040. http://dx.doi.org/10.1097/CCM.0b013 e31824e1b43
- Gidron, Y., Gal, R., Freedman, S., Twiser, I., Lauden, A., Snir, Y., & Benjamin, J. (2001). Translating research findings to PTSD prevention: Results of a randomized-controlled pilot study. *Journal of Traumatic Stress*, 14, 773–780. http://dx.doi.org/10.1023/A:1013046322993
- Girard, T. D., Shintani, A. K., Jackson, J. C., Gordon, S. M., Pun, B. T., Henderson, M. S., . . . Ely, E. W. (2007). Risk factors for post-traumatic stress disorder symptoms following critical illness requiring mechanical ventilation: A prospective cohort study. *Critical Care (London, England)*, 11(1), R28. http://dx.doi.org/10.1186/cc5708
- Green, B. L., Rowland, J. H., Krupnick, J. L., Epstein, S. A., Stockton, P., Stern, N. M., . . . Steakly, C. (1998). Prevalence of posttraumatic stress disorder in women with breast cancer. *Psychosomatics: Journal of Consultation and Liaison Psychiatry*, 39, 102–111. http://dx.doi.org/10 .1016/S0033-3182(98)71356-8
- Harvey, A. G., & Bryant, R. A. (1998). The relationship between acute stress disorder and posttraumatic stress disorder: A prospective evaluation of motor vehicle accident survivors. *Journal of Consulting and Clinical Psychology*, 66, 507–512. http://dx.doi.org/10.1037/0022-006X .66.3.507
- Jackson, J. C., Ely, E. W., Morey, M. C., Anderson, V. M., Denne, L. B., Clune, J., . . . Hoenig, H. (2012). Cognitive and physical rehabilitation of intensive care unit survivors: Results of the RETURN randomized controlled pilot investigation. *Critical Care Medicine*, 40, 1088–1097. http://dx.doi.org/10.1097/CCM.0b013e3182373115
- Jackson, J. C., Hart, R. P., Gordon, S. M., Hopkins, R. O., Girard, T. D., & Ely, E. W. (2007). Post-traumatic stress disorder and post-traumatic stress symptoms following critical illness in medical intensive care unit patients: Assessing the magnitude of the problem. *Critical Care (London, England)*, 11(1), R27. http://dx.doi.org/10.1186/cc5707
- Jackson, J. C., Hart, R. P., Gordon, S. M., Shintani, A., Truman, B., May, L., & Ely, E. W. (2003). Six-month neuropsychological outcome of medical intensive care unit patients. *Critical Care Medicine*, 31, 1226– 1234. http://dx.doi.org/10.1097/01.CCM.0000059996.30263.94

- Jackson, J. C., Pandharipande, P. P., Girard, T. D., Brummel, N. E., Thompson, J. L., Hughes, C. G., . . . Bringing to Light the Risk Factors and Incidence of Neuropsychological Dysfunction in ICU Survivors (BRAIN-ICU) study investigators. (2014). Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: A longitudinal cohort study. *The Lancet Respiratory Medicine*, 2, 369–379. http://dx.doi.org/10.1016/S2213-2600(14)70051-7
- Jones, C., Bäckman, C., Capuzzo, M., Egerod, I., Flaatten, H., Granja, C., ... RACHEL group. (2010). Intensive care diaries reduce new onset post traumatic stress disorder following critical illness: A randomised, controlled trial. *Critical Care (London, England)*, 14(5), R168. http://dx.doi .org/10.1186/cc9260
- Jones, C., Bäckman, C., Capuzzo, M., Flaatten, H., Rylander, C., & Griffiths, R. D. (2007). Precipitants of post-traumatic stress disorder following intensive care: A hypothesis generating study of diversity in care. *Intensive Care Medicine*, 33, 978–985. http://dx.doi.org/10.1007/ s00134-007-0600-8
- Jones, C., Backman, C., & Griffiths, R. D. (2012). Intensive care diaries and relatives' symptoms of posttraumatic stress disorder after critical illness: A pilot study. American Journal of Critical Care: An Official Publication, American Association of Critical-Care Nurses, 21, 172– 176.
- Jones, C., Griffiths, R. D., & Humphris, G. (2000). Disturbed memory and amnesia related to intensive care. *Memory*, 8, 79–94. http://dx.doi.org/ 10.1080/096582100387632
- Jones, C., Griffiths, R. D., Humphris, G., & Skirrow, P. M. (2001). Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care. *Critical Care Medicine*, 29, 573–580. http://dx.doi.org/10.1097/00003246-200103000-00019
- Jones, C., Griffiths, R. D., Macmillan, R., & Palmer, T. (1994). Psychological problems occurring after intensive care. *British Journal of Intensive Care*, 4, 46–53.
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G. H., Ingleby, S., Eddleston, J., . . . Gager, M. (2003). Rehabilitation after critical illness: A randomized, controlled trial. *Critical Care Medicine*, *31*, 2456–2461. http://dx.doi.org/10.1097/01.CCM.0000089938.56725.33
- Kapfhammer, H. P., Rothenhäusler, H. B., Krauseneck, T., Stoll, C., & Schelling, G. (2004). Posttraumatic stress disorder and health-related quality of life in long-term survivors of acute respiratory distress syndrome. *The American Journal of Psychiatry*, 161, 45–52. http://dx.doi .org/10.1176/appi.ajp.161.1.45
- Kearns, M. C., Ressler, K. J., Zatzick, D., & Rothbaum, B. O. (2012). Early interventions for PTSD: A review. *Depression and Anxiety*, 29, 833– 842. http://dx.doi.org/10.1002/da.21997
- Kennedy, J. E., Jaffee, M. S., Leskin, G. A., Stokes, J. W., Leal, F. O., & Fitzpatrick, P. J. (2007). Posttraumatic stress disorder and posttraumatic stress disorder-like symptoms and mild traumatic brain injury. *Journal* of Rehabilitation Research and Development, 44, 895–920. http://dx.doi .org/10.1682/JRRD.2006.12.0166
- Kessler, R. C., & Wang, P. S. (2008). The descriptive epidemiology of commonly occurring mental disorders in the United States. *Annual Review of Public Health*, 29, 115–129. http://dx.doi.org/10.1146/ annurev.publhealth.29.020907.090847
- Kiekkas, P., Theodorakopoulou, G., Spyratos, F., & Baltopoulos, G. I. (2010). Psychological distress and delusional memories after critical care: A literature review. *International Nursing Review*, 57, 288–296. http://dx.doi.org/10.1111/j.1466-7657.2010.00809.x
- Knowles, R. E., & Tarrier, N. (2009). Evaluation of the effect of prospective patient diaries on emotional well-being in intensive care unit survivors: A randomized controlled trial. *Critical Care Medicine*, 37, 184– 191. http://dx.doi.org/10.1097/CCM.0b013e31819287f7
- Kollef, M. H., Levy, N. T., Ahrens, T. S., Schaiff, R., Prentice, D., & Sherman, G. (1998). The use of continuous i.v. sedation is associated

with prolongation of mechanical ventilation. Chest, 114, 541-548. http://dx.doi.org/10.1378/chest.114.2.541

- Kress, J. P., Gehlbach, B., Lacy, M., Pliskin, N., Pohlman, A. S., & Hall, J. B. (2003). The long-term psychological effects of daily sedative interruption on critically ill patients. *American Journal of Respiratory* and Critical Care Medicine, 168, 1457–1461. http://dx.doi.org/10.1164/ rccm.200303-455OC
- Kronish, I. M., Edmondson, D., Goldfinger, J. Z., Fei, K., & Horowitz, C. R. (2012). Posttraumatic stress disorder and adherence to medications in survivors of strokes and transient ischemic attacks. *Stroke*, 43, 2192– 2197. http://dx.doi.org/10.1161/STROKEAHA.112.655209
- Leaman, S. C., Kearns, M. C., & Rothbaum, B. O. (2013). Prevention and early intervention: PTSD following traumatic events. *Focus*, 11, 321– 327. http://dx.doi.org/10.1176/appi.focus.11.3.321
- Levine, B., Robertson, I. H., Clare, L., Carter, G., Hong, J., Wilson, B. A., . . . Stuss, D. T. (2000). Rehabilitation of executive functioning: An experimental-clinical validation of goal management training. *Journal of the International Neuropsychological Society*, *6*, 299–312. http://dx.doi .org/10.1017/S1355617700633052
- Mealer, M. L., Shelton, A., Berg, B., Rothbaum, B., & Moss, M. (2007). Increased prevalence of post-traumatic stress disorder symptoms in critical care nurses. *American Journal of Respiratory and Critical Care Medicine*, 175, 693–697. http://dx.doi.org/10.1164/rccm.200606-735OC
- Micek, S. T., Anand, N. J., Laible, B. R., Shannon, W. D., & Kollef, M. H. (2005). Delirium as detected by the CAM-ICU predicts restraint use among mechanically ventilated medical patients. *Critical Care Medicine*, 33, 1260–1265. http://dx.doi.org/10.1097/01.CCM.0000164540 .58515.BF
- Needham, D. M., Davidson, J., Cohen, H., Hopkins, R. O., Weinert, C., Wunsch, H., . . . Harvey, M. A. (2012). Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders' conference. *Critical Care Medicine*, 40, 502–509. http://dx.doi.org/10 .1097/CCM.0b013e318232da75
- Nelson, B. J., Weinert, C. R., Bury, C. L., Marinelli, W. A., & Gross, C. R. (2000). Intensive care unit drug use and subsequent quality of life in acute lung injury patients. *Critical Care Medicine*, 28, 3626–3630. http://dx.doi.org/10.1097/00003246-200011000-00013
- Nelson, L. P., & Gold, J. I. (2012). Posttraumatic stress disorder in children and their parents following admission to the pediatric intensive care unit: A review. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive* and Critical Care Societies, 13, 338–347.
- Newman, J. D., Muntner, P., Shimbo, D., Davidson, K. W., Shaffer, J. A., & Edmondson, D. (2011). Post-traumatic stress disorder (PTSD) symptoms predict delay to hospital in patients with acute coronary syndrome. *PLoS ONE*, 6(11), e27640. http://dx.doi.org/10.1371/journal.pone .0027640
- Nieuwenhuis, S., Broerse, A., Nielen, M. M., & de Jong, R. (2004). A goal activation approach to the study of executive function: An application to antisaccade tasks. *Brain and Cognition*, 56, 198–214. http://dx.doi.org/ 10.1016/j.bandc.2003.12.002
- Pandharipande, P. P., Girard, T. D., Jackson, J. C., Morandi, A., Thompson, J. L., Pun, B. T., . . . the BRAIN-ICU Study Investigators. (2013). Long-term cognitive impairment after critical illness. *The New England Journal of Medicine*, 369, 1306–1316. http://dx.doi.org/10.1056/ NEJMoa1301372
- Pandharipande, P., Shintani, A., Peterson, J., Pun, B. T., Wilkinson, G. R., Dittus, R. S., . . . Ely, E. W. (2006). Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology*, 104, 21–26. http://dx.doi.org/10.1097/00000542-200601000-00005
- Parker, A. M., Sricharoenchai, T., Raparla, S., Schneck, K. W., Bienvenu, O. J., & Needham, D. M. (2015). Posttraumatic stress disorder in critical

illness survivors: A metaanalysis. Critical Care Medicine, 43, 1121–1129. http://dx.doi.org/10.1097/CCM.0000000000882

- Payen, J. F., Chanques, G., Mantz, J., Hercule, C., Auriant, I., Leguillou, J. L., . . . Bosson, J. L. (2007). Current practices in sedation and analgesia for mechanically ventilated critically ill patients: A prospective multicenter patient-based study. *Anesthesiology*, *106*, 687–695. http://dx.doi.org/10.1097/01.anes.0000264747.09017.da
- Perier, A., Revah-Levy, A., Bruel, C., Cousin, N., Angeli, S., Brochon, S., . . . Garrouste-Orgeas, M. (2013). Phenomenologic analysis of healthcare worker perceptions of intensive care unit diaries. *Critical Care* (*London, England*), 17(1), R13. http://dx.doi.org/10.1186/cc11938
- Peris, A., Bonizzoli, M., Iozzelli, D., Migliaccio, M. L., Zagli, G., Bacchereti, A., . . . Belloni, L. (2011). Early intra-intensive care unit psychological intervention promotes recovery from post traumatic stress disorders, anxiety and depression symptoms in critically ill patients. *Critical Care (London, England), 15*, R41. http://dx.doi.org/10.1186/ cc10003
- Powers, M. B., Halpern, J. M., Ferenschak, M. P., Gillihan, S. J., & Foa, E. B. (2010). A meta-analytic review of prolonged exposure for posttraumatic stress disorder. *Clinical Psychology Review*, 30, 635–641. http://dx.doi.org/10.1016/j.cpr.2010.04.007
- Qureshi, S. U., Long, M. E., Bradshaw, M. R., Pyne, J. M., Magruder, K. M., Kimbrell, T., . . . Kunik, M. E. (2011). Does PTSD impair cognition beyond the effect of trauma? *The Journal of Neuropsychiatry* and *Clinical Neurosciences*, 23, 16–28.
- Randolph, C. (1998). RBANS manual: Repeatable battery for the assessment of neuropsychological status. San Antonio, TX: The Psychological Corporation.
- Rattray, J., Crocker, C., Jones, M., & Connaghan, J. (2010). Patients' perceptions of and emotional outcome after intensive care: Results from a multicentre study. *Nursing in Critical Care*, 15, 86–93.
- Rattray, J. E., Johnston, M., & Wildsmith, J. A. (2005). Predictors of emotional outcomes of intensive care. *Anaesthesia*, 60, 1085–1092. http://dx.doi.org/10.1111/j.1365-2044.2005.04336.x
- Riker, R. R., Shehabi, Y., Bokesch, P. M., Ceraso, D., Wisemandle, W., Koura, F., . . . SEDCOM (Safety and Efficacy of Dexmedetomidine Compared With Midazolam) Study Group. (2009). Dexmedetomidine vs midazolam for sedation of critically ill patients: A randomized trial. *Journal of the American Medical Association*, 301, 489–499. http://dx .doi.org/10.1001/jama.2009.56
- Rose, S. C., Bisson, J., Churchill, R., & Wessely, S. (2002). Psychological debriefing for preventing post traumatic stress disorder (PTSD). *The Cochrane Library*.
- Samuelson, K. A., Lundberg, D., & Fridlund, B. (2007a). Stressful experiences in relation to depth of sedation in mechanically ventilated patients. *Nursing in Critical Care*, 12, 93–104. http://dx.doi.org/10.1111/ j.1478-5153.2006.00199.x
- Samuelson, K., Lundberg, D., & Fridlund, B. (2007b). Stressful memories and psychological distress in adult mechanically ventilated intensive care patients: A 2-month follow-up study. *Acta Anaesthesiologica Scandinavica*, 51, 671–678.
- Schelling, G., Stoll, C., Haller, M., Briegel, J., Manert, W., Hummel, T., . . . Peter, K. (1998). Health-related quality of life and posttraumatic stress disorder in survivors of the acute respiratory distress syndrome. *Critical Care Medicine*, 26, 651–659. http://dx.doi.org/10.1097/ 00003246-199804000-00011
- Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., . . Kress, J. P. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: A randomised controlled trial. *The Lancet*, 373, 1874–1882.
- Siegel, M. D., Hayes, E., Vanderwerker, L. C., Loseth, D. B., & Prigerson, H. G. (2008). Psychiatric illness in the next of kin of patients who die in the intensive care unit. *Critical Care Medicine*, *36*, 1722–1728. http:// dx.doi.org/10.1097/CCM.0b013e318174da72

- Society of Critical Care Medicine. (2005). Critical care units: A descriptive analysis. Des Plaines, IL: Author.
- Stevenson, J. E., & Dowdy, D. W. (2012). Thinking outside the box: Intensive care unit diaries to improve psychological outcomes in family members. *Critical Care Medicine*, 40, 2231–2232. http://dx.doi.org/10 .1097/CCM.0b013e3182514c00
- Stoll, C., Kapfhammer, H. P., Rothenhäusler, H. B., Haller, M., Briegel, J., Schmidt, M., . . . Schelling, G. (1999). Sensitivity and specificity of a screening test to document traumatic experiences and to diagnose posttraumatic stress disorder in ARDS patients after intensive care treatment. *Intensive Care Medicine*, 25, 697–704. http://dx.doi.org/10.1007/ s001340050932
- Walsh, T. S., Salisbury, L. G., Merriweather, J. L., Boyd, J. A., Griffith, D. M., Huby, G., . . . the RECOVER Investigators. (2015). Increased hospital-based physical rehabilitation and information provision after intensive care unit discharge: The RECOVER randomized clinical trial. *JAMA Internal Medicine*, 175, 901–910. http://dx.doi.org/10.1001/ jamainternmed.2015.0822
- Weinert, C. R., & Sprenkle, M. (2008). Post-ICU consequences of patient wakefulness and sedative exposure during mechanical ventilation. *In*tensive Care Medicine, 34, 82–90. http://dx.doi.org/10.1007/s00134-007-0829-2

- Wilcox, M. E., Brummel, N. E., Archer, K., Ely, E. W., Jackson, J. C., & Hopkins, R. O. (2013). Cognitive dysfunction in ICU patients: Risk factors, predictors, and rehabilitation interventions. *Critical Care Medicine*, 41(9, Suppl. 1), S81–S98. http://dx.doi.org/10.1097/CCM .0b013e3182a16946
- Wolf, G. K., Strom, T. Q., Kehle, S. M., & Eftekhari, A. (2012). A preliminary examination of prolonged exposure therapy with Iraq and Afghanistan veterans with a diagnosis of posttraumatic stress disorder and mild to moderate traumatic brain injury. *The Journal of Head Trauma Rehabilitation*, 27, 26–32. http://dx.doi.org/10.1097/HTR .0b013e31823cd01f
- Zimmerman, J. E., Kramer, A. A., & Knaus, W. A. (2013). Changes in hospital mortality for United States intensive care unit admissions from 1988 to 2012. *Critical Care (London, England)*, 17, R81. http://dx.doi .org/10.1186/cc12695

Received May 1, 2015 Revision received January 19, 2016

Accepted January 22, 2016 ■

Posttraumatic Stress Symptoms in Intensive Care Patients: An Exploration of Associated Factors

Rosalind Elliott University of Technology Sydney Sharon McKinley Royal North Shore Hospital, St Leonards, New South Wales, Australia

Mary Fien eHealth New South Wales, Chatswood, New South Wales, Australia Doug Elliott University of Technology Sydney

Purpose/Objective: To explore demographic, clinical, and psychological factors in intensive care unit (ICU), including self-reported sleep quality and experiences that were associated with posttraumatic stress (PTS) symptoms 6 months after discharge from hospital. Research Method/Design: A prospective survey was conducted (N = 222). On the day of transfer to the hospital ward, ICU patients reported pain and state-anxiety levels, as well as ICU and prehospital sleep quality. Two months after hospital discharge, they reported sleep quality at home and experiences in ICU. Six months after hospital discharge, sleep quality, PTS symptoms (measured with the Posttraumatic Stress Disorder Checklist-Specific; PCL-S; VA National Center for PTSD, 2014) and psychological well-being (using Depression, Anxiety and Stress Scales-21; DASS-21; Ware, Kosinski, & Keller, 1994) were reported. Descriptive data analyses were performed and factors associated with PTS symptoms were explored with multiple linear regression. Results: The sample was predominately male (65%), with a mean age 57 years. At baseline, pain intensity was low ($M \pm SD$; 2.25 \pm 1.14) and state-anxiety levels were moderate (2.50 \pm 2.90). At 6 months, 30% of the sample demonstrated depression, and 13.5% (mean PCL-S score: 26.54 \pm 10.52) reported symptoms reflective of PTS. The regression model explained 68.2% of the variance in the PCL-S score. Higher PTS scores were independently associated with frightening experiences in ICU, higher stress and depression scores, pain intensity at baseline, and sleep quality at 6 months. Conclusion/Implications: Continuing symptoms of PTS were evident in 14% of the cohort. Screening for prevention and treatment of delirium while a patient is in ICU is essential, and psychological screening and follow-up during recovery would therefore also be beneficial for many patients.

Impact and Implications

Continued attempts to maximize sleep quality and comfort for patients while being treated in an intensive care unit (ICU) are required and appear to be important during recovery. Current efforts to prevent and treat delirium while patients are in ICU should be enhanced. Patients recovering from critical illness should be provided with access to specialist follow-up and rehabilitative services for psychological screening and treatment.

Keywords: intensive care, posttraumatic stress disorder symptoms, sleep, critical illness, health-related quality of life

Supplemental materials: http://dx.doi.org/10.1037/rep0000074.supp

Introduction

Critical illness and treatment in an intensive care unit (ICU) present specific physical and psychological challenges for patients

during recovery and rehabilitation (Needham et al., 2012). In particular, patients are frequently required to contend with poorer psychological health and cognitive function, with current substantial evidence suggesting that posttraumatic stress (PTS) symptoms,

Rosalind Elliott is now at Royal North Shore Hospital, St Leonards, where the work for this article was conducted.

Correspondence concerning this article should be addressed to Rosalind Elliott, PhD, Royal North Shore Hospital, St Leonards, NSW 2065, Australia. E-mail: roz.m.elliott@gmail.com

Rosalind Elliott, Faculty of Health, University of Technology Sydney; Sharon McKinley, Royal North Shore Hospital, St Leonards, New South Wales, Australia; Mary Fien, eHealth NSW, Chatswood, New South Wales, Australia; Doug Elliott, Faculty of Health, University of Technology Sydney.

anxiety, and depression are more frequent in former ICU patients than in the general population (Davydow, Zatzick, Hough, & Katon, 2013; O'Donnell et al., 2010). Prevalence of PTS symptoms in former ICU patients varies widely (5–64%), depending on measurement points and the assessment technique employed (e.g., the gold-standard structured interview by an expert or self-report using a screening instrument; Long, Kross, Davydow, & Curtis, 2014). One systematic review reported the prevalence of PTSD after critical illness as 18% (Wade, Hardy, Howell, & Mythen, 2013).

Feelings of anxiety, avoidance, intrusive thoughts, and alterations in reaction to those attributes characterize PTS symptoms as a result of exposure to a traumatic life event (Friedman et al., 2011). The nature of PTS symptoms in former ICU patients appears to be largely characterized by intrusive thoughts and stress (Davydow et al., 2013; Wade, Hardy, Howell, & Mythen, 2013). Depression and functional impairments (especially social) may also result, and have significant effects on quality of life for many people (Pacella, Hruska, & Delahanty, 2013; Schelling et al., 1998). This is particularly challenging for former ICU patients who may also face physical, financial, and social limitations during their recovery and beyond (Griffiths et al., 2013).

It is therefore important to explore potential contributing and risk factors of PTS symptoms in patients recovering from critical illness. More understanding will be of use to future investigators seeking to develop and test interventions to minimize adverse effects of PTS symptoms on quality of life in this population. There are currently conflicting reports about risk factors for posttraumatic stress disorder (PTSD) in the general population (e.g., age) (Breslau, 2002). In addition, evidence that poor sleep is associated with PTS is emerging from investigations involving individuals at risk for developing PTS symptoms who have not necessarily been treated in ICU. (Germain, Buysse, & Nofzinger, 2008; Spoormaker & Montgomery, 2008; Talbot et al., 2014).

From an ICU perspective, symptoms of PTS have been associated with benzodiazepine administration (Girard et al., 2007), prior mental illness (Bienvenu et al., 2013; Paparrigopoulos et al., 2014), agitation, in particular delirium (Samuelson, Lundberg, & Fridlund, 2007), high levels of stress during treatment in ICU (Davydow, Zatzick, Hough, & Katon, 2013), traumatic injury prior to ICU treatment (O'Donnell et al., 2010; Schandl, Bottai, Hellgren, Sundin, & Sackey, 2013), and unreal (delusional) or frightening memories of the ICU (possibly a manifestation of delirium; Jones et al., 2007; Wade et al., 2013). Mental illness prior to ICU treatment is also acknowledged as a risk factor for later development of PTSD during recovery (Wade et al., 2013). Notably, there is emerging evidence that the experience, in itself, of being treated in ICU may contribute to the development of PTSD (O'Donnell et al., 2010). Although the exact reason for this remains unclear, delirium and sleep disturbances are likely contributing factors. Investigation of the effects of sleep in ICU during critical illness on subsequent PTS symptoms has not been previously reported in former ICU patients.

The aim of this work was therefore to explore demographic, clinical, and psychological factors, including self-reported sleep quality and experiences in ICU that were associated with PTS symptoms 6 months after discharge from hospital.

Method

We conducted an extensive questionnaire-based exploratory study specifically to assess the quality of sleep reported by former ICU patients early in their recovery; the findings on sleep were reported elsewhere (McKinley, Fien, Elliott, & Elliott, 2013). This paper is specifically a report on a secondary study aim to explore whether psychological health 6 months after discharge was associated with experiences in the ICU, including sleep disruption. No specific hypotheses were set a priori. We therefore contemporaneously collected measures of psychological well-being known to be associated with subjective sleep quality (Caldwell & Redeker, 2005; Davydow et al., 2013; Myhren, Ekeberg, Toien, Karlsson, & Stokland, 2010).

While in the ICU, participants completed self-report instruments on their sleep quality prior to hospital admission, as well as their sleep quality in the ICU. Clinical and demographic data were also obtained from the patient records while in ICU. Two months after hospital discharge, participants reported on their quality of sleep over the last month and their experiences in ICU. Six months after hospital discharge, the participants again reported on their PTS symptoms, as well as depression, anxiety, stress levels, and quality of sleep over the last month.

Setting and Participants

The study was conducted in an adult ICU at a universityaffiliated hospital in New South Wales, Australia. Eligible patients were ≥ 18 years old, had capacity to provide informed consent, were treated in ICU for ≥ 48 hours, and assessed as sufficiently recovered by the treating ICU physician to transfer from the ICU to a hospital ward. The exclusion criteria included a known or suspected preexisting sleep disorder, an inability to complete the study instruments in English, and uncorrected vision or hearing impairments. All patients treated in the study ICU who met eligibility criteria were invited to participate. The Local Health District Human Research Ethics Committee (HREC) approved the study with ratification from the university's HREC. At enrollment, patients gave written, informed consent to participate; at each subsequent time point, their continued consent was sought verbally.

Measures

Specifically designed data-collection forms were used to record the patients' clinical and demographic characteristics at enrollment. The majority of these data were collected from the healthcare records and hospital databases. These included age, sex, body-mass index, severity of illness (measured with the Acute Physiology and Chronic Health Evaluation II score; (Knaus, Draper, Wagner, & Zimmerman, 1985), operative admission or not, trauma or not, length of mechanical ventilation, and length of stay in ICU and in hospital. Sedation level, pain intensity, and state anxiety at this time were also recorded using the Richmond Sedation–Agitation Scale, a vertical 100-mm visual analogue pain scale (Sessler et al., 2002) and the Faces Anxiety Scale (McKinley, Stein-Parbury, Chehelnabi, & Lovas, 2004), respectively.

The protocol was designed to minimize patient burden and maximize the probability of obtaining accurate and complete data. The experience of treatment in ICU, psychological well-being, and self-reported quality of sleep were all assessed using validated questionnaires (see supplementary file for a detailed description of the instruments used, administration points, and rationale for their use in this study). In summary, the Intensive Care Experience Questionnaire (ICEQ; Rattray, Johnston, & Wildsmith, 2004) was used to assess patients' perceptions of their experience of being treated in ICU and at 2 months after discharge. The instruments used to assess sleep were relevant for assessment at specific data-collection points. The Insomnia Severity Index (ISI; Bastien, Vallieres, & Morin, 2001) was used to identify prehospital sleep disturbance. The ISI is brief, is validated for use by a proxy, and is less complex than other sleep instruments that elicit information that a proxy would not necessarily be aware of. Use of more extensive instruments to identify prehospital sleep disturbance were not used because of difficulties for patients to self-report while they were still being treated in ICU. Patients did report on their prehospital sleep quality using a simple numerical scale; 1 =poor, 10 = excellent (Freedman, Kotzer, & Schwab, 1999).

The Richards–Campbell Sleep Questionnaire (RCSQ; Richards, O'Sullivan, & Phillips, 2000) was used to self-report patient sleep in ICU and in the hospital ward. The Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) was completed by participants at 2 and 6 months after hospital discharge to report sleep quality and quantity over the preceding month. (The PSQI provides information about many aspects of sleep quality required to address the aims of the main study.) The Depression, Anxiety and Stress Scales–21 (DASS-21; Ware, Kosinski, & Keller, 1994) and Posttraumatic Stress Disorder Checklist–Specific (PCL-S; VA National Center for PTSD, 2014) were used to assess psychological well-being 6 months after discharge.

Data-Collection Procedures

Daily screening in the ICU was conducted by critical-care research nurses for 8 months (June, 2010 to February, 2011) to identify eligible patients. Patients were approached by one of the research nurses the day on which the ICU physician assessed them as well enough for transfer to the hospital ward. The patients' nurses were requested to provide their opinions on the patients' cognitive abilities to participate (including their capacity to provide informed consent). Each patient's capacity to provide informed consent was then assessed by checking his or her orientation to time and place, and understanding of the information provided.

The sequence and rationale for administration of questionnaires across the study timeline is located in the supplementary file. Once written informed consent was obtained, the patient completed the first battery of questionnaires: the ISI (Bastien et al., 2001), Item 1 of the Sleep in the Intensive Care Unit Questionnaire (SICQ), and the RCSQ (Richards et al., 2000). Patients were posted batteries of questionnaires with paid return, addressed envelopes at 2 and 6 months after discharge from hospital. Patients who had not returned the questionnaires after 2 weeks were contacted by telephone and given the option to complete the questionnaires by telephone. Three attempts were made to contact participants. Errors or omissions were corrected by contacting and checking with the participant whenever possible.

Statistical Analysis

Data were entered and cleaned in an Excel database (Microsoft Corp., Redmond, WA) and analyzed using PASW statistics (Version 18.0, IBM/SPSS, Chicago, IL). Descriptive statistics, mean, standard deviation, median, range, interquartile range (IQR), frequencies, and percentages were used to describe the sample, ICU experiences, psychological well-being, and sleep self-reports. Bivariate comparisons of factors related to a PCL-S (VA National Center for PTSD, 2014) cut-off score of >36 at 6 months after discharge were made with t tests, Mann–Whitney U tests, and χ^2 or Fisher's exact tests. Factors significantly associated with PTS symptoms (p < .05) during bivariate comparisons (e.g., pain at baseline, PSQI (Buysse et al., 1989) global score at 6 months, awareness of ICU and frightening memories of ICU) and factors known from published research to contribute to PTSD (i.e., female gender) were entered into an ordinary least-squares multiple linear regression model. The PCL-S global score at 6 months was the dependent variable in the model. Independent variables were gender plus continuous scores for pain and anxiety at enrollment, stress, anxiety, depression, ICEQ (Rattray, 2004) awareness of surroundings and frightening experiences at 2 months, and total PSQI score at 6 months.

Results

The inclusion criteria were satisfied by 344 patients, but 122 were not enrolled: 79 had declined and 43 had been discharged before they could be invited. Baseline ICU data collection was therefore completed for 222 patients. Eight patients were lost to follow-up, six were deceased, and 10 declined to continue in the study by the 6-month time point. The number of patients who completed the various instruments after hospital discharge varied (see Figure 1). The overall study-completion rate was 79%; data were complete for 183 (82%) patients on the ICEQ (Rattray, 2004) at 2 months and 178 (80%) for the PCL-S (VA National Center for PTSD, 2014), and 176 (79%) for the DASS-21 (Ware et al., 1994) and PSQI (Buysse et al., 1989) at 6 months.

Patient Demographic and Clinical Characteristics

Clinical and demographic characteristics of the respondents are shown in Table 1. The sample was two thirds male (65%) and the mean age was 57 years. Severity of illness was low; mean APACHE II (Acute Physiology and Chronic Health scale) score = 12.75 (Knaus, Draper, Wagner, & Zimmerman, 1985), median duration of mechanical ventilation was 0.5 days, and median length of ICU stay was 3 days. Pain intensity (scale of 0–10) was low ($M \pm SD = 2.50 \pm 2.19$ and state-anxiety level (scale of 1–5) was moderately high (2.25 ± 1.14) for the sample at baseline.

Posttraumatic Stress Symptoms and Psychological Health at 6 Months

Scores for the PCL-S (VA National Center for PTSD, 2014), DASS (Ware et al., 1994), and ICEQ (Rattray, 2004) are shown in Table 2. Twenty-four patients reported a PCL-S score >36 (13.5%), with the mean score 26.54 (median 24.00; IQR = 19–29; range 17–67). DASS cut-off scores were exceeded for 52 (30%), 41 (23%), and 33 (18%) patients, respectively.



Figure 1. Flowchart of the number of patients completing questionnaires at each time point.

Experience of Treatment in ICU

Based on the ICEQ (Rattray, 2004), this sample remembered their ICU stay (82.7% disagreement with *I have no recollection of intensive care* and 66.5% responded to "I knew what was happening to me" some, all of the time, or rarely). Fifty percent disagreed that their memories were blurred, with a high frequency of memories evident for "bad dreams" (47.6% all of the time) and "seeing strange things" (53% all of the time). Seventy-five percent of patients reported, "I felt in control" some, all of the time, or rarely; notably 10.2% of patients responded all of the time to this item (Figures 2 and 3).

Factors Associated With PTS Symptoms at 6 Months

There were statistically significant differences among patients whose PCL-S (VA National Center for PTSD, 2014) scores were >36 (more PTS symptoms) compared with 36 or less (fewer PTS symptoms) for a number of variables: higher pain intensity at enrollment (4.63 \pm 3.40 vs. 2.18 \pm 2.68, p = .002), poorer PSQI (Buysse et al., 1989) global score at 6 months (12.71 \pm 4.65 vs. 6.50 \pm 4.10, p < .005), lower scores on awareness (Component 1 of the ICEQ; Rattray, 2004; 34.05 \pm 6.67 vs. 37.39 \pm 5.57, p = .035), higher scores for frightening experiences (Component 2 of the ICEQ; 16.67 \pm 4.30 vs. 12.93 \pm 4.62, p = .001) and higher scores on all of the DASS (Ware et al., 1994) subscales (see Table 3).

Data from 160 patients were included in the multivariate regression analysis. The regression model explained 68.2% of the variability in the PTS symptoms according to PCL-S (VA National Center for PTSD, 2014) scores. Higher PTS symptoms at 6 months were independently associated with, stress ($\beta = 0.31$, 95% CI [0.139, 0.490]) and depression ($\beta = 0.30$, 95% CI [0.139, 0.478]; DASS (Ware et al., 1994) subscale scores at 6 months after hospital discharge), global sleep quality (PSQI; Buysse et al., 1989) at 6 months ($\beta = 0.34$, 95% CI [0.081, 0.598]), and frightening experiences (ICEQ; Rattray, 2004; Component 2; $\beta = 0.31$, 95% CI [0.068, 0.551]) and higher pain intensity at enrollment ($\beta = 0.43$, 95% CI [0.081, 0.784]). The DASS Stress subscale contributed most to the variance regression model ($\beta = 0.29$, p = .001) (see Table 4).

Discussion

The key study findings, prevalence of PTS symptoms, and the influence of five factors (pain at enrollment in ICU, recall of frightening experiences in ICU, and presence of stress, depression, and global sleep quality 6 months after discharge), are discussed below in relation to the available literature.

Despite a low severity of illness in this ICU cohort, PTS symptoms were reported by one in seven patients at 6 months. With a mean PCL-S (VA National Center for PTSD, 2014) score of 26, 14% of the sample exceeded the PCL-S cut-off score of 36, suggesting probable cases of PTSD. A high proportion of patients also reported experiencing symptoms of depression (30%), anxiety (23%) and stress (18%). These findings are comparable to results of a previous study from the United States examining psychological well-being in recovering ICU patients (Davydow et al., 2013) despite differences in patient characteristics (e.g., median mechanical ventilation time of 2 days compared with 0.5 days in our study). The percentage of probable PTSD cases in our cohort was in the lower range for patients treated in ICU, with previous studies ranging from 9% to 27% (Davydow et al., 2013; Girard et al., 2007; Myhren, Ekeberg, Toien, Karlsson, & Stokland, 2010; Nickel et al., 2004; O'Donnell et al., 2010; Richter, Waydhas, & Pajonk, 2006; Twigg, Humphris, Jones, Bramwell, & Griffiths, 2008; Wallen, Chaboyer, Thalib, & Creedy, 2008), but higher than the 1-9% range for the general population (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Lukaschek et al., 2013).

This variance in reported PTS symptoms for former ICU patients may be influenced by different patient groups, e.g., longterm surgical patients (Richter et al., 2006) and trauma survivors (O'Donnell et al., 2010), and different measures, e.g., Post-Traumatic Stress Syndrome 10-Questions Inventory (PTSS-10; Girard et al., 2007, the UK-Post-Traumatic Stress Syndrome 14-Questions Inventory (UK-PTSS-14; Twigg et al., 2008), and structured clinician interviews (Nickel et al. 2004; O'Donnell et al., 2010; Richter et al., 2006). Measurements have also been per-

Table 1 Selected ICU Patients Demographic and Clinical Characteristics (N = 222)

Characteristic	Statistic
Age (years), $M \pm SD$	57.20 ± 17.20
Female gender, n (%)	77 (35)
BMI (Kg/M ²), $M \pm SD$	26.00 ± 4.40
APACHE II (Day 1), $M \pm SD$	12.75 ± 5.80
Pain intensity score on enrollment (0–10, 10 is the worst), $M \pm SD$	2.50 ± 2.90
State-anxiety score (1–5, higher scores indicate higher anxiety level), $M \pm SD$	2.25 ± 1.14
Sedation score (Richards Agitation Sedation Scoring), Mdn [IQR]	.00 [.0000]
Length of mechanical ventilation (days), Mdn [IQR]	.50 [.00-1.50]
ICU LOS (days), Mdn [IQR]	3.00 [2.00-6.00]
Hospital LOS (days), Mdn [IQR]	13.00 [8.00-22.25]
Operative diagnosis, n (%)	156 (70)
Trauma (operative and nonoperative) diagnosis, n (%)	35 (16)

Note. IQR = interquartile range; BMI = body mass index; APACHE = Acute Physiology and Chronic Health scale; LOS = length of stay.

formed at different time points, for example, 1 month and 1 year after hospital discharge (Myhren et al., 2010; Wallen, Chaboyer, Thalib, & Creedy, 2008), in recognition that chronic PTS symptoms are not characterized as such until 3 months after a traumatic event (Stein et al., 2014). Therefore it is difficult to estimate the true prevalence rate of PTSD in patients who have experienced treatment in ICU.

Although a PCL-S (VA National Center for PTSD, 2014) cutoff score <44 can overestimate PTSD in populations with a low prevalence (Terhakopian, Sinaii, Engel, Schnurr, & Hoge, 2008), we used a cut-off score of 36 (VA National Center for PTSD, 2014). Our rationale was that, with an uncertain prevalence rate for PTSD in patients who had been treated in ICU, we wanted to be sure we identified all patients who were experiencing clinically significant PTS symptoms. However, given the range in the occurrence of symptoms of PTS (13%–27%) and the rates identified using structured clinical interviews (e.g., 9%; Nickel et al., 2004; 17%; O'Donnell et al., 2010), a rate of 14% 6 months after hospital discharge in this cohort appears consistent with those reported previously. Of note, this was demonstrated in a cohort with a relatively low severity of illness, and short durations of mechanical ventilation and ICU length of stay, and therefore a low level of exposure to the critical illness process and treatments that may affect psychological well-being.

Patients with higher PTS scores had higher pain-intensity levels at enrollment, poorer sleep quality at 6 months, lower awareness of ICU, more recall of frightening experiences, and higher levels of depression, anxiety, and stress. These factors explained two thirds of the variability in PTS symptoms with multivariate linear regression modeling. Independent associations were found between PTS symptoms and stress, depression and global sleep quality 6 months after discharge, recall of frightening experiences in ICU, and pain score in ICU.

Depression was reported as coexisting with PTS symptoms after hospital discharge in some general ICU patients in recent original research (Davydow et al., 2013; Jackson et al., 2014; Paparrigopoulos et al., 2014). In addition, a systematic review of depression in survivors of general ICU reported a median prevalence rate for clinically significant depression of 28% (Davydow, Gifford, Desai, Bienvenu, & Needham, 2009), similar to the 30% reported here. Depression is often measured in this population using a single or a combined construct instrument such as the Hospital Anxiety and Depression Scale (Snaith & Zigmond, 1986), but stress is not

Table 2

Patient Experiences of ICU, Posttraumatic Stress Symptoms, and Psychological Well-Being

Instrument	Statistic
PCL-S total score (lower is better), $M \pm SD$	26.54 ± 10.52
PCL-S cut-off $>$ 36, n (%)	24 (14)
DASS	
Depression subscale (lower is better), $M \pm SD$	9.16 ± 9.68
Anxiety subscale (lower is better), $M \pm SD$	5.57 ± 6.33
Stress subscale (lower is better), $M \pm SD$	9.18 ± 9.66
Patients with depression scale score > 13 , $n [\%]$	52 [30]
Patients with anxiety scale score $> 10, n [\%]$	41 [23]
Patients with stress scale score > 18 , $n [\%]$	33 [18]
ICEQ Component 1 (awareness, higher scores are better), $M \pm SD$	36.91 ± 5.88
ICEQ Component 2 (frightening, lower scores are better), $M \pm SD$	13.43 ± 4.66
ICEQ Component 3 (recall, higher scores are better), $M \pm SD$	17.20 ± 4.30
ICEQ Component 4 (satisfaction, higher scores are better), $M \pm SD$	14.57 ± 2.93

Note. PCL-S = Posttraumatic Stress Disorder Checklist–Specific; DASS = Depression, Anxiety and Stress Scales; ICEQ = Intensive Care Experience Questionnaire.



Figure 2. Percentage responses to ICEQ agreement items.

frequently reported as a psychological outcome after surviving ICU.

In the current study an interrelated psychological construct of stress was also measured, using an instrument validated with ICU survivors (Sukantarat, Williamson, & Brett, 2007). Of note, stress was independently associated with PTS symptoms after controlling for other factors during analysis, and was the largest contributing factor to the variance in the multivariate model. Items for stress in the DASS-21 (Ware et al., 1994) may capture the same construct as hyperarousal in the PCL-S (VA National Center for PTSD, 2014). Although acute stress was not directly assessed in this study (in contrast to Davydow et al., 2013), state anxiety was moderately high upon enrollment in ICU. In our previous research, mean state-anxiety level for patients receiving mechanical ventilation was 2.9 ± 1.2 (McKinley et al., 2004) and 1.9 ± 0.99 for patients not mechanically ventilated (McKinley & Madronio, 2008).

Sleep quality 6 months after hospital discharge was independently associated with symptoms of PTS, as we and others have



Figure 3. Percentage responses to ICEQ frequency items.

Factor	PCL-S < 36 ($n = 154$)	PCL-S > 36 $(n = 24)$	р
Age, years, $M \pm SD$	58.31 ± 16.33	53.67 ± 16.87	.218
Male gender, n [%]	100 [65]	13 [54]	.364
Pain intensity score (0–10), $M \pm SD$	2.18 ± 2.68	4.63 ± 3.40	.002
State-anxiety score (1–5), $M \pm SD$	2.12 ± 1.08	2.67 ± 1.33	.067
APACHE II, $M \pm SD$	13.07 ± 5.93	12.21 ± 3.84	.354
Operative diagnosis, n [%]	105 [68]	19 [79]	.345
Duration of ventilation (days), Mdn [IQR]	.50 [.00-1.00]	.50 [.00-2.00]	.311
ICU length of stay (days), Mdn [IQR]	3.00 [2.00-6.00]	3.00 [2.00-5.00]	.784
Hospital length of stay (days), Mdn [IQR]	12.00 [8.00-20.00]	13.00 [7.25–31.75]	.628
ISI score (0–28), $M \pm SD$	7.31 ± 6.63	8.67 ± 8.01	.435
SICQ sleep quality, home (1–10), $M \pm SD$	7.35 ± 2.12	7.65 ± 1.90	.488
SICQ sleep quality, ICU (1–10), $M \pm SD$	4.35 ± 2.25	3.65 ± 2.60	0.
RSCQ ICU (0–100 mm), $M \pm SD$	49.11 ± 27.97	42.61 ± 31.35	.346
RSCQ ward (0–100 mm), $M \pm SD$	56.83 ± 24.45	48.90 ± 22.25	.129
PSQI global score at 6 months (0–21), $M \pm SD$	6.50 ± 4.10	12.71 ± 4.65	<.005
ICEQ Component 1 (awareness), $M \pm SD$	37.39 ± 5.57	34.05 ± 6.67	.039
ICEQ Component 2 (frightening), $M \pm SD$	12.93 ± 4.62	16.67 ± 4.30	.001
ICEQ Component 3 (recall), $M \pm SD$	17.54 ± 4.30	16.43 ± 4.47	.292
DASS depression subscale, $M \pm SD$	7.07 ± 7.77	22.50 ± 10.07	<.005
DASS anxiety subscale, $M \pm SD$	4.13 ± 4.62	14.82 ± 8.02	<.005
DASS stress subscale, $M \pm SD$	6.91 ± 7.67	23.82 ± 8.36	<.005

 Table 3

 Bivariate Analyses of Factors Related to Posttraumatic Stress Symptoms at 6 Months After

 Hospital Discharge

Note. PCL-S = Posttraumatic Stress Disorder Checklist–Specific; State-anxiety score = Faces Anxiety Scale score (FAS); APACHE = Acute Physiology and Chronic Health; IQR = interquartile range; ISI = Insomnia Severity Index; SICQ = Sleep in Intensive Care Questionnaire; RCSQ = Richards–Campbell Sleep Questionnaire; PSQI = Pittsburgh Sleep Quality Index; ICEQ = Intensive Care Experience Questionnaire; DASS = Depression, Anxiety and Stress Scales.

previously reported (McKinley et al., 2012; Bryant, Creamer, O'Donnell, Silove, & McFarlane, 2010; Spoormaker & Montgomery, 2008). It has been postulated that activation of the amygdala and medial prefrontal cortex, frequently associated with PTSD symptoms, leads to sleep disruption (or PTSD symptoms are partially mediated by sleep disruption) (Germain et al., 2008; Jaoude, Vermont, Porhomayon, & El-Solh, 2014). It is therefore possible that sleep disruption and/or the stress of critical illness and experience of treatment in ICU may be mediating factors for the presence of PTSD symptoms in this cohort (rather than frightening memories). The exact nature of the relationship between

Table 4

Multiple Linear Regression Analysis for Model of Variables Associated With Total PCL-S Score (n = 160)

Variable	В	SE B	β	р
Male gender	.873	1.055	.039	.409
Pain-intensity score in ICU	.433	.178	.119	.016
State-anxiety score in ICU	578	.487	062	.237
PSOI global score at 6 months	.340	.131	.152	.010
DASS stress subscale	.315	.089	.287	.001
DASS anxiety subscale	.214	.112	.130	.058
DASS depression subscale	.309	.086	.285	<.005
ICEO Component 1 (Awareness)	144	.092	080	.120
ICEO Component 2 (Frightening)	.310	.122	.140	.012

Note. $R^2 = .682, p = <.005$ (constant: 17.984 *SE*, 4.499). State-anxiety score = Faces Anxiety Scale score (FAS); PSQI = Pittsburgh Sleep Quality Index; DASS = Depression, Anxiety and Stress Scales; ICEQ = Intensive Care Experience Questionnaire.

sleep disturbance and PTSD symptoms in our model may be worth further consideration.

An independent association was noted between frightening experiences (from ICEQ) and PTS symptoms. We found it interesting that the percentage of patients reporting frightening experiences such as "I had bad dreams" all of the time was comparable to a report from a similar ICU cohort in the United Kingdom (Rattray et al., 2010, although "I saw strange things" was reported more frequently in our cohort. Previous reports have demonstrated associations between delusional or distorted memories of ICU experiences and PTS symptoms in ICU survivors (Jones, Griffiths, Humphris, & Skirrow, 2001; Rattray et al., 2010). In a systematic review of psychological risk factors for PTSD after critical care, Wade et al. (2013) found that risk factors included stress and fear experienced acutely in ICU, and frightening memories of the experience in ICU. Thus the findings of our current study further support recommendations to assess, prevent, and treat ICU delirium (hallucinations and delusions) to potentially reduce the impact of PTS symptoms in ICU survivors.

In this study, a low average level of pain reported just prior to transfer from ICU was independently associated with PTS symptoms. Similarly, pain during ICU treatment, remembered 4 weeks after discharge, was significantly associated with the reexperiencing and avoidance symptoms of PTSD (Myhren et al., 2010). Pain has also been associated with PTS symptoms in populations such as U.S. Military personnel (Stratton et al., 2014), orthopedic trauma patients (Nota, Bot, Ring, & Kloen, 2014), and patients with other physical injury (Cody & Beck, 2014). Chronic pain and PTS symptoms sometimes occur in combination and may be synergistic, with further research suggested to explore interrelated pathophysiology (Scioli-Salter et al., 2015).

Strengths and Limitations

This is one of the largest prospective studies to measure psychological well-being and self-reported sleep quality in a cohort of ICU patients with a low "loss to follow-up" rate. This enabled us to conduct multivariate analyses using variables that are potentially associated with PTS symptoms in former ICU patients.

As these analyses were exploratory and conducted post hoc on an existing dataset, a limitation was that data on pre-illness traumatic events were not collected and incorporated into the analysis. Given that fear experienced acutely in ICU has been associated with development of PTSD (Wade et al., 2013), we speculated that patients with existing PTS symptoms would have high stateanxiety levels at baseline and included ICU state anxiety in the analysis; there was, however, no independent association. Despite the relatively large sample, we were cautious in our modeling of relationships, considering that reports from the study dataset had already appeared, that complex post hoc analyses could be "overusing" the data, and that analyses were of associations, not risk factors.

Other limitations of our study pertain to unavoidable implications of the design. For example there is always a risk of recall bias when requesting information about previous experience and behaviors. Patients were therefore specifically requested to report on their pre illness sleep quality and the patient's proxy was requested to report on prehospital sleep disturbance, enabling us to control for the presence of pre-existing poor sleep quality or disturbance in the analysis. These data may not have been entirely accurate but could not be obtained in any other way and were important in addressing the overall study aim.

Recommendations for Future Research

Our findings on the relationship between poor sleep quality and PTS symptoms at 6 months after hospital discharge suggest that former ICU patients may benefit not just physically but psychologically from interventions that improve sleep quality. There is a need, therefore, to investigate the effectiveness of sleep interventions that specifically improve the proportion of REM sleep (Spoormaker & Montgomery, 2008) for former ICU patients, to ameliorate any long-term psychological effects of critical illness and treatment in ICU. Similarly, interventions that decrease medial prefrontal cortical and amygdala activation, for example, blocking α -1 adrenergic receptors using Prazosin (Spoormaker & Montgomery, 2008), require testing in this population to see if they reduce the prevalence of PTS symptoms and poor sleep quality during recovery.

Further investigations into the complex interplay between sleep fragmentation and neuroendocrine pathways has also been made by sleep-medicine experts, in particular those who grapple with the challenge of concomitantly treating sleep disordered breathing and PTSD (Jaoude et al., 2014). Similarly the mechanisms underlying the relationship between pain experienced in ICU and PTS symptoms experienced during recovery requires further investigation, for example the role of the type of pain and pain-intensity level plays in the development of PTS symptoms and the effectiveness of existing pain-management strategies in ameliorating symptoms.

Implications for Clinical Practice

Approximately 14% of this ICU cohort with a low severity of illness had evidence of PTSD, and a high proportion reported symptoms of depression, anxiety, and stress. Symptoms of PTS were independently associated with stress, depression, and global sleep quality 6 months after discharge, recall of frightening experiences in ICU, and pain intensity on enrollment in ICU. These findings suggest there may be scope to further improve pain-management practices in ICU. Likewise, we recommend that ICU patients' psychological well-being, in particular anxiety, is assessed using a validated scale such as the Faces Anxiety Scale (McKinley, Coote, & Stein-Parbury, 2003) regularly during ICU treatment and anxiolytic treatment administered if required. Our findings also support the need to assess, prevent, and treat delirium to reduce the likelihood of patients recalling frightening experiences in ICU.

Conclusion

The results of our study, one of the largest of its kind, confirm findings of previous studies that former ICU patients face considerable physical and psychological challenges during their recovery and beyond. Symptoms of PTS were reported by one in seven patients in this cohort, despite a relatively low severity of critical illness on admission. In addition, clinically significant depression and anxiety symptoms were demonstrated for one in five patients.

These findings highlight potential links of pain experienced in ICU and sleep quality with PTS symptoms. Higher PTS symptoms 6 months after discharge were independently associated with stress and depression, global sleep quality at 6 months, frightening experiences, and higher pain intensity in ICU. Further research should identify areas for improvement during ICU treatment, including interventions to reduce adverse experiences (e.g., optimizing pain management while in ICU, prompt identification and treatment of delirium and intensive efforts to reduce anxiety levels such as providing reassurance and repeating explanations about treatment and enabling the patient to communicate their fears when possible). The psychological well-being and self-reported sleep quality of ICU patients during recovery also requires further consideration; screening and follow-up during recovery would be beneficial for many patients. Interventions to improve sleep quality during ICU treatment and recovery from critical illness may reduce the prevalence of or ameliorate PTS symptoms.

References

- Bastien, C. H., Vallieres, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, 2, 297–307.
- Bienvenu, O. J., Gellar, J., Althouse, B. M., Colantuoni, E., Sricharoenchai, T., Mendez-Tellez, P. A., . . . Needham, D. M. (2013). Post-traumatic stress disorder symptoms after acute lung injury: A 2-year prospective longitudinal study. *Psychological Medicine*, 43, 2657–2671. http://dx .doi.org/10.1017/S0033291713000214
- Breslau, N. (2002). Epidemiologic studies of trauma, posttraumatic stress disorder, and other psychiatric disorders. *Canadian Journal of Psychiatry*, 47, 923–929.
- Bryant, R. A., Creamer, M., O'Donnell, M., Silove, D., & McFarlane, A. C. (2010). Sleep disturbance immediately prior to trauma predicts

subsequent psychiatric disorder. *Sleep: Journal of Sleep and Sleep Disorders Research*, 33, 69–74.

- Buysse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28, 193–213. http://dx.doi.org/10.1016/0165-1781(89)90047-4
- Caldwell, B. A., & Redeker, N. (2005). Sleep and trauma: An overview. *Issues in Mental Health Nursing*, 26, 721–738. http://dx.doi.org/10 .1080/01612840591008294
- Cody, M. W., & Beck, J. G. (2014). Physical injury, PTSD symptoms, and medication use: Examination in two trauma types. *Journal of Traumatic Stress*, 27, 74–81. http://dx.doi.org/10.1002/jts.21880
- Davydow, D. S., Gifford, J. M., Desai, S. V., Bienvenu, O. J., & Needham, D. M. (2009). Depression in general intensive care unit survivors: A systematic review. *Intensive Care Medicine*, 35, 796–809. http://dx.doi .org/10.1007/s00134-009-1396-5
- Davydow, D. S., Zatzick, D., Hough, C. L., & Katon, W. J. (2013). A longitudinal investigation of posttraumatic stress and depressive symptoms over the course of the year following medical-surgical intensive care unit admission. *General Hospital Psychiatry*, 35, 226–232. http:// dx.doi.org/10.1016/j.genhosppsych.2012.12.005
- Freedman, N. S., Kotzer, N., & Schwab, R. J. (1999). Patient perception of sleep quality and etiology of sleep disruption in the intensive care unit. *American Journal of Respiratory and Critical Care Medicine*, 159, 1155–1162. http://dx.doi.org/10.1164/ajrccm.159.4.9806141
- Friedman, M. J., Resick, P. A., Bryant, R. A., Strain, J., Horowitz, M., & Spiegel, D. (2011). Classification of trauma and stressor-related disorders in DSM–5. Depression and Anxiety, 28, 737–749. http://dx.doi.org/ 10.1002/da.20845
- Germain, A., Buysse, D. J., & Nofzinger, E. (2008). Sleep-specific mechanisms underlying posttraumatic stress disorder: Integrative review and neurobiological hypotheses. *Sleep Medicine Reviews*, *12*, 185–195. http://dx.doi.org/10.1016/j.smrv.2007.09.003
- Girard, T. D., Shintani, A. K., Jackson, J. C., Gordon, S. M., Pun, B. T., Henderson, M. S., . . . Ely, E. W. (2007). Risk factors for post-traumatic stress disorder symptoms following critical illness requiring mechanical ventilation: A prospective cohort study. *Critical Care*, 11, R28–R35. http://dx.doi.org/10.1186/cc5708
- Griffiths, J., Hatch, R. A., Bishop, J., Morgan, K., Jenkinson, C., Cuthbertson, B. H., & Brett, S. J. (2013). An exploration of social and economic outcome and associated health-related quality of life after critical illness in general intensive care unit survivors: A 12-month follow-up study. *Critical Care, 17*, R100–R111. http://dx.doi.org/10.1186/cc12745
- Jackson, J. C., Pandharipande, P. P., Girard, T. D., Brummel, N. E., Thompson, J. L., Hughes, C. G., . . Ely, E. W. (2014). Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: A longitudinal cohort study. *The Lancet: Respiratory Medicine*, 2, 369–379.
- Jaoude, P., Vermont, L. N., Porhomayon, J., & El-Solh, A. A. (2014). Sleep-Disordered Breathing in Patients with Posttraumatic Stress Disorder. *Annals of the American Thoracic Society*. http://dx.doi.org/10 .1513/AnnalsATS.201407-299FR
- Jones, C., Bäckman, C., Capuzzo, M., Flaatten, H., Rylander, C., & Griffiths, R. D. (2007). Precipitants of post-traumatic stress disorder following intensive care: A hypothesis generating study of diversity in care. *Intensive Care Medicine*, 33, 978–985. http://dx.doi.org/10.1007/ s00134-007-0600-8
- Jones, C., Griffiths, R. D., Humphris, G., & Skirrow, P. M. (2001). Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care. *Critical Care Medicine*, 29, 573–580. http://dx.doi.org/10.1097/00003246-200103000-00019
- Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month

DSM–IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62, 617–627. http://dx.doi.org/10.1001/ archpsyc.62.6.617

- Knaus, W. A., Draper, E. A., Wagner, D. P., & Zimmerman, J. E. (1985). APACHE II: A severity of disease classification system. *Critical Care Medicine*, 13, 818–829. http://dx.doi.org/10.1097/00003246-198510000-00009
- Long, A. C., Kross, E. K., Davydow, D. S., & Curtis, J. R. (2014). Posttraumatic stress disorder among survivors of critical illness: Creation of a conceptual model addressing identification, prevention, and management. *Intensive Care Medicine*, 40, 820–829. http://dx.doi.org/ 10.1007/s00134-014-3306-8
- Lukaschek, K., Baumert, J., Kruse, J., Emeny, R. T., Lacruz, M. E., Huth, C., . . . the KORA Investigators. (2013). Relationship between posttraumatic stress disorder and type 2 diabetes in a population-based crosssectional study with 2970 participants. *Journal of Psychosomatic Research*, 74, 340–345. http://dx.doi.org/10.1016/j.jpsychores.2012.12 .011
- McKinley, S., Aitken, L. M., Alison, J. A., King, M., Leslie, G., Burmeister, E., & Elliott, D. (2012). Sleep and other factors associated with mental health and psychological distress after intensive care for critical illness. *Intensive Care Medicine*, 38, 627–633. http://dx.doi.org/10 .1007/s00134-012-2477-4
- McKinley, S., Coote, K., & Stein-Parbury, J. (2003). Development and testing of a Faces Scale for the assessment of anxiety in critically ill patients. *Journal of Advanced Nursing*, 41, 73–79. http://dx.doi.org/10 .1046/j.1365-2648.2003.02508.x
- McKinley, S., Fien, M., Elliott, R., & Elliott, D. (2013). Sleep and psychological health during early recovery from critical illness: An observational study. *Journal of Psychosomatic Research*, 75, 539–545. http:// dx.doi.org/10.1016/j.jpsychores.2013.09.007
- McKinley, S., & Madronio, C. (2008). Validity of the Faces Anxiety Scale for the assessment of state anxiety in intensive care patients not receiving mechanical ventilation. *Journal of Psychosomatic Research*, 64, 503–507. http://dx.doi.org/10.1016/j.jpsychores.2008.02.002
- McKinley, S., Stein-Parbury, J., Chehelnabi, A., & Lovas, J. (2004). Assessment of anxiety in intensive care patients by using the Faces Anxiety Scale. *American Journal of Critical Care*, 13, 146–152.
- Myhren, H., Ekeberg, O., Toien, K., Karlsson, S., & Stokland, O. (2010). Posttraumatic stress, anxiety and depression symptoms in patients during the first year post intensive care unit discharge. *Critical Care, 14*, R14–R23. http://dx.doi.org/10.1186/cc8870
- Needham, D. M., Davidson, J., Cohen, H., Hopkins, R. O., Weinert, C., Wunsch, H., . . . Harvey, M. A. (2012). Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders' conference. *Critical Care Medicine*, 40, 502–509. http://dx.doi.org/10 .1097/CCM.0b013e318232da75
- Nickel, M., Leiberich, P., Nickel, C., Tritt, K., Mitterlehner, F., Rother, W., & Loew, T. (2004). The occurrence of posttraumatic stress disorder in patients following intensive care treatment: A cross-sectional study in a random sample. *Journal of Intensive Care Medicine*, 19, 285–290. http://dx.doi.org/10.1177/088506660426768419/5/285
- Nota, S. P., Bot, A. G., Ring, D., & Kloen, P. (2014). Disability and depression after orthopaedic trauma. *Injury*, 46, 207–212.
- O'Donnell, M. L., Creamer, M., Holmes, A. C. N., Ellen, S., McFarlane, A. C., Judson, R., . . . Bryant, R. A. (2010). Posttraumatic stress disorder after injury: Does admission to intensive care unit increase risk? *The Journal of Trauma*, 69, 627–632. http://dx.doi.org/10.1097/TA .0b013e3181bc0923
- Pacella, M. L., Hruska, B., & Delahanty, D. L. (2013). The physical health consequences of PTSD and PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders*, 27, 33–46. http://dx.doi.org/10.1016/j .janxdis.2012.08.004

- Paparrigopoulos, T., Melissaki, A., Tzavellas, E., Karaiskos, D., Ilias, I., & Kokras, N. (2014). Increased co-morbidity of depression and posttraumatic stress disorder symptoms and common risk factors in intensive care unit survivors: A two-year follow-up study. *International Journal of Psychiatry in Clinical Practice*, 18, 25–31. http://dx.doi.org/10.3109/ 13651501.2013.855793
- Rattray, J., Crocker, C., Jones, M., & Connaghan, J. (2010). Patients' perceptions of and emotional outcome after intensive care: Results from a multicentre study. *Nursing in Critical Care, 15*, 86–93. http://dx.doi .org/10.1111/j.1478-5153.2010.00387.x
- Rattray, J., Johnston, M., & Wildsmith, J. A. (2004). The intensive care experience: Development of the ICE questionnaire. *Journal of Advanced Nursing*, 47, 64–73. http://dx.doi.org/10.1111/j.1365-2648.2004.03066 .xJAN3066
- Richards, K. C., O'Sullivan, P. S., & Phillips, R. L. (2000). Measurement of sleep in critically ill patients. *Journal of Nursing Measurement*, 8, 131–144.
- Richter, J. C., Waydhas, C., & Pajonk, F. G. (2006). Incidence of posttraumatic stress disorder after prolonged surgical intensive care unit treatment. *Psychosomatics*, 47, 223–230. http://dx.doi.org/10.1176/appi .psy.47.3.223
- Samuelson, K. A., Lundberg, D., & Fridlund, B. (2007). Stressful memories and psychological distress in adult mechanically ventilated intensive care patients: A 2-month follow-up study. *Acta Anaesthesiologica Scandinavica*, 51, 671–678. http://dx.doi.org/10.1111/j.1399-6576.2007 .01292.x
- Schandl, A., Bottai, M., Hellgren, E., Sundin, O., & Sackey, P. V. (2013). Developing an early screening instrument for predicting psychological morbidity after critical illness. *Critical Care*, 17, R210–R220. http://dx .doi.org/10.1186/cc13018
- Schelling, G., Stoll, C., Haller, M., Briegel, J., Manert, W., Hummel, T., . . . Peter, K. (1998). Health-related quality of life and posttraumatic stress disorder in survivors of the acute respiratory distress syndrome. *Critical Care Medicine*, 26, 651–659. http://dx.doi.org/10.1097/ 00003246-199804000-00011
- Scioli-Salter, E. R., Forman, D. E., Otis, J. D., Gregor, K., Valovski, I., & Rasmusson, A. M. (2015). The shared neuroanatomy and neurobiology of comorbid chronic pain & PTSD: Therapeutic implications. *The Clinical Journal of Pain*, 31, 363–374. http://dx.doi.org/10.1097/AJP .000000000000115
- Sessler, C. N., Gosnell, M. S., Grap, M. J., Brophy, G. M., O'Neal, P. V., Keane, K. A., . . . Elswick, R. K. (2002). The Richmond Agitation– Sedation Scale: Validity and reliability in adult intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, *166*, 1338–1344. http://dx.doi.org/10.1164/rccm.2107138
- Snaith, R. P., & Zigmond, A. S. (1986). The hospital anxiety and depression scale. [Letter]. *British Medical Journal*, 292, 344. http://dx.doi.org/ 10.1136/bmj.292.6516.344
- Spoormaker, V. I., & Montgomery, P. (2008). Disturbed sleep in posttraumatic stress disorder: Secondary symptom or core feature? *Sleep*

Medicine Review, 12, 169–184. http://dx.doi.org/10.1016/j.smrv.2007 .08.008

- Stein, D. J., McLaughlin, K. A., Koenen, K. C., Atwoli, L., Friedman, M. J., Hill, E. D., . . . Kessler, R. C. (2014). *DSM*–5 and ICD-11 definitions of posttraumatic stress disorder: Investigating "narrow" and "broad" approaches. *Depression and Anxiety*, 31, 494–505. http://dx.doi .org/10.1002/da.22279
- Stratton, K. J., Clark, S. L., Hawn, S. E., Amstadter, A. B., Cifu, D. X., & Walker, W. C. (2014). Longitudinal interactions of pain and posttraumatic stress disorder symptoms in U.S. Military service members following blast exposure. *The Journal of Pain*. Advance online publication. http://dx.doi.org/10.1016/j.jpain.2014.07.002
- Sukantarat, K. T., Williamson, R. C., & Brett, S. J. (2007). Psychological assessment of ICU survivors: A comparison between the Hospital Anxiety and Depression scale and the Depression, Anxiety and Stress scale. *Anaesthesia*, 62, 239–243. http://dx.doi.org/10.1111/j.1365-2044.2006 .04948.x
- Talbot, L. S., Maguen, S., Metzler, T. J., Schmitz, M., McCaslin, S. E., Richards, A., . . . Neylan, T. C. (2014). Cognitive behavioral therapy for insomnia in posttraumatic stress disorder: A randomized controlled trial. *Sleep: Journal of Sleep and Sleep Disorders Research*, 37, 327–341.
- Terhakopian, A., Sinaii, N., Engel, C. C., Schnurr, P. P., & Hoge, C. W. (2008). Estimating population prevalence of posttraumatic stress disorder: An example using the PTSD checklist. *Journal of Traumatic Stress*, 21, 290–300. http://dx.doi.org/10.1002/jts.20341
- Twigg, E., Humphris, G., Jones, C., Bramwell, R., & Griffiths, R. D. (2008). Use of a screening questionnaire for post-traumatic stress disorder (PTSD) on a sample of UK ICU patients. *Acta Anaesthesiologica Scandinavica*, 52, 202–208. http://dx.doi.org/10.1111/j.1399-6576.2007 .01531.x
- U.S. Department of Veterans Affairs, National Center for PTSD. (2014). Using the PTSD Checklist for *DSM–IV* (PCL). Retrieved from http:// www.ptsd.va.gov/professional/pages/assessments/assessment-pdf/pclhandout.pdf
- Wade, D., Hardy, R., Howell, D., & Mythen, M. (2013). Identifying clinical and acute psychological risk factors for PTSD after critical care: A systematic review [Meta-Analysis]. *Minerva Anestesiologica*, 79, 944–963.
- Wallen, K., Chaboyer, W., Thalib, L., & Creedy, D. K. (2008). Symptoms of acute posttraumatic stress disorder after intensive care. *American Journal of Critical Care*, 17, 534–543.
- Ware, J. E., Kosinski, M., & Keller, S. D. (1994). SF-36 Physical & Mental Health Summary Scales: A user's manual. Boston, MA: Health Assessment Lab, New England Medical Center Institute.

Received January 12, 2015

Revision received December 4, 2015

Accepted December 9, 2015

Caregiver Strain and Posttraumatic Stress Symptoms of Informal Caregivers of Intensive Care Unit Survivors

Sascha A. van den Born–van Zanten Tergooi Hospital, DA Hilversum, the Netherlands Dave A. Dongelmans and Daniela Dettling-Ihnenfeldt University of Amsterdam

Roel Vink Tergooi Hospital, DA Hilversum, the Netherlands Marike van der Schaaf University of Amsterdam

Background: Many intensive care unit survivors (ICU) are confronted with undesirable and long-lasting impairments in physical, cognitive, and mental health, but not only patients are at risk of developing this post-intensive care syndrome (PICS). Family members can experience symptoms of depression, anxiety, and posttraumatic stress disorder (PTSD). This cluster of complications is called PICS-family. Objective: To describe the level of caregiver strain and posttraumatic stress-related symptoms in relatives of ICU survivors. Methods: We conducted a cohort study in a general hospital between July 2010 and May 2014. Relatives of ICU survivors, mechanically ventilated for > 48 h in the ICU, were asked to complete a questionnaire 3 months after discharge from critical care. Symptoms of PTSD and caregiving concerns were assessed using the Trauma Screening Questionnaire and the Caregiver Strain Index (CSI). Results: A total of 94 relatives visiting our post-ICU clinic completed the questionnaires. Twenty-one percent of the caregivers had a CSI score of 7 or more, indicating high levels of strain. Six percent had CSI scores indicating severe strain (CSI > 10). <u>PTSD-related</u> symptoms were seen in <u>21%</u> of the <u>caregivers</u>. The mean time spent on caregiving was 10 h (interquartile range 6-17 h) per week. Conclusion: This study shows that relatives of ICU survivors could experience strain 3 months after hospital discharge and are at risk of developing PTSD-related symptoms. This complements existing data that relatives are at risk of psychological symptoms. Knowledge can lead to improvements and means to prevent these symptoms.

Impact and Implications

This current study supports previous research on the existence of symptoms related to post-intensive care syndrome-family (PICS-F), among relatives of intensive care unit (ICU) survivors, several months after discharge. Health care professionals should be aware that ICU care is not just patient related; caregivers should also be considered. High-quality research is needed to determine the magnitude of the problem, identify caregivers at risk, and implement interventions to prevent PICS-F.

Keywords: intensive care unit, post-intensive care syndrome, caregiver, strain, posttraumatic stress disorder, employment

Supplemental materials: http://dx.doi.org/10.1037/rep0000081.supp

Introduction

Published data on the long-term consequences of critical illness have led to the awareness of the problems patients might experi-

We thank Annemarie Heinig-Korteweg (Tergooi Hilversum) for her assistance with the data entry and J. M. van Rossem for providing language assistance.

Correspondence concerning this article should be addressed to Sascha A. van den Born–van Zanten, MD, Tergooi Hospital, PO Box 10016, 1201 DA Hilversum, the Netherlands. E-mail: savanzanten@gmail.com

(ICU). They might endure impairments in physical, cognitive, and mental health, and this therefore reduces quality of life after surviving critical illness (Needham et al., 2012). The knowledge that this post–intensive care syndrome (PICS) exists has led to the recognition that there is a need for improvement of care, rehabilitation, and follow-up for patients (van der Schaaf, Bakhshi-Raiez, van der Steen, Dongelmans, & De Keizer, 2015). What might be overlooked is the major burden an admission to

ence long after being discharged from the intensive care unit

what might be overlooked is the major burden an admission to the ICU has on the patient's family. They often take responsibility for the patients' care after discharge, even though they might be inadequately prepared and are therefore overwhelmed. Recent literature suggests they are prone to develop depression, anxiety, acute stress syndrome, and symptoms of posttraumatic stress (PTSD), following admission of their loved one to the ICU (Davidson, Jones, & Bienvenu, 2012; Schmidt & Azoulay, 2012). In

173

Sascha A. van den Born–van Zanten, Department of Intensive Care Medicine, Tergooi Hospital, DA Hilversum, the Netherlands; Dave A. Dongelmans, Academic Medical Center, University of Amsterdam; Daniela Dettling-Ihnenfeldt, Academic Medical Center, University of Amsterdam; Roel Vink, Tergooi Hospital; Marike van der Schaaf, Academic Medical Center, University of Amsterdam.

2010, the Society of Critical Care Medicine incorporated this cluster of complications into a new term, <u>*PICS-family*</u> (PICS-F; Davidson et al., 2012). This burden on the relatives' new responsibility as a caregiver may affect their perception of enduring problems or may alter their state of well-being. This is termed *caregiver strain* (Thornton & Travis, 2003). Caregiver strain may affect their daily functioning or result in difficulty performing as a family caregiver.

In an attempt to define preventive strategies, the American College of Critical Care Medicine Task Force 2004-2005 developed clinical practice guidelines to achieve family involvement in patient care and support, during and after an ICU admission (Davidson et al., 2007). In the United Kingdom, approximately 30% of ICUs have established a follow-up clinic (Griffiths, Barber, Cuthbertson, & Young, 2006). In the Netherlands, approximately 40% of ICUs provide ICU aftercare (van der Schaaf et al., 2015). In 2010, we established, as one of the first, an outpatient post-intensive care clinic in our general hospital. This clinic creates awareness and a better understanding of the existence of ICU-related problems and facilitates care after discharge (Dettling-Ihnenfeldt, de Graaff, Nollet, & van der Schaaf, 2015). However, even though several studies have demonstrated the existence of PICS-F, and suggestions on how to target this syndrome have been made, the level of evidence is low and the exact extent of the problem is unknown.

In this study, we aim to describe the caregiver strain on relatives of critically ill patients who have been discharged from critical care. We also aim to describe which main tasks the caregiver performs. Additionally, we wish to determine the prevalence of developing PTSD-related symptoms in relatives after an ICU admission.

Method

The data of this cohort study were acquired from relatives of patients admitted to the ICU between July 2010 and May 2014. This adult intensive care consists of a 12-bed ICU. We established a post-intensive care clinic based on the recommendations from the National Institute for Health and Clinical Excellence (NICE, 2009) guidelines. A clinical nurse offers patients (mechanically ventilated for more than 48 h and discharged from critical care) a reassessment after 3 months. Using validated and patient-reported questionnaires, we screen for any new physical, cognitive, or psychological impairments or restrictions. If any problems are detected during this assessment, patients can be referred to different health care providers for further treatment. This ICU clinic gives patients (and family members) the chance to pose questions about their time in the ICU and the aftermath of their critical illness. To identify PICS-related problems in family members, we decided to include questionnaires evaluating caregiver strain, PTSD-related symptoms, and the impact this has on daily functioning, for example, employment.

Eligible for participation were relatives of patients (mechanically ventilated for more than 48 h and discharged from critical care) who visited our post-ICU outpatient clinic. Relatives were invited to participate if they met the following inclusion criteria:

1. Age 18 years or older

- 2. Closely related (not necessarily blood related) to a patient 18 years or older
- Patient discharged from critical care and alive during the initial caregiver interview
- 4. Involved in care during and/or after hospital admission

Persons with insufficient knowledge of the Dutch language were excluded, as the questionnaires used were written in Dutch only. Visits to the post-ICU clinics were planned 3 months after ICU discharge. This study did not need approval from the Institutional Research Ethics Board because of its noninterventional nature.

Outcome Measures

The Dutch version of the validated Caregiver Strain Index (CSI) was used to measure strains in the domains of employment, time management, and financial, physical, and social status. This selfreported assessment scale consists of 13 questions related to care provision. Each item is answered with a binary yes or no response. A score of 7 or more indicates high levels of strain on the caregiver. A total score of 11-13 indicates severe strain (Robinson, 1983). This questionnaire developed by Robinson (1983) in the 1980s has proven reliable with a good internal consistency ($\alpha =$.86; Robinson, 1983). In 2003, Thornton and Travis slightly modified the CSI by introducing sometimes to the previously dichotomous answers and once again showed it is an instrument that can quickly identify families with potential caregiving concerns. The current study uses the CSI as produced by Robinson (1983) with dichotomous answers. The Trauma Screen Questionnaire (TSQ) was used to evaluate posttraumatic stress-related complaints acquired after the intensive care admission of their relative. It contains 10 questions concerning the personal reaction to the traumatic event. Each item is answered with a binary yes or no response. A total score higher than 5 indicates the likelihood of PTSD-related symptoms and counseling support might be beneficial (Brewin et al., 2002). An additional self-composed questionnaire was included, concerning questions on the care given (e.g., assistance with personal care, household tasks, or management of medication), the hours spent on giving this care, and the health care utilization or needs of the caregivers themselves (see Supplemental Materials). This questionnaire was developed to evaluate which supplemental care is required, which can then be arranged and provided.

Relatives completed the questionnaires at home prior to the visit to the post-ICU clinic. Patient data, retrieved from medical records, included age, gender, severity of illness on ICU admission (measured by the Acute Physiology and Chronic Health Evaluation II [APACHE II] score), and duration of stay in the ICU.

Statistical Analysis

SPSS Version 19 (SPSS, Inc., Chicago, Illinois) for Windows was used to analyze the data. Descriptive statistics ($M \pm SD$ for normally distributed data and median and interquartile range [IQR] for nonparametric and ordinal data) were used to describe demographics and CSI/TSQ scores. Categorical variables are reported as proportions. To observe a relation between two-variable data, we implemented these variables in scatterplots. If a correlation was

suspected between baseline characteristics and a high CSI/TSQ score, bivariate analyses were used. As a threshold for statistical significance, p > .05 was used.

Results

A total of 215 patients were mechanically ventilated for more than 48 h and discharged from critical care and therefore met the criteria to be invited to our post-ICU clinic. A total of 106 patients visited the post-intensive care outpatient clinic with a relative (see Figure 1). The data of 12 caregivers were excluded because they either declined or the questionnaires were not completed. Most relatives were female (71%), with an $M \pm SD$ age of 57 \pm 16 years, and 76% of the relatives were spouses. Most patients were male (69%), with an $M \pm SD$ age of 66 \pm 10 years, a median ICU duration of 8 days, and a median APACHE II score of 21. Table 1 displays demographics and baseline characteristics of the study population.

Sixty-five of the relatives (57%) indicated spending 1 h or more per week on caregiving after hospital discharge compared to prehospital admission. Thirty-three (29%) indicated not spending more hours on caregiving after hospital admission. Sixteen (14%) did not answer this question and therefore these data are missing.

The mean time spent on care was 10 h (IQR 6–17 h), ranging from 1–120 h. The most caregiving tasks performed were shopping or running errands (44% of caregivers), routine housework (42%), and accompanying patients to their medical appointments (40%). Twenty of the relatives (18%) indicated they had missed specific aftercare by professionals—for instance, a debriefing conversation before discharge, what to expect from the rehabilitation period, and/or psychological care after discharge. Some indicated they would have preferred (more) help and/or information about medication and other medical actions (e.g., tracheotomy care).

The median CSI score was 3 (IQR 1–6), ranging from 0–12. Five relatives did not complete the questionnaire because they were not involved in caregiving tasks. Twenty (21%) endured levels of strain related to care provision. Of these 20 relatives, 14 (15%) had a CSI score indicating high levels of strain (CSI score 7–10) and 6 relatives (6%) had CSI scores indicating severe strain (CSI score 11–13). Two caregivers scored 7 or higher but did not indicate spending more hours on caregiving after hospital admission. This could indicate that they had already endured a high level of strain before the patient was admitted to the ICU. The most common strains reported were sleep disturbance (40% of relatives), family adjustments (51%), changes in personal plans (42%), and other demands on time, for example, from other relatives (65%).

The median TSQ score was 2 (IQR 0-4), ranging from 0-10. Of the completed questionnaires, 20 relatives (21%) scored 5 or higher, indicating a likelihood of PTSD. The most frequent complaints were distressful thoughts or memories relating to the event that arise against one's will (44%), difficulty falling or staying asleep (39%), and a heightened awareness of potential dangers to yourself and others (31%).

Forty-four of the relatives (47%) were carrying out gainful employment before hospital admission. After hospital discharge, 42 relatives (45%) reported that they were still working. Eleven (26%) reported employment reduction compared to the situation before hospital admission; the median hours spent on work was 32



Figure 1. Diagram of participant recruitment for the study. ICU = intensive care unit.

(IQR 20–38) before hospital admission and 29 (IQR 20–38) after ICU admission. Two of the caregivers reported working more hours.

No correlation was found between the age and gender of the relatives and the CSI and TSQ score. In addition, there was no

Table 1Relative and Patient Characteristics

	Value
Relatives' characteristics $(n = 114)$	
Age, M (SD), range (y)	59 (11), 24-88
Gender (%)	
Male	28
Female	72
Relationship to patient (%)	
Partner/spouse	76
Parent	3
Child	12
Brother/sister	5
No family	4
Level of education (%)	
Primary school	6
Secondary school	64
College or greater	30
Patients' characteristics ($n = 114$)	
Age, M (SD), range (y)	65 (11), 21-84
Gender (%)	
Male	70
Female	30
ICU duration, median (IQR) (days)	8 (7)
APACHE II score, M (SD)	21 (7)

Note. ICU = intensive care unit; IQR = interquartile range; APACHE II = Acute Physiology and Chronic Health Evaluation II.

correlation between the APACHE II score, the duration of the patient's ICU stay, and the score of the CSI and TSQ. The average hours spent on care also did not influence the total scores.

Discussion

As admission to an ICU can produce significant turmoil in the lives of both patients and their relatives, the objective of this study was to assess the strain of caregiving and to determine the risks of developing PTSD-related symptoms. We found that 21% of the caregivers reported a level of strain endured due to care provision. Six percent of caregivers indicated they experienced extremely high levels of strain. The median hours spent weekly on care was 10 (IQR 6–17). The most caregiving tasks performed were routine housework, shopping/running errands, and accompanying patients to their medical appointments. Twenty-one percent of the caregivers experienced PTSD-related symptoms 3 months after discharge. There was no correlation between the height of the CSI/TSQ scores and the age, gender, severity of the patient's illness, and average hours spent on caregiving.

Our findings suggest that a high level of strain exists in 21% of the relatives, but literature supporting this result does not exist. The CSI has not previously been used as an outcome measurement in caregivers of ICU survivors. It has been proven a valid and feasible method in family members of stroke patients (Post, Festen, van de Port, & Visser-Meily, 2007; van Exel et al., 2004). What has previously been reported in family members of ICU patients is caregiver burden. <u>Caregiver burden</u> is defined as the <u>physical and/or emotional response to caregiving challenges.</u> <u>Caregiver strain</u> is defined as the caregivers' <u>perception</u> of enduring problems or altered state of well-being, consequently caused by burden (Thornton & Travis, 2003). Burden has been previously examined using the Brief Zarit Burden Interview as a screening instrument (Haines, Denehy, Skinner, Warrillow, & Berney, 2015). Two months after discharge from critical care, caregiver burden exists in as many as 36% of relatives (Choi et al., 2012).

Twenty-one percent of the relatives of patients admitted to our ICU experienced PTSD-related symptoms 3 months after discharge from critical care. Only a few previous studies have been published on PTSD-related symptoms in caregivers. It is difficult to compare our results to earlier literature as our study used the TSQ. This questionnaire is not widely used among caregivers, but as we are used to this screening method to screen for PTSD-related symptoms in our patients, we chose this questionnaire for screening relatives as well. Previous studies were executed using the Impact on Event Scale (Brewin et al., 2002; Horowitz, Wilner, & Alvarez, 1979). Using this scale, studies reported a prevalence among family members as high as 41% three months after discharge (Sundararajan, Martin, Rajagopala, & Chapman, 2014) or 49% six months after discharge (Jones et al., 2004), which therefore indicates the need to offer formal counseling to close relatives. Jones et al. (2004) also found that PTSD-related symptoms in caregivers correlate with PTSD-related symptoms in patients. Azoulay et al. (2005) reported that PTSD-related symptoms were more common in relatives who shared in (end-of-life) decision making.

Day, Haj-Bakri, Lubchansky, and Mehta (2013) are among the few to report on sleep quality among family members of ICU patients. They found that 65% could experience difficulty sleeping during their family member's ICU admission due to anxiety and tension. Our results suggest that the quality of sleep is continuously disrupted 3 months after discharge from critical care; around 40% of relatives have reported sleeping difficulty. This is of significant importance as the caretaking ability of relatives can be adversely affected by sleep deprivation.

Even though this was not our primary aim, the results show that one quarter of the relatives had reduced their hours of gainful employment prior to hospital admission and that 2% had completely stopped working. Recently, the Dutch Social and Cultural Planning Office (2015) reported higher work absenteeism when work and caregiving were combined. It found that 18% of the caregivers reported being on sick leave for at least 2 consecutive weeks compared to 10% before performing caregiving tasks. It also reported an increase in the total number of caregivers (mostly female) in the Netherlands, from 13% in 2004% to 18% in 2012. Ågård, Lomborg, Tønnesen, and Egerod (2014) recently showed that partners went on extensive sick leave in the 12 months following ICU stay. Van Pelt et al. (2007) showed that 14% of caregivers had stopped working to provide care. Griffiths et al. (2013) have shown that as many as 50% of caregivers had to make some adjustments to their working life to accommodate their caregiving responsibilities 12 months after discharge.

Therefore, this study and previous studies, even though scarce, have revealed that relatives could endure psychosocial and physical symptoms during and after an intensive care admission. In addition, even though the magnitude of the problem is not clearly defined, and caregiver strain and PTSD-related symptoms were relatively low in our study, it does provide further support that there may be high-risk groups of caregivers. Future research is needed to detect these groups at risk and implement targeted interventions. Kentish-Barnes, Lemiale, Chaize, Pochard, and Azoulay (2009) suggest that family burden should be routinely evaluated at three different time points during an ICU admission. However, with growing evidence showing that even long after hospital discharge, caregivers could experience problems in different domains, we believe follow-up is necessary. This will allow us to gain further insight into the specific needs and thus provide the additional interventions during hospital admission and at home.

Earlier research has indicated that we must acknowledge the importance of relatives' participation in patient care, give them frequent updates and consistent information, include them in decision making, and let them be actively involved in patient care (if they feel comfortable doing so) to help prevent PICS-F (Davidson et al., 2007). The implementation of a post-intensive care clinic at our hospital has resulted in beneficial effects on identifying potential problems and providing necessary support (Dettling-Ihnenfeldt et al., 2015). Although it is imaginable that a post-ICU clinic could have a beneficial effect on postdischarge outcome, evidence has yet to be provided (Williams & Leslie, 2008). Patients and their relatives have reacted positively to our post-ICU clinic. They are pleased with the fact that they can discuss their experiences (Dettling-Ihnenfeldt et al., 2015), and it enables them to generate a better understanding of what they experienced during their ICU stay (Engström, Andersson, & Söderberg, 2008). Relatives visiting our post-ICU clinic state they missed a debriefing visit after discharge, and recent articles likewise mention the appreciation of these visits (Engström et al., 2008).

The small sample size of this study is probably the reason for not finding a correlation between baseline characteristics available and the prevalence of high strain or PTSD-related symptoms, whereas previous studies did report a variety of predictors for developing PICS-F symptoms. These risk factors include younger patient and relative age, female gender, a lower educational level, preexisting depression, and anxiety symptoms (Azoulay et al., 2005; Choi et al., 2012; Davidson et al., 2012). A greater functional dependency and comorbidities are also associated with increased burden and psychological problems (Haines et al., 2015). We found that the person indicating spending 120 h on caregiving did, however, score as having severe strain on the CSI questionnaire.

Our study has some important limitations that should be noted. First, no information was collected on the relatives' previous psychosocial status or previous caregiving tasks. We, therefore, could not examine the difference between strain and PTSD-related symptoms before and after hospital admission. This begs the question whether the same level of caregiver strain and PTSDrelated symptoms existed before hospital admission. Inclusion of more relevant baseline characteristics would have been helpful to assess the applicability and comparability of results in other studies. Second, a large proportion of patients and caregivers declined the invitation to visit our post-ICU clinic (Figure 1). The question arises whether this avoidance is due to the fact that visiting the clinic can trigger a recall of distressing memories and emotions in patients and caregivers, or perhaps they declined because they had no health issues and no longer needed further assistance. Another important limitation is that this study did not include a questionnaire to evaluate the prevalence of anxiety and depression symptoms, whereas recent literature does indicate depression symptoms as the most commonly reported psychological adverse effect (Haines et al., 2015). Van Pelt et al. (2007) report a high risk of depression (23%) among caregivers 12 months after hospital discharge. Lifestyle disruption and employment reduction were also common and persistent. Finally, this study relies on self-reports rather than assessments performed by professionals. In addition, although the CSI and TSQ have proven to be reliable screening methods and are easily administrable (Brewin et al., 2002; Deeken, Taylor, Mangan, Yabroff, & Ingham, 2003; Robinson, 1983), self-report is prone to response bias and dishonest reporting (Huang, Liao, & Chang, 1998). The choice of outcome measures is debatable, and in the future, widely used questionnaires might improve consistency of results with other studies to date.

In conclusion, this study adds to the small amount of data available on the existence of PICS-F. We have shown that relatives could develop caregiver strain and PTSD-related symptoms, incurring a negative effect on sleep and employment. Future research with a larger sample size, extended baseline characteristics, and widely used screening methods is therefore needed to evaluate the extent of the existence of PICS-F and the impact that interventions and post-ICU clinics can have on postdischarge outcome.

References

- Ågård, A. S., Lomborg, K., Tønnesen, E., & Egerod, I. (2014). Rehabilitation activities, out-patient visits and employment in patients and partners the first year after ICU: A descriptive study. *Intensive and Critical Care Nursing*, 30, 101–110. http://dx.doi.org/10.1016/j.iccn.2013.11 .001
- Azoulay, E., Pochard, F., Kentish-Barnes, N., Chevret, S., Aboab, J., Adrie, C., . . . Schlemmer, B. (2005). Risk of post-traumatic stress symptoms in family members of intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, 171, 987–994. http://dx.doi.org/10.1164/rccm.200409-1295OC
- Brewin, C. R., Rose, S., Andrews, B., Green, J., Tata, P., McEvedy, C., . . . Foa, E. B. (2002). Brief screening instrument for post-traumatic stress disorder. *The British Journal of Psychiatry*, 181, 158–162. http://dx.doi .org/10.1192/bjp.181.2.158
- Choi, J., Sherwood, P. R., Schulz, R., Ren, D., Donahoe, M. P., Given, B., & Hoffman, L. A. (2012). Patterns of depressive symptoms in caregivers of mechanically ventilated critically ill adults from intensive care unit admission to 2 months postintensive care unit discharge: A pilot study. *Critical Care Medicine*, 40, 1546–1553. http://dx.doi.org/10.1097/CCM .0b013e3182451c58
- Davidson, J. E., Jones, C., & Bienvenu, O. J. (2012). Family response to critical illness: Postintensive care syndrome–family. *Critical Care Medicine*, 40, 618–624. http://dx.doi.org/10.1097/CCM.0b013e318236ebf9
- Davidson, J. E., Powers, K., Hedayat, K. M., Tieszen, M., Kon, A. A., Shepard, E., . . . the American College of Critical Care Medicine Task Force 2004–2005, Society of Critical Care Medicine. (2007). Clinical practice guidelines for support of the family in the patient-centered intensive care unit: American College of Critical Care Medicine Task Force 2004–2005. *Critical Care Medicine*, 35, 605–622. http://dx.doi .org/10.1097/01.CCM.0000254067.14607.EB
- Day, A., Haj-Bakri, S., Lubchansky, S., & Mehta, S. (2013). Sleep, anxiety and fatigue in family members of patients admitted to the intensive care unit: A questionnaire study. *Critical Care (London, England)*, 17, R91. http://dx.doi.org/10.1186/cc12736
- Deeken, J. F., Taylor, K. L., Mangan, P., Yabroff, K. R., & Ingham, J. M. (2003). Care for the caregivers: A review of self-report instruments developed to measure the burden, needs, and quality of life of informal caregivers. *Journal of Pain and Symptom Management*, 26, 922–953. http://dx.doi.org/10.1016/S0885-3924(03)00327-0
- Dettling-Ihnenfeldt, D. S., de Graaff, A. E., Nollet, F., & van der Schaaf, M. (2015). Feasibility of post-intensive care unit clinics: An observa-

tional cohort study of two different approaches. *Minerva Anestesiologica*, 81, 865-875. http://ncbi.nlm.nih.gov/pubmed/

- Dutch Social and Cultural Planning Office. (2015). Competition between caregiving and paid employment. Retrieved from http://www.scp.nl/ Publicatie/Alle_publicaties/publicaties_2015/Concurrentie_tussen_ mantelzorg_en_betaald_werk
- Engström, A., Andersson, S., & Söderberg, S. (2008). Re-visiting the ICU experiences of follow-up visits to an ICU after discharge: A qualitative study. *Intensive & Critical Care Nursing*, 24, 233–241. http://dx.doi.org/ 10.1016/j.iccn.2008.03.002
- Griffiths, J. A., Barber, V. S., Cuthbertson, B. H., & Young, J. D. (2006). A national survey of intensive care follow-up clinics. *Anaesthesia*, 61, 950–955. http://dx.doi.org/10.1111/j.1365-2044.2006.04792.x
- Griffiths, J., Hatch, R. A., Bishop, J., Morgan, K., Jenkinson, C., Cuthbertson, B. H., & Brett, S. J. (2013). An exploration of social and economic outcome and associated health-related quality of life after critical illness in general intensive care unit survivors: A 12-month follow-up study. *Critical Care (London, England), 17*, R100. http://dx.doi.org/10.1186/cc12745
- Haines, K. J., Denehy, L., Skinner, E. H., Warrillow, S., & Berney, S. (2015). Psychosocial outcomes in informal caregivers of the critically ill: A systematic review. *Critical Care Medicine*, 43, 1112–1120. http://dx .doi.org/10.1097/CCM.00000000000865
- Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of Event Scale: A measure of subjective stress. *Psychosomatic Medicine*, *41*, 209–218. http://dx.doi.org/10.1097/00006842-197905000-00004
- Huang, C. Y., Liao, H. Y., & Chang, S. H. (1998). Social desirability and the clinical self-report inventory: Methodological reconsideration. *Journal of Clinical Psychology*, 54, 517–528. http://dx.doi.org/10.1002/ (SICI)1097-4679(199806)54:4<517::AID-JCLP13>3.0.CO;2-I
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G., Ingleby, S., Eddleston, J., . . . Gager, M. (2004). Post-traumatic stress disorder-related symptoms in relatives of patients following intensive care. *Intensive Care Medicine*, 30, 456–460. http://dx.doi.org/10.1007/s00134-003-2149-5
- Kentish-Barnes, N., Lemiale, V., Chaize, M., Pochard, F., & Azoulay, E. (2009). Assessing burden in families of critical care patients. *Critical Care Medicine*, 37 (Suppl), S448–S456. http://dx.doi.org/10.1097/CCM .0b013e3181b6e145
- Needham, D. M., Davidson, J., Cohen, H., Hopkins, R. O., Weinert, C., Wunsch, H., . . . Harvey, M. A. (2012). Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders' conference. *Critical Care Medicine*, 40, 502–509. http://dx.doi.org/10 .1097/CCM.0b013e318232da75

- NICE. (2009). *Rehabilitation after critical illness NICE Clinical Guideline* 83. London, UK: National Institute for Health and Clinical Excellence.
- Post, M. W., Festen, H., van de Port, I. G., & Visser-Meily, J. M. (2007). Reproducibility of the Caregiver Strain Index and the Caregiver Reaction Assessment in partners of stroke patients living in the Dutch community. *Clinical Rehabilitation*, 21, 1050–1055. http://dx.doi.org/ 10.1177/0269215507079140
- Robinson, B. C. (1983). Validation of a Caregiver Strain Index. Journal of Gerontology, 38, 344–348. http://dx.doi.org/10.1093/geronj/38.3.344
- Schmidt, M., & Azoulay, E. (2012). Having a loved one in the ICU: The forgotten family. *Current Opinion in Critical Care*, 18, 540–547. http:// dx.doi.org/10.1097/MCC.0b013e328357f141
- Sundararajan, K., Martin, M., Rajagopala, S., & Chapman, M. J. (2014). Posttraumatic stress disorder in close Relatives of Intensive Care unit patients' Evaluation (PRICE) study. *Australian Critical Care*, 27, 183– 187. http://dx.doi.org/10.1016/j.aucc.2014.04.003
- Thornton, M., & Travis, S. S. (2003). Analysis of the reliability of the modified caregiver strain index. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, 58, S127–S132. http://dx .doi.org/10.1093/geronb/58.2.S127
- van der Schaaf, M., Bakhshi-Raiez, F., van der Steen, M., Dongelmans, D. A., & De Keizer, N. F. (2015). Recommendations for intensive care follow-up clinics; report from a survey and conference of Dutch intensive cares. *Minerva Anestesiologica*, 81, 135–144. http://ncbi.nlm.nih .gov/pubmed/
- van Exel, N. J., Scholte op Reimer, W. J., Brouwer, W. B., van den Berg, B., Koopmanschap, M. A., & van den Bos, G. A. (2004). Instruments for assessing the burden of informal caregiving for stroke patients in clinical practice: A comparison of CSI, CRA, SCQ and self-rated burden. *Clinical Rehabilitation*, 18, 203–214. http://dx.doi.org/10.1191/ 0269215504cr723oa
- Van Pelt, D. C., Milbrandt, E. B., Qin, L., Weissfeld, L. A., Rotondi, A. J., Schulz, R., . . . Pinsky, M. R. (2007). Informal caregiver burden among survivors of prolonged mechanical ventilation. *American Journal of Respiratory and Critical Care Medicine*, 175, 167–173. http://dx.doi .org/10.1164/rccm.200604-493OC
- Williams, T. A., & Leslie, G. D. (2008). Beyond the walls: A review of ICU clinics and their impact on patient outcomes after leaving hospital. *Australian Critical Care*, 21, 6–17. http://dx.doi.org/10.1016/j.aucc .2007.11.001

Received April 1, 2015 Revision received December 12, 2015 Accepted December 21, 2015

The Intensive Care Unit Experience: Psychological Impact on Family Members of Patients With and Without Traumatic Brain Injury

Ann Marie Warren Baylor University Medical Center

Monica Bennett Baylor Scott & White Health, Dallas, Texas Evan Elizabeth Rainey and Rebecca Joanne Weddle Baylor Research Institute, Dallas, Texas

> Kenleigh Roden-Foreman University of Texas Southwestern Medical Center

Michael L. Foreman Baylor University Medical Center

Purpose/Objective: The intensive care unit (ICU) has been identified as a possible contributor to emotional distress. This study seeks to identify whether families of traumatic brain injury (TBI) patients in the ICU experience psychological differences as compared with non-TBI patients' family members. Method: Eighty-two family members in a trauma/critical care ICU were assessed at baseline and again at 3 months. The Patient Health Questionnaire 8-Item measured depression, the Primary Care PTSD Screen measured symptoms of posttraumatic stress (PTS). Results: Forty of these individuals were the family members of ICU patients who had sustained a TBI; 42 of the individuals were the family members of non-TBI patients in the ICU. At baseline, 39% (33% non-TBI, 45% TBI, p = .28) of the total sample screened positive for depressive symptoms and 24.3% (26% non-TBI, 23% TBI, p = .69) screened positive for PTS symptoms. However, differences emerged between the groups at 3 months, with family members in the non-TBI group showing a significant decrease in both baseline depression and PTS symptoms. Conclusions/Implications: This study, to our knowledge, is the first of its kind to examine psychological differences in the ICU in those whose family members either have or do not have a TBI. Results suggest the TBI group endorsed more symptoms of depression and PTS symptoms at 3 months. Although it is unclear whether symptoms were directly related to the ICU experience or the injury itself, future research should explore the possible additive effect of postintensive care syndrome-family symptoms.

Impact and Implications

Postintensive care syndrome-family (PICS-F) describes the constellation of depression, anxiety, posttraumatic stress symptoms, and complicated grief that can occur in family members of intensive care unit (ICU) patients. This novel paper identified differences based on whether or not the patient had a traumatic brain injury (TBI), which may improve our understanding of the ICU experience on the family. The study improves our understanding of the possible impact of the ICU experience on families by following their psychological response from the time of the ICU until 3 months post injury, which allows for trends to be identified among families whose loved ones either did or did not have a TBI. Early psychological interventions should be targeted at reducing the potential negative consequences of having a family member in the ICU, as families who experience symptoms consistent with PICS-F may have increased difficulty if placed in a caregiving role post hospitalization.

Keywords: intensive care unit, traumatic brain injury, family caregiver

Ann Marie Warren, Division of Trauma, Critical Care and Acute Care Surgery, Baylor University Medical Center; Evan Elizabeth Rainey and Rebecca Joanne Weddle, Baylor Research Institute, Dallas, Texas; Monica Bennett, Baylor Scott & White Health, Dallas, Texas; Kenleigh Roden-Foreman, Department of Psychiatry, University of Texas Southwestern Medical Center; Michael L. Foreman, Division of Trauma, Critical Care and Acute Care Surgery, Baylor University Medical Center. Correspondence concerning this article should be addressed to Ann Marie Warren, PhD, Associate Investigator of Trauma Research, Licensed Psychologist, Baylor University Medical Center—Division of Trauma, Critical Care and Acute Care Surgery, 3409 Worth Street, Suite C2.500, Dallas, TX 75246. E-mail: annmarie.warren@BSW Health.org

Introduction

In the United States, approximately five million people are admitted to an intensive care unit (ICU) each year for traumatic injury or critical illness (National Quality Forum, 2012). The ICU environment can be anxiety provoking and emotionally distressing for both the patients and their family members. In the ICU, patients often endure unfamiliar and sometimes painful medical procedures, have significant communication barriers, and display changes in cognition and behavior. While witnessing these experiences, family members have to simultaneously cope with the external demands of managing occupational and household responsibilities, navigating complex insurance and financial decisions, and maintaining the needs of other family members, such as children. In the ICU setting, balancing time with the hospitalized family member and coping with outside demands is often done on minimal sleep and general lack of regard for one's overall sense of health and well-being. Baumhover and May (2013) provide an important conceptual model to describe this vulnerability that ICU family members experience. It describes the role of both antecedents (i.e., family system disruption, helplessness) and defining attributes (i.e., exposure to burden due to lack of sleep and other factors, lack of protection), as well as the subsequent consequences. Consequences for family members, according to the model, can be positive, such as the development of increased resilience, but also negative, as expressed in a wide range of negative psychological symptoms (Baumhover & May, 2013). It is not surprising, then, that having a family member admitted to the ICU after an injury or illness can result in a significant emotional toll.

Previous research has shown that individuals who have a family member admitted to the ICU can develop adverse psychological outcomes including symptoms of depression, posttraumatic stress, and complicated grief (Davidson, Jones, & Bienvenu, 2012). In 2010, the Society for Critical Care Medicine (SCCM) created a task force to examine these issues and coined the term "postintensive care syndrome-family" (PICS-F) to better describe these symptoms in family members of ICU patients (SCCM, 2010). A recent critical review of PICS-F by Davidson and colleagues (2012) indicated the rates of generalized anxiety disorder range from 21-56%, rates of posttraumatic stress disorder (PTSD) range from 13%-56%, and of the presence of depression ranged from 8%-42%. This is especially concerning given that these symptoms may continue long after ICU discharge. For example, Jones et al. (2004) found up to 49% of relatives exhibited high posttraumatic stress-related symptoms 6 months after ICU discharge. Further, PICS-F may negatively impact the family member's ability to provide caregiving for those relatives who are discharged to a home setting (Schmidt & Azoulay, 2012).

Research suggests that factors such as female gender (Pochard et al., 2005), younger age (Pochard et al., 2005), prior psychiatric disorders (Lefkowitz, Baxt, & Evans, 2010), and being either a spouse (Pochard et al., 2005) or a child of the ICU patient (Azoulayet al., 2005) may place individuals at higher risk for developing PICS-F. Certain patient diagnoses, such as cancer, as well as patient death also appear to put people at risk (Azoulay et al., 2005). With the exception of a cancer diagnosis, there appears to be limited research available on whether or not specific patient

diagnosis factors have an impact on family psychological response.

Traumatic brain injury (TBI) is a leading cause of death and disability in children and adults. In 2010, 2.5 million individuals sustained a TBI in the United States (Centers for Disease Control and Prevention [CDC], 2010). It is estimated as many as 5.3 million Americans, approximately 2% of the population, currently live with TBI-related disability (Langlois, Rutland-Brown, & Wald, 2006). TBI is a contributing factor to one third of all injury-related deaths in the United States, with an estimated \$76.5 billion in direct medical costs and lost productivity (Stead et al., 2013). A large body of research has shown negative outcomes for patients post TBI, including death, disability, and impaired psychological health.

The literature has also explored in depth the impact of providing care for individuals with TBI, suggesting that significant emotional distress can occur (Sander, Maestas, Clark, & Havins, 2013). Six months following injury, family members of individuals with severe TBI endorsed depression and anxiety levels as high as 37% and 39%, respectively (Marsh, Kersel, Havill, & Sleigh, 1998). After TBI, family members often struggle with the seemingly "normal" outward appearance of their family member who may now have profound emotional and social differences including disability, memory loss, anger, loneliness, or poor interpersonal relations (Saban, Hogan, Hogan, & Pape, 2015). Family members can exhibit prolonged depression and anxiety long after hospital discharge regardless of their relationship to the patient (Ennis, Rosenbloom, Canzian, & Topolovec-Vranic, 2013; Schonberger, Ponsford, Oliver, & Ponsford, 2010). However, the majority of studies examining families of those with a TBI were more than one year after injury (Saban et al., 2015). As such, the information and understanding we have regarding the early psychological impact when a family member sustains a TBI is limited. Given the relatively high frequency of TBI, and the unique impact TBI has on family members, exploring the additive impact of this factor on PICS-F symptoms may be an important area of study.

Identifying risk factors for negative psychological consequences in family members beginning in the ICU based on patient diagnosis may help direct strategies and resources to those who may be at increased risk for depression, posttraumatic stress, and anxiety at the time of the patient's ICU admission. Therefore, the primary objective of this study was to examine psychological symptoms in families with patients in the ICU at the time of hospitalization and 3 months later. Families were enrolled at the time of ICU admission to determine any additive impact of the ICU experience. We hypothesized that psychological distress would be more prevalent in family members of TBI patients compared with family members of individuals admitted for an injury or illness other than TBI, though we expected psychiatric morbidity to occur in both groups.

Method

Participants

The participants in the current analysis constituted a subgroup of a larger ongoing longitudinal dataset of family members of patients in the trauma/critical care ICU of an urban Level I trauma center in the southwestern United States. For the purposes of this study, family members were defined according to the Institute of Patient and Family Centered Care as "two or more persons who are related in any way-biologically, legally, or emotionally" (Institute for Patient- and Family-Centered Care, 2015). Participants for the present study were screened between March 2013 and November 2014 and included only those who completed both baseline and 3-month follow-up. Participants whose family member expired prior to 3-month follow-up were excluded from this analysis but remained in the study using a bereavement protocol. Inclusion criteria for participants included adult (18 years or older) family of adult patients admitted to the trauma/critical care ICU service; the patient had to be admitted for at least 48 hr with an expected survival greater than 96 hr; family members had to identify they would be in a caregiver or supportive role (e.g., emotional, social, financial) after the patient was discharged. Exclusion criteria included the inability to understand written or spoken English at the 8th grade level and the inability to provide at least two forms of contact information for follow-up.

Procedures

Approval was obtained from the medical center's Institutional Review Board. Participants who met the criteria to be approached for inclusion in the study were voluntarily consented and enrolled. Recruitment occurred in the ICU waiting room and all eligible individuals were approached as part of a convenience sample. Baseline measurements were collected during initial inpatient admission to the trauma/critical care ICU. The 3-month follow-ups were collected within a 4-week window around the participants' due date (i.e., 2 weeks before due date through 2 weeks after). Reminder postcards or e-mails, based on participants' preference at baseline, were sent 1 week prior to the 4-week window opening. Participants were contacted over the telephone using the contact information provided at baseline, with a maximum number of 12 attempts to successfully contact the participant. The same measures were administered during these 3-month follow-up calls as at baseline.

Measures

Participant demographic variables were obtained through a standard self-report form administered at baseline and included age, gender, ethnicity, marital status, education level, employment status, and income. Patient demographic and injury-related variables were extracted from a variety of sources, including the hospital's trauma registry for trauma patients, information provided during ICU rounds, and participant self-report. These variables included date of birth, date of hospital admission, etiology of injury for trauma patients, primary ICU diagnosis, date of ICU admission, insurance status, and the presence of a TBI. For the purposes of this study, the TBI group included those individuals with moderate to severe TBI, as described by a period of a loss of consciousness lasting 30 min or more.

Depression was measured using the Patient Health Questionnaire 8-Item (PHQ-8; Kroenke & Spitzer, 2002), a validated brief self-report measure of major depressive disorder for populationbased studies and clinical populations. This is an 8-item questionnaire derived from the original measure (PHQ-9), with the last question regarding suicide removed. The PHQ-8 consists of 8 items that are statements about an individual's affective state (e.g., "Little interest or pleasure in doing things"; "Feeling down, depressed, or hopeless"), which are scored with responses ranging from 0 (*not at* all) to 3 (*nearly every day*). A score of greater than or equal 10 was considered as the cutoff diagnostic value for a positive screen for depressive symptoms (Kroenke et al., 2009).

Posttraumatic stress (PTS) symptoms were measured using the primary care PTSD Screen (PC-PTSD), a four-item screen designed for use in medical settings. The PC-PTSD is considered a psychometrically sound screen for determining the presence of PTSD risk in both veteran and civilian medical populations (Ouimette, Wade, Prins, & Schohn, 2008; Prins et al., 2003), including those who sustained traumatic injury (Hanley, deRoon-Cassini, & Brasel, 2013). With a cutoff score of 3, the PC-PTSD had shown 85% diagnostic efficiency, 75% sensitivity, and 87% specificity (Prins et al., 2003). As PTSD cannot be diagnosed until symptoms exist for at least 30 days after the traumatic exposure, in the current study at baseline, a score of 3 or higher on the PC-PTSD was considered a positive screen for PTSD risk, rather than as a diagnostic tool for PTSD.

Data Analysis

Participant characteristics were summarized with means and standard deviations or counts and percentages. Multiple logistic regression was used to determine whether demographic and clinical factors, such as premorbid diagnosis of depression and time from ICU admission to study enrollment, were associated with PHQ-8 results. Differences between the group with follow-up data and the group without were assessed using *t* tests or Wilcoxon's rank sum test for numerical variable and chi-square tests for categorical variables. To determine whether the TBI group was associated with PHQ-8 or PC-PTSD scores at baseline and 3-month follow-up, Fisher's test was used to obtain odds ratios and test for significance. Logistic regression was used to determine whether other patient characteristics were associated with the participants' mental health outcomes at both time points. Significance was measured at the p = .05 level.

Results

At the time of analysis, 110 participants had completed baseline measurements. Of those, 10 more were enrolled in the bereavement protocol and thus excluded from this analysis. Eighty-two (82%) of the eligible participants completed their 3-month follow-up measures and were included in this analysis (see Figure 1). Reasons for loss to follow-up included inability to contact participant (n = 11), no usable contact information at follow-up (n = 3), withdrawal from study (n = 2), incomplete measures (n = 3)1), and participant request to skip follow-up yet remain in study due to self-report of emotional distress (n = 1). The sample included 60 females (73%) and 22 males (27%) with a mean age of 49.2 years (SD = 14.4). Regarding relationship to the patient, 27% of the sample were parents, 24% were spouses, 18% children, 6% siblings, and 24% other. Forty (48.7%) of these individuals were the family members of ICU patients who had sustained a TBI and 42 (51.2%) were the family members of non-TBI patients in the ICU (see Table 1). The demographic characteristics of the participants and 3-month patient disposition are shown in Table 1. In regard to demographic information, with the exception of race/

110 Enrolled between March 26, 2013 - November 11.2014 10 100 Eligible for Eligible for Bereavement Protocol Standard Protocol at at 3 months 3 months (Excluded from analysis) 82 14 Completed 3 month Unable to contact at standard measures 3 months 2 Withdrew from study at 3 months 1 Incomplete measure at 3 months 1 Requested to skip 3 month but remain in study

Figure 1. Flow chart of enrollment and follow-up.

ethnicity (p = .0037), no significant group differences were found between the TBI and non-TBI family members. Although we did not control for preexisting depression or PTSD, there were no significant differences in the rate of premorbid mental health history between participants in the TBI and non-TBI group. The medical diagnoses of the non-TBI patients are shown in Table 2.

Depression Symptoms

Using a cutoff score of 10 or greater on the PHQ-8, 39% (n = 32) of the total sample screened positive for depressive symptoms

 Table 1

 Summary of Participant's Demographic Data

Table 2				
Cumana	of Non	TDI	Laines	C

Summary	of	Non-TBI	Injury	Characi	eristics

Variable	N = 42
Traumatic injury	
Spinal cord injury	1 (2%)
Abdominal injury	5 (12%)
Orthopedic injury	3 (7%)
ARDS	6 (14%)
Nontraumatic injury	
Sepsis	3 (7%)
Transplant	9 (22%)
Gastrointestinal surgery	5 (12%)
Aneurysm/stroke	7 (17%)
Surgical oncology	3 (7%)

Note. TBI = traumatic brain injury; ARDS = acute respiratory distress syndrome.

at baseline. There were no significant differences (p = .28) between families in the TBI group (45% screening positive) versus those in the non-TBI group (33% scoring positive). At 3-month follow-up, 20% of the total sample screened positive for depression. Again, there were no significant differences (p = .08) between those in the TBI group (28% screening positive) and those in the non-TBI group (12% screening positive). However, when analyzing the change in depressive symptoms from baseline to 3 months between the 2 groups, a significant decrease of 21% was noticed among the non-TBI group (p = .0027), yet there was no significant change in the TBI group (p = .07), as shown in Table 3. This finding suggests that family members of those with TBI are more likely to maintain depressive symptoms for the 3 months following the patient's injury than those without TBI.

Posttraumatic Stress Symptoms

A similar analysis was performed using the PC-PTSD scale, with a score of 3 or more considered positive for PTS symptoms. Using this cutoff, 24.3% (n = 20) of the total sample screened positive on the PC-PTSD at baseline There was no significant difference (p = .69) when between-groups comparisons were

1 0 1	0.1			
Variable	Combined $(N = 82)$	No TBI $(N = 42)$	TBI (N = 40)	р
Age	49.2 ± 14.4	48.9 ± 15.0	49.6 ± 13.9	.8409
Gender-male	22 (27%)	14 (33%)	8 (20%)	.1732
Race/ethnicity	· /		· /	.0037
White (non-Hispanic)	37 (45%)	14 (44%)	23 (58%)	
Black (non-Hispanic)	21 (26%)	17 (41%)	4 (10%)	
Hispanic	17 (21%)	6 (14%)	11 (28%)	
Other/unknown	7 (9%)	5 (12%)	2 (5%)	
Married	49 (60%)	25 (60%)	24 (60%)	.9649
College degree	38 (46%)	17 (40%)	21 (53%)	.2751
Employed	47 (57%)	22 (52%)	25 (63%)	.3544
Income $>$ \$50k ^a	33 (53%)	15 (48%)	18 (58%)	.4451
Premorbid depression	21 (26%)	8 (19%)	13 (33%)	.1630
Premorbid PTSD	6 (7%)	2 (5%)	4 (10%)	.4321

Note. TBI = traumatic brain injury; PTSD = posttraumatic stress disorder. ^a Income for 20 participants was unobtainable.

Table 3 Change in Prevalence of Depression and PTSD From Baseline to 3 Months

Variable	Percent change	р
Depression symptoms		
No TBI	-21%	.0027
TBI	-9%	.0707
PTSD symptoms		
No TBI	-17%	.0196
TBI	2%	.7389

Note. PTSD = posttraumatic stress disorder; TBI = traumatic brain injury.

made, with 23% of the TBI group scoring positive on the PC-PTSD and 26% of the non-TBI group scoring positive. At 3 months, 17% (n = 14) of the total sample screened positive on the PC-PTSD. Again, there were no significant between-groups differences (p = .07) between those in the TBI group (25% scoring positive) and those in the non-TBI group (10%). When analyzing the change in PC-PTSD scores from baseline to 3 months between the two groups, a significant decrease of 17% was noticed among the non-TBI group (p = .019), yet there was no change in the TBI group (p = .73), as shown in Table 3. This finding is similar to the trend noted for depressive symptoms and suggests that family members of those with TBI are more likely to continue experiencing PTSD symptoms for the 3 months following the patient's injury

Discussion

The impact of having a family member admitted to an ICU is often a profound emotional experience. As most will engage in some caregiving aspect following hospitalization, understanding the psychological impact of this event is critical given its potential impact on future caregiving ability as well as the general health and well-being of the family member. In the present study, although psychological distress was expected to be frequent, we also hypothesized that differences would emerge based on whether or not a TBI had occurred. As anticipated, psychological symptoms occurred frequently in the sample. Positive scores on both the PHQ-8 and PC-PTSD were found across the sample, with 39% of the participants endorsing depression and 24% endorsing PTS symptoms at baseline. However, differences emerged when comparisons were made between the TBI and non-TBI groups. In the group whose family members did not have a TBI, there was a significant decrease in rates of depression between baseline and 3-month follow-up, whereas those whose family members did sustain a TBI did not show the same pattern of improvement. The same trend was observed for PTS symptoms, with non-TBI families experiencing a significant decrease in reported symptoms while the TBI group did not show a similar pattern of symptom reduction. Taken together, this suggests that psychological distress is more likely to continue for TBI families than non-TBI families between the ICU admission and 3 months later.

This finding supports the large body of literature regarding psychological distress in those families who provide care for individuals with TBI (Saban et al., 2015). Additionally, the high endorsement of psychological distress when family members were

assessed in the ICU may contribute new insight into what occurs for these families in the time period immediately following an injury or illness that results in acute hospitalization. Clearly, this period has a powerful impact on families and, unfortunately, negative emotional consequences can and do occur, regardless of the reason for hospitalization. However, our study suggests that differences do emerge when a moderate to severe TBI is present. This cannot necessarily be attributed to "caregiver burden," as for approximately half of our sample the caregiving aspect had not yet occurred because the individual was still in a hospital or rehabilitation setting. For the TBI group, as compared with the non-TBI group, this may be associated with differences in the ability to communicate and engage with family members; patient behavioral changes, such as agitation; and impaired memory and information processing. The cognitive, emotional, and behavioral changes in patients with TBI may lead to more long lasting psychological distress in family members than in those family members whose loved one did not experience those changes.

Limitations

There are several inherent limitations in this study that must be addressed. The primary limitation of this study is there is no way to know if psychological distress, as measured in terms of both depression and PTS symptoms at 3 months, was a result of the ICU experience itself or in fact was related to the experience of involvement with a loved one with a serious injury. It is possible to hypothesize that the higher rates of depression and early PTSsymptoms across both groups at baseline suggest some type of additive or unique stress to having a family member hospitalized in the ICU. Perhaps the trend in both groups for improvement in symptoms 3 months later reflects gaining distance from the ICU experience. However, although improved, it is not possible to know if the maintenance of these symptoms was a reflection of PICS-F or in fact related directly to the experience of the continued complexity having an injured or ill family member, particularly in those with TBI.

Second, we did not control for preexisting depression or PTSD. In fact, the premorbid depression rate in our sample (26%) was higher than the estimated 9% of the United States general population when assessed with the PHQ-8 (CDC, 2010). However, participants' rate of preexisting PTSD was consistent with the United States general population, estimated at 7%-8% (National Center for PTSD, 2015). It is unclear if the endorsement of these symptoms reflected an exacerbation of preexisting stress, although baseline rates of depression and PTS symptoms were substantially higher than preexisting rates and rates seen at 3-month follow-up. This suggests that perhaps the ICU experience contributed to an increase in already existing symptoms and/or initiated the development of these symptoms. As endorsed symptoms were highest for the sample at the time in which their family member was in the ICU, future research should explore what, if any, additive component the ICU environment contributes to psychological distress.

Third, the results reflect the experience of families in one trauma/critical care unit and therefore may not be generalizable to other families in a different hospital setting. As ICU settings vary from hospital to hospital, factors such as open access for families, waiting room dynamics, and support structures provided for fam-

ilies may all influence the emotional experience of individual family members.

Fourth, there was a wide variety of medical diagnoses in the non-TBI group, so using a more homogenous group (e.g., the family members of ICU patients with cancer) may have strengthened the results. However, despite this lack of homogeneity, differences were still identified between groups. Finally, the sample size of the study was relatively small; however, this study represents an initial analysis of a planned larger sample in an attempt to identify trends in the data to better inform clinical practice. With a greater number of participants, we anticipate the study results would likely be strengthened.

Finally, elements of the PICS-F syndrome, including complicated grief and anxiety, were not included in the current analysis. Although we did assess complicated grief in the individuals whose family members died, these participants were not included in the current analysis due to the small number of these participants. Additionally, we did not measure anxiety as a separate variable. However, as we are not suggesting a full diagnosis of PICS-F, but rather to determine the possible influence of the ICU environment, we feel that the results still provide insight into early psychological distress in these families.

Implications for Future Research and Clinical Practice

Identification of psychological distress in family members at the time of ICU admission, and provision of psychological support for ICU families, regardless of patient diagnosis, should be a component of comprehensive, patient-centered care (Jutte, Erb, & Jackson, 2015). Identification of family needs while in the ICU (e.g., consistent communication, open access visitation, and shared decision-making) is well documented (Davidson et al., 2007), but much less is understood about how to assess and provide for those at risk for depression and PTS symptoms in this setting. Clinical recommendations could include having a dedicated psychologist in the ICU and critical care settings to provide assessment and intervention for families identified at higher risk (Warren, Stucky, & Sherman, 2013). Recent interventions for families have included the use of ICU diaries which, in a small study, was shown to reduce the risk of PTS symptoms in ICU families, although further research is needed to determine the effectiveness of this intervention (Ulmanet al., 2014). Additionally, the potential positive impact of the experience for families should not be left unexplored. Concepts including resilience, which is the ability to bounce back after an adverse event, are increasingly studied in individuals who experience a variety of serious health conditions, such as traumatic injury (Rainey, Petrey, Reynolds, Agtarap, & Warren, 2014). Therefore, an exploration of resilience in family members of ICU patients warrants further study (Baumhover & May, 2013). Resilience may, in fact, be a protective factor against the development of PICS-F, although additional research is needed to support this assumption.

As the families of those with TBI were found to have less improvement in either depression (-9% vs. -21%) or PTS (-17% vs. 2%) symptoms at 3 months, interventions specifically for these families should be developed. In the TBI caregiving literature, recommendations have been made, including management of the cognitive and behavioral consequences of TBI (Kreutzer, Stejaskal, Godwin, Powell, & Arango-Lasprilla, 2010), and problem solving training in which families of those with TBI were taught to engage in problem identification, brainstorming possible solutions, and then, after critique, chose a solution and assess the outcome (Rivera, Elliot, Berry, & Grant, 2007). These types of strategies and approaches have been shown to be effective and perhaps could be modified for use in the ICU setting. Future research should explore implementation of such strategies in the ICU setting in order to determine the impact on the development of PICS-F.

Conclusions

This study, to our knowledge, is the first of its kind to examine differences in psychological response during the ICU experience between those whose family members either have or do not have a TBI. Although our results suggest that the TBI group had less improvement in depression and PTS symptoms at 3 months, both groups experienced these symptoms. Future research should continue to explore the potential effect of the ICU environment in this population and intervention studies should be developed to reduce its impact on families during and after an ICU admission.

References

- Azoulay, E., Pochard, F., Kentish-Barnes, N., Chevret, S., Aboab, J., Adrie, C., . . . The FAMIREA Study Group. (2005). Risk of posttraumatic stress symptoms in family members of intensive care unit patients. *American Journal of Respiratory and Critical Care Medicine*, 171, 987–994. http://dx.doi.org/10.1164/rccm.200409-1295OC
- Baumhover, N. C., & May, K. M. (2013). A vulnerable population: Families of patients in adult critical care. *American Association of Critical-Care Nurses Advanced Critical Care*, 24, 130–148.
- Centers for Disease Control and Prevention. (2010). Current depression among adults—United States, 2006 and 2008. *MMWR*. Morbidity and Mortality Weekly Report, 59, 1229–1235.
- Davidson, J. E., Jones, C., & Bienvenu, O. J. (2012). Family response to critical illness: Postintensive care syndrome-family. *Critical Care Medicine*, 40, 618–624. http://dx.doi.org/10.1097/CCM.0b013e318236ebf9
- Davidson, J. E., Powers, K., Hedayat, K. M., Tieszen, M., Kon, A. A., Shepard, E., . . Armstrong, D. (2007). Clinical practice guidelines for support of the family in the patient-centered intensive care unit: American College of Critical Care Medicine Task Force 2004–2005. *Critical Care Medicine*, 35, 605–622. http://dx.doi.org/10.1097/01.CCM .0000254067.14607.EB
- Ennis, N., Rosenbloom, B. N., Canzian, S., & Topolovec-Vranic, J. (2013). Depression and anxiety in parent versus spouse caregivers of adult patients with traumatic brain injury: A systematic review. *Neuropsychological Rehabilitation*, 23, 1–18. http://dx.doi.org/10.1080/09602011 .2012.712871
- Hanley, J., DeRoon-Cassini, T., & Brasel, K. (2013). Efficiency of a four-item posttraumatic stress disorder screen in trauma patients. *Journal of Trauma and Acute Care Surgery*, 75, 722–727. http://dx.doi.org/ 10.1097/TA.0b013e3182a53a5f
- Institute for Patient- and Family-Centered Care. (2015). Frequently asked questions: What is meant by the word "family"? Retrieved from http://www.ipfcc.org/faq.html
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G., Ingleby, S., Eddleston, J., . . . Gager, M. (2004). Post-traumatic stress disorder-related symptoms in relatives of patients following intensive care. *Intensive Care Medicine*, 30, 456–460. http://dx.doi.org/10.1007/s00134-003-2149-5
- Jutte, J. E., Erb, C. T., & Jackson, J. C. (2015). Physical, cognitive, and psychological disability following critical illness: What is the risk?

Seminars in Respiratory and Critical Care Medicine, 36, 943–958. http://dx.doi.org/10.1055/s-0035-1566002

- Kreutzer, J. S., Stejskal, T. M., Godwin, E. E., Powell, V. D., & Arango-Lasprilla, J. C. (2010). A mixed methods evaluation of the Brain Injury Family Intervention. *NeuroRehabilitation*, 27, 19–29.
- Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, 32, 1–7. http://dx .doi.org/10.3928/0048-5713-20020901-06
- Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. B. W., Berry, J. T., & Mokdad, A. H. (2009). The PHQ-8 as a measure of current depression in the general population. *Journal of Affective Disorders*, *114*, 163–173. http://dx.doi.org/10.1016/j.jad.2008.06.026
- Langlois, J. A., Rutland-Brown, W., & Wald, M. M. (2006). The epidemiology and impact of traumatic brain injury: A brief overview. *The Journal of Head Trauma Rehabilitation*, 21, 375–378. http://dx.doi.org/ 10.1097/00001199-200609000-00001
- Lefkowitz, D. S., Baxt, C., & Evans, J. R. (2010). Prevalence and correlates of posttraumatic stress and postpartum depression in parents of infants in the Neonatal Intensive Care Unit (NICU). *Journal of Clinical Psychol*ogy in Medical Settings, 17, 230–237. http://dx.doi.org/10.1007/s10880-010-9202-7
- Marsh, N. V., Kersel, D. A., Havill, J. H., & Sleigh, J. W. (1998). Caregiver burden at 6 months following severe traumatic brain injury. *Brain Injury*, 12, 225–238. http://dx.doi.org/10.1080/026990598122700
- National Center for PTSD. (2015). *How common is PTSD?* Washington, DC: U. S. Department of Veterans Affairs. Retrieved from http://www .ptsd.va.gov/public/PTSD-overview/basics/how-common-is-ptsd.asp
- National Quality Forum. (2012). *Endorsement summary: Pulmonary and critical care measures*. Washington, DC: Author. Retrieved from http://www.qualityforum.org/Projects/Pulmonary_Endorsement_Maintenance .aspx
- Ouimette, P., Wade, M., Prins, A., & Schohn, M. (2008). Identifying PTSD in primary care: Comparison of the Primary Care-PTSD Screen (PC-PTSD) and the General Health Questionnaire-12 (GHQ). *Journal of Anxiety Disorders*, 22, 337–343.
- Pochard, F., Darmon, M., Fassier, T., Bollaert, P. E., Cheval, C., Coloigner, M., . . . Azoulay, E. (2005). Symptoms of anxiety and depression in family members of intensive care unit patients before discharge or death. A prospective multicenter study. *Journal of Critical Care*, 20, 90–96.

- Prins, A., Ouimette, P., Kimerling, R., Cameron, R. P., Hugelshofer, D. S., Shaw-Hegwer, J., . . . Sheikh, J. I. (2003). The Primary Care PTSD Screen (PC-PTSD): Development and operating characteristics. *Primary Care Psychiatry*, *9*, 9–14.
- Rainey, E. E., Petrey, L. B., Reynolds, M. C., Agtarap, S., & Warren, A. M. (2014). Psychological factors predicting outcome after traumatic injury: The role of resilience. *American Journal of Surgery*, 4, 517–523.
- Rivera, P., Elliot, T. R., Berry, J. W., Grant, J. S., & Oswald, K. (2007). Predictors of caregiver depression among community-residing families living with traumatic brain injury. *NeuroRehabilitation*, 22, 3–8.
- Saban, K. L., Hogan, N. S., Hogan, T. P., & Pape, T. L. B. (2015). He looks normal but . . . Challenges of family caregivers of veterans diagnosed with a traumatic brain injury. *Rehabilitation Nursing*, 40, 277–285.
- Sander, A. M., Maestas, K. L., Clark, A. N., & Havins, W. N. (2013). Predictors of emotional distress in family caregivers of persons with traumatic brain injury: A systematic review. *Brain Impairment*, 14, 113–129.
- Schmidt, M., & Azoulay, E. (2012). Having a loved one in ICU: The forgotten family. *Current Opinion Critical Care*, 18, 540–547.
- Schonberger, M., Ponsford, M., Oliver, J., & Ponsford, M. (2010). A longitudinal study of family functioning after TBI and relatives emotional status. *Neuropsychological Rehabilitation*, 20, 813–827.
- Society of Critical Care Medicine. (2011). Post-intensive care syndrome (PICS): Psychological sequelae of critical illness. Retrieved from http:// www.sccm.org/Conferences/Webcasts/Pages/PICS.aspx
- Stead, L. G., Bodhit, A. N., Patel, P. S., Daneshvar, Y., Peters, K. R., Mazzuoccolo, A., . . . Tyndall, J. A. (2013). TBI surveillance using the common data elements for traumatic brain injury: A population study. *International Journal of Emergency Medicine*, 6, 5.
- Ulman, A. J., Aitken, L. M., Rattray, J., Kenardy, J., LeBrocque, R., MacGillivray, S., & Hull, A. M. (2014). Diaries for recovery from critical illness. *Cochrane Database of Systematic Reviews*, 12.
- Warren, A. M., Stucky, K., & Sherman, J. J. (2013). Rehabilitation psychology's role in the Level I trauma center. *Journal of Trauma and Acute Care Surgery*, 74, 1357–1362.

Received April 14, 2015

Revision received December 16, 2015

Accepted December 18, 2015

After Critical Care: Challenges in the Transition to Inpatient Rehabilitation

Nancy Hansen Merbitz University of Michigan

Jennifer A. Dammeyer University of Michigan Health System Katharine Westie Private Practice, Glen Arbor, Michigan

Lester Butt Craig Hospital, Englewood, Colorado

Jessica Schneider University of Michigan

Purpose/Objective: The aftermath of treatment for critical illness and/or critical injury in the intensive care unit (ICU) often includes persisting cognitive and emotional morbidities as well as severe physical deconditioning (a constellation termed post-intensive care syndrome, or PICS), but most patients do not receive psychological services before they enter the inpatient rehabilitation facility (IRF). Although a burgeoning literature guides the efforts of critical care providers to reduce risk factors for PICS - for example, reducing the use of sedatives and enacting early mobilization, there is need for a corresponding awareness among IRF psychologists and other providers that the post-ICU patient often arrives in a state of significantly reduced capacity, with persisting cognitive impairments and acute psychological distress. Many are at risk for long-term complications of posttraumatic stress disorder, general anxiety and/or clinical depression, and assuredly all have experienced a profound life disruption. This paper offers a multilevel perspective on the adaptation of post-ICU patients during inpatient rehabilitation, with discussion of the psychologist's role in education and intervention. Research Method/Design: Clinical review paper. Results: NA. Conclusions: To optimize response to rehabilitation, it is important to understand the behavior of post-ICU patients within a full biopsychosocial context including debility, cognitive and emotional impairment, disruption of role identities, and environmental factors. The psychologist can provide education about predictable barriers to participation for the post-ICU patient, and guide individual, family and team interventions to ameliorate those barriers.

Impact and Implications

Survivors of critical illness have distinct clinical issues that are often not addressed. This novel review extends our understanding of how to optimize the treatment and management of survivors of critical illness as they transition into the rehabilitation setting. In this review, concepts are presented from the field of rehabilitation psychology that are applicable to the care of these individuals and their families, to ameliorate the effects of persisting cognitive and/or emotional morbidity on comprehension and participation. Focused clinical efforts and treatment guidelines are needed to enhance rehabilitation outcomes in this population.

Keywords: post-intensive care syndrome, rehabilitation psychology, role identities, fundamental attribution error

Introduction

The caseload of every psychologist working in an inpatient rehabilitation facility (IRF) is likely to include patients arriving after recent, life-threatening critical illness or critical injury with treatment in an intensive care unit (ICU). The aftermath of critical care has been called "the burden of survivorship" (Iwashyna & Netzer, 2012). Evidence is mounting that large numbers of patients treated in ICUs manifest new-onset cognitive and/or emotional impairments that can persist long-term (Hopkins et al., 1999; Jackson, Pandharipande, et al., 2014; Jones, 2014; Pandharipande et al., 2013; Wiseman, Foster, & Curtis, 2013). The term *post-intensive care syndrome* (PICS; Needham et al., 2012) describes new or worsening impairments in physical, cognitive, or mental health status arising after critical illness and persisting beyond acute care hospitalization. As summarized by Elliott and colleagues (2014), the increasing incidence of critical illness as well as reduced mortality have resulted in growing numbers of

Nancy Hansen Merbitz, Department of Physical Medicine and Rehabilitaiton, University of Michigan; Katharine Westie, Private Practice, Glen Arbor, Michigan; Jennifer A. Dammeyer, University of Michigan Health System; Lester Butt, Craig Hospital, Englewood, Colorado; Jessica Schneider, Department of Physical Medicine and Rehabilitation, University of Michigan.

Nancy Hansen Merbitz is now at the Louis Stokes VA Medical Center, Cleveland, Ohio.

Correspondence concerning this article should be addressed to Nancy Hansen Merbitz, PhD, Psychology Service 116B (W), Louis Stokes VA Medical Center, 10701 East Boulevard, Cleveland, OH 44106. E-mail: nancymerbitz@gmail.com

post-intensive care survivors in the United States, including an unknown but large percentage with PICS.

More than 4 million patients are admitted to ICUs in the United States each year (Joint Commission, 2004, as cited in Engel, Needham, Morris, & Gropper, 2013; Mullins, Goyal, & Pines, 2013). Approximately 800,000 ICU patients per year have critical illnesses such as acute respiratory distress syndrome (ARDS) requiring mechanical ventilation (Elliott et al., 2014; Needham et al., 2012; Wiseman et al., 2013). Sepsis, the condition with the highest total hospital costs in the United States (Torio & Andrews, 2014), is a leading cause for ICU admission, with over 600,000 survivors of severe sepsis among older Americans alone (Elliott et al., 2014). Cognitive disability with or without delirium occurs commonly in critically ill patients, especially those with ARDS (Hopkins et al., 2005), and/or sepsis (Iwashyna, Ely, Smith, & Langa, 2010). Reports of delirium among ICU patients range from 34% to 80% (Girard, Pandharipande, & Ely, 2008; Morandi & Jackson, 2009; Pisani et al., 2006). Persisting delirium also has been identified in a substantial portion of patients who are discharging from ICU (Ely et al., 2001) and entering postacute rehabilitation including IRFs (Hall, Meagher, & MacLullich, 2012). Anxiety, depression and acute stress disorder/posttraumatic stress disorder are also very common after ICU care, and symptoms often persist for months to years (Bienvenu et al., 2015; Girard et al., 2007; Granja et al., 2005; Jackson et al., 2007; Myhren, Ekeberg, Toien, Karlsson, & Stokland, 2010; Powers et al., 2014; Ratzer, Romano, & Elklit, 2014; Stevenson et al., 2013; Wiseman et al., 2013).

Several approaches to understanding and preventing PICS have been proposed. Elliott et al. (2014) proposed a formal comparison of patients' functional ability prior to hospitalization with their current status at all transitions in level of care within institutions and between institutions and outpatient/community settings. Their "functional reconciliation" approach is directed toward the goal of preventing, identifying and ameliorating ICU-related morbidities across the care continuum, and facilitating research on post-ICU outcomes.

To prevent or ameliorate PICS, ICU physicians and nurses are developing and enacting guidelines for reduced and more targeted use of sedation (Dammeyer et al., 2012) and enabling rehabilitation for "early mobilization" provided by nursing, occupational, physical and speech and language therapists (Bailey et al., 2007; Dammeyer, Dickinson, Packard, Baldwin, & Ricklemann, 2013; Engel et al., 2013; Schweickert et al., 2009). As stated by Parker, Sricharoenchai, and Needham (2013), "A shift in ICU 'culture' with a focus on interventions to reduce subsequent physical and mental health impairments is essential to successful implementation of an early rehabilitation program" (p. 307).

Psychological assessment and intervention for ICU patients and families is recognized as beneficial, although most post-ICU patients will meet a psychologist only after they arrive in the IRF (Centre for Clinical Practice at NICE, 2009; Hermans, Jonghe, Bruyninckx, & Van den Berghe, 2014; Needham, Davidson et al., 2012; Warren, Stucky, & Sherman, 2013; Wiseman et al., 2013). Florida standards (Florida Department of Health, 2013) for facilities accredited as brain and spinal cord injury treatment centers require the services of psychologists in ICU, acute care settings and inpatient rehabilitation, for both patients and their families. The wisdom of this policy is supported by findings in a study of 209 patients in Italy (Peris et al., 2011); those receiving in-ICU psychological services had significantly less incidence of posttraumatic stress symptoms at one year compared with an equivalent sample of ICU patients admitted and discharged prior to the study.

Although specific statistics for discharges from ICU to IRF are lacking, the trend in the United States from 1996 to 2010 was toward decreased length of stay in ICUs and acute care units (Burke et al., 2015). Thus, patients present to IRF teams with more complex medical and nursing needs, in addition to potential acute cognitive and psychological challenges (see Figure 1).

When the patient and family enter the IRF, they face a new environment and set of expectations, transitioning from an environment of passive dependency to one in which independence is emphasized. Their psychological capabilities, key to rehabilitation success, may be challenged by PICS. Without input from the psychologist, the behavior of patients struggling under these multiple burdens may be interpreted within a framework of baseline personality and motivation, without an appreciation of the full context that includes illness, debility, impairment and environmental factors (Dunn, 2011; Lewin, 1935). Other rehabilitation team members may not understand how patients can appear grossly cognitively intact but not have the wherewithal to apply advanced coping strategies in highly novel and challenging circumstances (Krpan, Levine, Stuss, & Dawson, 2007).

More understanding of the ICU experience and its sequelae will help the psychologist support the patient, family and other rehabilitation team members, foster greater awareness of patient vulnerabilities, and enable better coordination of information between critical and acute care, rehabilitation settings and community aftercare (Bienvenu, 2014; Camicia et al., 2014; Mitchell & Courtney, 2005; Mitchell, Courtney, & Coyer, 2003; Volk & Grassi, 2009; Warren et al., 2013). By sharing mental status data across ICU, IRF and community settings, the psychologists can be a partner in "functional reconciliation."

In the following sections, we will present and discuss some of the environmental, medical, social and individual factors that combine to impact the transition and adaptation of patients coming to the IRF after treatment in the ICU, and how the psychologist contributes to post-ICU patients' rehabilitation outcomes through delivery of flexible interventions and provision of holistic case formulation. This discussion is based on the authors' experiences and observations and supported by literature where available.

Before the IRF: Treatment in the ICU

Patient and Family Experiences in the ICU

To assist patients and families arriving in the IRF after critical care, it is helpful to consider their recent experiences. With the imperative to deliver aggressive treatments to save life, the ICU can be an alien and intrusive environment from the patient's perspective, dominated by equipment and machines (Sinuff, Giacomini, Shaw, Swinton, & Cook, 2009). There is marked dependence upon unknown others and an esoteric language (Williams, 2005). Providers in critical care are necessarily task-oriented when treating medically unstable patients. Surveys and qualitative studies have found that many families and patients note the kindness and caring attitudes of their ICU nurses (Bobrovitz, Santana, Ball, Kortbeek, & Stelfox, 2012;



This model, adapted from a model developed in 2010 by the Long-Term Consequences Task Force of the Society of Critical Care Medicine (SCCM), shows the physical, cognitive, and mental-health problems affecting inpatient rehabilitation in patients with post intensive care syndrome (PICS). IRF = Inpatient Rehabilitation Facility

ASR = Acute stress reaction

PTSD = Posttraumatic stress disorder

PTSS = Posttraumatic stress symptoms



Hofhuis et al., 2008; McKiernan & McCarthy, 2010; Williams, 2005); nevertheless, patients and families may perceive communication by physicians and nurses to be inadequate (Alvarez & Kirby, 2006; Hofhuis et al., 2008; McKiernan & McCarthy, 2010). The ICU environment combines sensory deprivation—as available sensory experiences are typically monotonous and provide neither interactive opportunities nor aesthetic enjoyment—with the sensory overload of instrument noises, lights, the comings and goings of multiple providers, as well as painful procedures superimposed upon ongoing physical discomfort (Hofhuis et al., 2008; Reade & Finfer, 2014). Sleep and orientation are disrupted in the absence of usual day-night cycles

(Pisani et al., 2015; Wilcox et al., 2013). Privacy is minimal, and there is often a heightened sense of vulnerability and confusion (Hewitt, 2002). The ICU has been likened to a total institution, wherein individuality is subordinate to environmental/procedural demands (Goffman, 1961, as discussed in Benner, Hooper-Kyriakidis, & Stannard, 2011).

In the struggle to save lives, brain function can be slighted as a focus of preservation (Hopkins et al., 1999; Jackson, Santoro et al., 2014; Wade et al., 2012). A variety of medications may compromise cognitive functioning. Prolonged sedation for patients with mechanical ventilation continues in many ICUs, in spite of a wealth of evidence of its deleterious effects on the brain and an

increasing literature substantiating delirium prevention or mitigation (Dammeyer et al., 2012; Maldonado, 2014; McGuire, Basten, Ryan, & Gallagher, 2000; Waked, Gordon, Whiteson, & Baron, 2015).

Transformations Underway in Critical Care

Strategies and protocols have been developed according to the guidelines of the Society of Critical Care Medicine (SCCM; Barr et al., 2013) for early mobilization as well as reduced and/or intermittently interrupted sedation to support patients' orientation, sense of security, and behavioral activation. Using these protocols, ICU nurses focus on pain management, keeping the patient engaged, promoting an optimal sleep/wake cycle, minimizing anxiolytic medications as possible with particular avoidance of benzo-diazepines (Maldonado, 2014; Vasilevskis et al., 2010).

An Example of Changing Guidelines for a Common ICU Intervention

The ABCDEF Bundle, a part of the SCCM recommendations (see Table 1), specifies a multidisciplinary process of interventions for the patient who requires mechanical ventilation. These interventions function to decrease the time spent ventilated, avoid delirium, and decrease ICU acquired weakness (Balas et al., 2012; Vasilevskis et al., 2010). Per these guidelines, each day is comprised of awakening and breathing trials, coordination among care providers, delirium prevention and early mobility. Adherence to these guidelines may decrease neuromuscular complications of mechanical ventilation (Bailey et al., 2007) and the duration of delirium (Schweikert et al., 2009). The guidelines promote patientcentered practices that are relevant to any ICU or IRF patient, including the family ("F") as part of the team (Bell, 2012; Benner, Hooper-Kyriakidis, & Stannard, 2011), to decrease anxiety and boredom as well as improve patients' engagement (VanHorn & Kautz, 2007). Many ICU nurses have offered assistance to families with journaling ("ICU diaries") to keep track of daily events and fill gaps in patients' recollection, thereby replacing delusional memories with factual information (Ewens, Hendricks, & Sundin, 2015; Jones, 2014; Jones et al., 2010; Stevenson & Dowdy, 2012). Evidence supports the use of ICU diaries for reducing occurrence

or severity of posttraumatic stress disorder (PTSD; Mehlhorn et al., 2014) with wide use in Europe noted (Bienvenu, 2014). See Appendix for links to share with colleagues and families for ICU and post-ICU resources.

After Critical Care: The Post-ICU Patient in the IRF

The ICU experiences of the patient and family will directly affect their response to rehabilitation. They are likely to be uninformed regarding post-ICU challenges (Govindan, Iwashyna, Watson, Hyzy, & Miller, 2014); in fact, information is the highest unmet need reported by families during the ICU stay and transition to other settings (Alvarez & Kirby, 2006; Mitchell et al., 2003; Mitchell & Courtney, 2005). The psychologist in the IRF can help patients and families learn about the IRF culture, and help team providers, patients and families anticipate and address emotional, cognitive and social barriers to active participation.

"Culture Shock" Between the ICU and the IRF

To understand the responses of patient and family during the transition from ICU to inpatient rehabilitation, it is helpful for the psychologist to be aware of the differences between ICU and rehabilitation "cultures". The implicit and explicit messages of critical and acute care can be quite different from those encountered in rehabilitation (Butt & Fitting, 1993). The goal of medical science and its related technologies is to conquer and cure diseases wherein illness/disease is seen as an alien threat to the self (Jennings, Callahan, & Caplan, 1988). Medicine's goal is to defend and restore the self by curing or markedly compensating for the illness, thereby returning to a 'normal' level of functioning. However, medicine's historic response to infectious and acute diseases does not offer an adequate or sufficient way of understanding or responding to the personal, social, and ethical challenges posed by chronic disability (A. Caplan, Callahan, & Haas, 1987).

Rehabilitation to prepare patients for life with a chronic disability requires negotiation, reconciliation, and diplomacy, quite different from the life and death crisis-oriented state often evidenced within critical and acute care medicine settings (Barnard, 1990). When cure is not possible, people with chronic disabilities have no constructive choice but to try to integrate disability into their daily

Table 1

Applying the Society of Critical Care M	licine (SCCM) ABCDEF Bundle	
A (

Aspects	Guidennes
Awakening	The nurse discontinues the continuous sedation to waken the patient who has passed a safety screen. Awakening allows a breathing trial to assess need for continued ventilation, and assessment of the patient's cognitive status while unsedated.
Breathing	The respiratory therapist changes the ventilator settings to allow the patient to more actively participate in breathing.
Coordination, and Choice of analgesics and sedatives	The nurse and respiratory therapist coordinate interventions so the patient is able to consciously participate in the breathing trial; nursing procedures include planned sedation-free periods. The physician chooses least-deliriogenic medications.
Delirium	The nurse performs a delirium screen of the patient using the Confusion Assessment Method-ICU (Ely et al., 2001), and reports to the team in order to develop the next steps in the plan of care related to cognitive function.
Early mobility	A team of nurses, respiratory therapists, physical therapists and technicians mobilize patients while they are receiving ventilator support.
Family	Eliminating "visiting hours" has been a first step in promoting family at the bedside. The Institute for Patient and Family Centered Care encourages ICU practitioners to work with patient and family.

Note. ICU = intensive care unit.

lives (Bishop, 2005). Rehabilitation proceeds from the recognition that a chronic disabling condition is simply one component of the person's overall state of being. The rehabilitative agenda is to educate and engage the individual in methods to minimize limitations and prevent or mitigate secondary complications while minimizing loss of one's sense of purpose and meaning in life.

Although there are promising trends toward greater patient and family centeredness, a relatively passive stance may be adaptive for the patient within the highly structured ICU; the "sick role" is a temporary and culturally recognized social role identity in which the individual has tacit permission to accept help and treatment while recovering (Parsons, discussed in Burnham, 2014). However, with a prolonged stay and uncertain recovery, the patient is suspended between living and not-quite-living, not knowing what comes next or what to do. Likewise, patients do not experience the routines, rituals and supports that give life meaning as an individual within a family and community.

The Post-ICU Transition as a Liminal Phase

The concept of liminality (first explicated by authors in sociology and anthropology, e.g., Gennep, 1960; Turner, 1967, 1995) can be applied to understand the experiences of patients with serious illness (Blows, Bird, Seymour & Cox, 2012; Thomas, Levack, & Taylor, 2015). A liminal phase (literally a "threshold", a state of betweenness) occurs before and during a rite of passage, while the person is in a process of transition before being shown the way to the next phase. The critical care unit can be likened to such a threshold, where prolonged immobility can induce an experience of suspended animation, where bodily, social and other environmental stimuli converge to convey the message: "Hold still and you might be safe for now."

If there is survival which includes persisting or permanent bodily and functional changes, the liminality of critical care becomes the liminality of rehabilitation, a time and place for confrontation with physical, psychological and social loss and redefinition. The patient who survives critical illness or injury transits through a threshold of not-quite-living to a phase of rehabilitation with unknown recovery, with unfamiliar landmarks, activities and people.

As noted earlier, there may be little preparation for the next phase. When entering the IRF patients and family are prompted toward active engagement and goal-setting, which in turn requires a reoriented sense of self (physical and psychological) that is antithetical to their ICU experiences. The arriving patient and family most often lack guidance for the rite of passage through this liminal phase, to give their journey purpose and meaning.

We introduce the concept of liminality to provide the psychologist a framework in which to convey the profound disruption to coping and identity experienced by patients arriving in the IRF after ICU care, and the responsibility of rehabilitation team members to serve as guides in a rite of passage that is both universal (living within the bounds of human limitations) and highly individualized (the search for that which can be achieved toward particular goals within particular limitations).

Advanced levels of cognition and emotional self-regulation are needed in pursuit of any challenging, complex goals (Taylor, Pham, Rivkin, & Armor, 1998). Rehabilitation requires the patient to switch from passive to active mode, to learn the names and roles of a large team, learn how to do activities in a different way and use various kinds of equipment, while being around many unfamiliar people, being watched and evaluated, being on the unit's schedule, waiting for help for the most basic assistance, and functioning adequately while sleep deprived. Learning routines of health self-management is a highly complex and multilayered endeavor (Mead & Cronin, 2012).

Rehabilitation is a prime example of the interconnectedness of cognition, psychological flexibility and adaption. In Figure 2, a possible trajectory is presented, showing rehabilitative success for the post-ICU patient with success defined in terms of gains in Activity and Participation that may surpass physical recovery. Within the International Classification of Function (ICF; World Health Organization, 2002), Activity is the execution of a task or action, with or without assistance or assistive devices, and Participation is involvement in life situations. The psychologist's efforts toward timely identification and amelioration of cognitive and emotional challenges can facilitate the learning and skill-development that is so central to the rehabilitation process, helping patients resume activities in spite of physical impairments. Figure 2 also describes the goals, barriers and interventions that may apply in each phase.

Addressing Cognitive Challenges to Rehabilitation

Hopkins et al. (2005) note there is often inadequate screening for post-ICU cognitive impairments and a confirmed diagnosis of delirium may not even be added to the patient's medical history (Hope et al., 2014). This is in spite of the knowledge that delirium is a risk factor for subsequent delirium and persisting cognitive impairment. Per findings cited earlier regarding cognitive effects of critical illness, the post-ICU patient arriving in the IRF may not have returned to baseline functioning, impacting the patient's quality of participation and ability to constructively cope within the rehabilitation environment. Jackson and colleagues (Jackson et al., 2012; Jackson, Pandharipande et al., 2014; Jackson, Santoro et al., 2014) have called for increased prevention and intervention efforts during and after critical care to support subsequent coping and adaptation.

Cognitive challenges arise from multiple sources. Patients may have occult brain injuries and/or anoxic events not formally diagnosed during the initial critical care period. For instance, some studies have found that a significant number of patients diagnosed with spinal cord injury, especially at the cervical level, have test scores indicative of cognitive deficits associated with brain injury, often without documentation of recent or prior head injury, loss of consciousness, or posttraumatic amnesia being noted in their charts (Macciocchi, Seel, Thompson, Byams, & Bowman, 2008; Roth et al., 1989; Wilmot, Cope, Hall, & Acker, 1985). These "silent head injuries" are often in the mild range, but even relatively subtle cognitive deficits can create disadvantages for a rehabilitation patient (Ownsworth & Clare, 2006; Schmitt & Elliott, 2004).

Many patients arrive in the IRF with noncentral nervous system medical conditions that rehabilitation professionals might not consider as impacting neurocognitive function (Gasquoine, 2011) but that warrant cognitive assessment and interventions (Wilcox et al., 2013). Up to 10% of elderly surgical patients with anesthesia lasting over 2 hr will experience short-term impairment of memory and concentration for three months or more, directly affecting rehabilitation (Moller et al., 1998). Drugs used for sedation, pain



Figure 2. Possible trajectory of functions following critical illness or injury. With successful rehabilitation, recovery of activities and participation may exceed recovery of physical capabilities. Post-intensive care syndrome (PICS) threatens that success. Awareness of PICS fosters prevention and interventions. ICU = intensive care unit.

and anxiety can impair cognitive functioning for a significant period of time, often lasting into the IRF transition. Withdrawal from these drugs can create similar, albeit acute challenges (Jones, Griffiths, & Humphris, 2000). Sleep deprivation, common during rehabilitation, is known to adversely impact cognitive and emotional functioning even in normal circumstances (Kamdar, Needham, & Collop, 2012; Nilsson et al., 2005; Wilcox et al., 2013). As a tired, stressed patient once told the first author, "It's like I'm going to therapies with my brain tied behind my back."

Assessment and consultation regarding cognitive challenges post-ICU. In light of findings regarding low rates of detection for occult brain injuries or persisting post-ICU cognitive deficits following hypoxic events, ARDS, sepsis, and delirium, the following protocol is recommended: thorough interviews of patient and family members, careful review of the medical record, neuropsychological screening, and ongoing observation. This provides information to the rehabilitation team about baseline functioning and the extent and acuity of current deficits. If deficits and their etiology are not appreciated by the rehabilitation staff, associated behavioral sequelae may be erroneously attributed to lack of motivation, "laziness", or "baseline personality" that may prompt the prescription of unnecessary psychotropics (Swigart, Kishi, Thurber, Kathol, & Meller, 2008), and/or early discharge (authors' observations).

Regarding neuropsychological aspects of patients' function, psychologists can consistently promote a scientific definition and understanding of delirium, without use of vague terms such as "ICU psychosis" or "ICU syndrome" that tend to perpetuate misunderstanding of its medical foundation. These vague terms for delirium can reduce the likelihood of vigilant investigation and amelioration of medically based etiologies (Morandi et al., 2012; McGuire et al., 2000). Acute, unexpected decline in arousal or attention should trigger a delirium protocol (European Delirium Association and American Delirium Society, 2014). Delirium is increasingly viewed as occurring on a spectrum rather than as a unitary, present-absent phenomenon (Marcantonio et al., 2005; Ouimet et al., 2007; Velilla et al., 2012), with post ICU outcomes showing an orderly relationship with severity indicators. The psychologist can monitor changes in mental status via frequent contact and interviews, discussion of team observations, and brief repeatable assessments such as the "O-log" (W. Jackson, Novack, & Dowler, 1998; Salisbury, Baños, Novack, & Schneider, 2005), or briefer tasks such as: "Tell me the days of the week, backwards, starting with Sunday."

The psychologist can additionally provide consultation to physicians regarding neuropsychological effects associated with metabolic derangements and/or other abnormal lab values that are common during inpatient rehabilitation. For example, the hypoxic condition caused by even mild anemia can negatively affect physical function, cognitive performance, and mood (Lucca et al., 2008). Hypoglycemia or hyperglycemia may reduce cognitive function (Hopkins, Key, Suchyta, Weaver & Orme, 2010; Sommerfield, Deary, & Frier, 2004). Hyponatremia, especially with rapid onset, is associated with nausea and malaise at levels between 125 and 130 mmol/L and with lethargy, weakness and confusion at levels between 115 and 125 mmol/L (Reynolds, Padfield, & Seckl, 2006). The medically fragile patient, with reduced cognitive reserve, may be especially sensitive to the effects of medications, including the aggregated burden of medications with sedating and/or anticholinergic effects (Maldonado, 2014).

Families may miss crucial information that providers relay to cognitively challenged patients who have difficulty focusing attention, comprehending, and/or retaining what they are told. During and after transition to the IRF, families' need for information continues while demands upon them for assistance and postrehabilitation planning increase. They may live far away and/or have many competing responsibilities, and their presence may necessarily decrease as treatment continues over longer periods of time. The psychologist can help ensure that information and guidance is shared and processed by both patient and family.

Emotional Challenges to Rehabilitation

Affective consequences of critical illness and ICU experiences can compromise the IRF transition with an impact on cooperation, new learning and engagement. Depressed mood is common in the ICU and associated with development of post-ICU depression (Davydow, Gifford, Desai, Bienvenu & Needham, 2009). Up to 60% of ICU patients report post-ICU related emotional distress upon discharge, lasting 6 or more months (Nelson et al., 2004). Wade and colleagues (2012) found that over half of their ICU patients experienced psychological morbidity lasting at least 3 months, primarily PTSD, other anxiety syndromes, and depression. They suggested that early psychological interventions could reduce poor psychological outcomes in the period post-ICU.

In an extensive systematic review of studies investigating predictors of post-ICU PTSD, Ratzer et al. (2014) identified premorbid psychopathology and frightening or traumatic memories from the ICU as the most consistently reported findings. ICU-related PTSD may be comparable to those rates found within our military (Johns Hopkins Medicine, 2013). Studies have noted that PTSD post-ICU is at least partly due to the ICU experience itself, as well as related to delirium-associated delusions and hallucinations (see reviews by Scragg, Jones, & Fauvel, 2001, and Ratzer et al., 2014). Due to the nature of the ICU setting, a patient may have been inadvertently exposed to other patients' deaths in relatively close proximity. Likewise, ARDS is associated with particularly high risk of PTSD and/or depression (Hopkins, Key, Suchyta, Weaver, & Orme, 2010; Volk & Grassi, 2009). Patients may have been intubated and unable to verbally communicate, an exceptionally stressful experience both emotionally and physically. Many intubated ICU patients report clear memories of distress: pain, fear, anxiety, lack of sleep, feeling tense, inability to speak/communicate, lack of control, nightmares, and loneliness (Novaes, Aronovich, Ferraz, & Knobel, 1997; Rotondi et al., 2002).

Supporting patients and families in crisis. As in any significant life crisis, the newly admitted post-ICU patient is often in a state of disequilibrium with an associated higher risk of maladaptive behavior or decompensation. For traumatically injured patients, life has changed in a split second. For critically medically ill patients, life may have changed via a long and painful process. According to crisis theory, people strive for homeostatic balance, including physical, psychological, and social equilibrium wherein they employ characteristic patterns of behavior to reduce stressors and resolve problems (G. Caplan, 1964; Sprangers, Tempelaar, van den Heuvel, & de Haes, 2002; Woolley, 1990). When obstacles to life goals prove insurmountable via the customary problemsolving methods, a period of disorganization follows wherein no effectively learned coping strategies are available to abate this disorganization, thus engendering a sense of incapacity. If a crisis is successfully managed, new behaviors can add to the coping repertoire of the individual and family; conversely, maladaptive responses can become ingrained during a prolonged period of disorganization, manifested within innumerable deleterious behaviors.

Availability of psychological services is especially important for those with premorbid mental illness and/or trauma history, but regardless of pre-ICU history, transitioning patients may feel overwhelmed. The patient who experienced delirium may have difficulty distinguishing dreams from reality (Granberg, Engberg, & Lundberg, 1999). Confused perceptions from delirium and acute stress reactions may continue to color the early IRF experience thereby affecting patients' trust in their care team (per authors' clinical observations). Patients often experience pain and may be directly dealing with issues of survival subsequent to a brush with mortality. Patients and families can experience considerable fear while adjusting to less intensive levels of nursing care after leaving the ICU (Misak, 2005; Mitchell et al., 2003). They may experience profound hopelessness and suicidal ideation if cognizant of the implications of future impairment and its life consequences.

There is a great deal of variability in patients' preferences for timing and amount of information surrounding deficits and prognosis (Innes & Payne, 2009; Kirshblum et al., 2015; Lindberg, Kreuter, Taft, & Person, 2013). Defenses such as denial or repression can be adaptive for the equilibrium of a cognitively and emotionally challenged post-ICU patient in service of not feeling overwhelmed (see Haan, 1993; Radnitz & Tiersky, 2007). The psychologist can help the patient, family and providers anticipate and manage the distress or temporary decompensation that may occur when defenses of denial or repression are threatened. This can occur in a daily fashion as the patient directly confronts impairment(s) during the entirety of the rehabilitation process.

Timely and pragmatic psychological interventions. Early psychological intervention can shape adaptive emotional and behavioral responses to rehabilitation (Julsonnet, Vereby, Westie, & Oborne, 1991) and help decrease incidence of PTSD and other psychological comorbidities (Hatch, McKechnie, & Griffiths, 2011; Jones et al., 2003; Peris et al., 2011). For example, patients with history of delirium will benefit from education, in simple and frank conversations, regarding its medical nature and frequent occurrence during critical illness. Volk and Grassi (2009) recommend post-ICU psychotherapy focused on recalling factual memories of ICU experiences or constructing a fact-based narrative. Post-ICU patients may benefit from shorter but more frequent psychotherapeutic intervention secondary to limited physical, cognitive and/or affective domains. This is especially true if time and energy-consuming adjunctive communication methods are needed.

Patients in the ICU and the IRF may benefit from relaxation training, simple cognitive-behavioral strategies, and techniques of distraction and imagery (Warren et al., 2013), as well as individualized strategies to tolerate aversive medical interventions and enhance learning of rehabilitative tasks. In one interdisciplinary intervention, the incidence of pressure ulcers in ICU, acute care and an IRF was significantly reduced via a program that utilized education, visual and auditory cues for patients, families and staff to remember weight shift intervals, and a successive approximation approach to shape adaptive behavior (Westie, Olavarria, & Galarneau, 2009). This program increased compliance with weight shifts, and facilitated longer sitting times coupled with earlier rehabilitative engagement. Patients who arrived in the IRF with pressure ulcers were less likely to further deteriorate and showed greater healing. Additionally, this program decreased length of stay with a concomitant positive financial outcome on the hospital system.

The patient with mechanical ventilation. The number of patients in ICUs receiving mechanical ventilation is increasing (Carson, 2006) while IRF beds for these patients remain limited. Nevertheless, this relatively small number of patients will present some of the greatest challenges for the rehabilitation team. Some will be long-term ventilator users while others are weaning. Sig-

nificant anxiety and depression are common during weaning, which can adversely affect attainment of independent breathing (Heffelfinger, Calamari, Workman, Lawm, & Kelly, 2006). More than a third of patients who had been mechanically ventilated in the ICU had ASD/PTSD symptoms related to this experience up to two years later (Girard et al., 2007). Psychologists may facilitate weaning through treatment of anxiety and depression as well as training in tolerance, relaxation, and distraction techniques.

IRF patients requiring a ventilator are often unable to verbally communicate or do so with great difficulty and effort. Nelson et al. (2004) found that 90% of patients using ventilators reported severe distress related to inability to communicate. Julsonnet et al. (1991) described individualized communication strategies for the psychologist to use with these patients, often in collaboration with the speechlanguage pathologist. Modern assistive technology (AT) devices can supplement often cumbersome accommodations. However, Happ et al. (2015) noted the persisting low AT availability for basic communication needs within major medical centers.

Facilitating family coping and engagement. Families transitioning to rehabilitation may warrant significant psychological support and intervention. Patients and families have different experiences and memories of the ICU. Patients may be amnestic and/or retain delusional memories, whereas families often have far too clear recollections of the ICU team struggling to preserve life. Informal caregivers of critically ill patients have been found to report depressive symptoms with a prevalence of over 75% during critical care; symptoms often last one year or more (Haines, Denehy, Skinner, Warrillow, & Berney, 2015). Nurses and other team members often state their highest priority for the psychologist is family intervention for family emotional and behavioral responses that can create stress and disruption for staff (present authors' observations; Mitchell & Courtney, 2005; Mitchell et al., 2003; Woolley, 1990).

A psychologist-facilitated multiple-family group can add a layer of therapeutic and peer support for family members. Additionally, this modality provides a format for education surrounding the rehabilitation process at its earliest phase (Westie & McKeon, 1987). As they gain experience, families can help educate and support new, transitioning families and thereby reinforce their own learning and progress. The supportive interfamily relationships established in such a group may extend beyond the actual session and into the daily lives of family members in the IRF, with the consequence a constructive, mutually supportive hospital culture.

Flexible hospital visiting hours for families have been found to decrease patient and family anxiety, increase collective satisfaction, reduce cardiovascular complications and reduce length of stay (Fumagalli et al., 2006). However, families often arrive in rehabilitation emotionally and physically depleted from the ICU following an extended round-the-clock vigil. The psychologist can give families encouragement and permission to "take shifts" and attend to basic sleep, nutritional, medical and self-care needs. Over time, there can be encouragement to relax their vigilance, and to recognize the transfer to the IRF as an indication of authentic medical stability. This represents movement from the acute care phase of recovery to true rehabilitation.

Helping Team Members Sustain a Holistic View of the Post-ICU Patient

Here we consider the post-ICU patient's ability to actively participate in rehabilitation, in the context of highly complex demands, diminished capabilities, and threats to identity. When the person in recovery from crisis feels threatened with reduced cognitive abilities, responses to novel information and social interactions may be less constructive and self-organized (Haan, 1993). The patient's mood, arousal, values, preferences, self-perceptions and perceptions of threats and available resources combine to form the substrate from which he or she either approaches and engages in rehabilitation or withdraws and resists.

Radomski (2011) provides a compelling description of patient adherence during rehabilitation as "a process involving a sequence of interrelated patient-therapist decisions and actions rather than an on-off switch" (p. 474). The IRF environment in which patient behavior occurs is comprised of the behaviors of team providers and family, and the organization's routines and processes. This environment provides antecedents and consequences that shape the capabilities and actions of each patient every day, whether by design or by default. When therapists see the patient-provider interaction as a behavioral sample of the patient *and* of the provider, they realize they are a modifiable part of the patient's environment.

A common rehabilitation team response to less than optimal participation involves the "fundamental attribution error" (Dunn, 2011; Ross, 1977) wherein observers emphasize enduring dispositional or other personal qualities (e.g., "motivation") as the cause of someone's behavior, rather than circumstantial factors (e.g., fatigue, cognitive impairment, remote or recent history of trauma, the recent ICU experience, the current environment). Within rehabilitation, there is evidence that therapists may attribute treatment failures to patient motivation while viewing treatment successes as the direct outcome of their professional skills (Macciocchi & Eaton, 1995; see also Plant, Richards, & Hansen, 1998 for further discussion of attributional biases in therapists' ratings of patient progress). Social psychology research indicates the "fundamental attribution error" is a predictable response albeit one that is inconsistent with the goals and philosophy of rehabilitation. The psychologist can counteract this potentially destructive tendency, didactically and/or through modeling.

Weiner (2008) noted the historical tendency in medicine to overweigh psychological factors when underlying pathology is not clearly defined; in essence a de facto diagnosis. He holds there is a risk of overplaying psychological components within the biopsychosocial model - without sufficiently considering how medical and environmental factors impact psychological function.

Development Revisited

Psychology also can help the interdisciplinary team understand post-ICU patients' behavior through the lens of a developmental model. Conditions arising from catastrophic injuries and/or prolonged critical illness can be associated with physical and sometimes psychological regression where the patient attempts to remaster previous abilities. Patients may experience greater emotional dependency with accompanying counterdependent rebellion and oppositional behaviors. Constructive guidance to rehabilitation team members may proceed from a view of the patient as reworking psychological developmental stages. For example, processes typical of adolescence may occur with a desire for independence from caretaker figures, coupled with efforts to regain control and mastery of one's life. This model can provide a useful conceptual framework for rehabilitation professionals to understand what may otherwise be perceived as lack of cooperation or motivation. This may assist the team tolerate, if not actually celebrate, the adolescent-like rebelliousness, control, and compliance issues manifested by some patients entering the rehabilitation process after critical injury or illness. Indeed, some of the behavioral tendencies least tolerated by staff are those that may enhance survival after discharge.

Role Loss and Change

The psychologist can help the team view the post-ICU patient's behavior through the lens of social psychology, particularly regarding the dramatic challenges to identity, variously considered in terms of role or self identity (see Burke, 1996; Thoits, 2013; Thomas et al., 2015). Identity disruptions experienced during critical illness and rehabilitation can be profound, including role *loss*—where nothing the person can do will restore a role (e.g., "skilled trades person"), and role *changes*—in which the person does not have the knowledge to match his or her behavior to a new role (e.g., "healthy person with tetraplegia," "competent wheel-chair user"). These are categories of role disruption associated with the greatest psychosocial stress (Burke, 1996).

Thoits (2013) reminds us that the impact of role disruptions magnifies according to their number, particularly according to the personal value and saliency to the individual. When core roles are affected, patients (and families) may respond with denial of what has happened, or deny that deficits are likely to persist. Denial or even regressive fragmentation can result when people face extreme threats to core identity and lack resources to cope (Haan, 1993). The process of identity reconstruction, imagining oneself with an acceptable future, is a key factor that leads to successful rehabilitation outcomes (Thomas et al., 2015). Ideally, rehabilitation providers welcome patients and families from ICU and acute settings to an environment with a structured yet flexible and patient-centered set of experiences to facilitate this healing process.

Summary

As lengths of stay are decreasing, with patients admitted to rehabilitation earlier in their recovery process, there are likely more cognitive, emotional and behavioral sequelae of the critical care experience that directly impact the IRF transition. Psychological services—for patients, family, and staff—can have an important impact on early adaptation to the IRF and ultimate rehabilitation outcome.

In order to help rehabilitation team providers bridge the procedural and cultural divide between ICUs and IRFs, the psychologist can

help team members understand differences between the ICU and the IRF, and

promote as-needed use of strategies similar to those used by critical care nurses, to monitor and support patients' orientation, sense of security, and behavioral activation during the early and sometimes disorienting phase of transition to the IRF. The psychologist can help patients and their families transitioning from critical care settings process information about safety, coping, and engagement in therapies, help them assume more responsibility for goal-setting and problem-solving, and help team providers, patients and families understand barriers posed by

crisis and "culture shock";

Impaired cognitive processing;

traumatic stress/PTSD, depression, general anxiety and emotional dysregulation, and;

disruption to valued roles.

To assist the team in managing care for patients at risk for altered mental status, the psychologist can

assess and monitor for

- (a) delirium or subsyndromal delirium and
- (b) executive dysfunction or other sometimes subtle cognitive deficits;

share data and observations to help inform corresponding adjustments to

- (a) medical treatment(s) and
- (b) nursing care and the therapeutic learning environment.

To optimize psychological adaptation for the patient transitioning to rehabilitation after critical care, the psychologist can

assess and intervene with psychological symptoms, which may include

- (a) depression, general anxiety, acute stress or PTSD, and
- (b) reactions to the loss of valued roles and sense of identity;
- help team providers increase patient-centeredness in their
- (a) communication of medical and prognostic information, and
- (b) goal-setting and reinforcement of progress.

Finally, the psychologist can help the team identify and address specific challenges that a patient and family are likely to encounter after discharge and provide recommendations for follow-up psychological and neuropsychological services.

References

- Alvarez, G. F., & Kirby, A. S. (2006). The perspective of families of the critically ill patient: Their needs. *Current Opinion in Critical Care, 12*, 614–618. http://dx.doi.org/10.1097/MCC.0b013e328010c7ef
- Bailey, P., Thomsen, G. E., Spuhler, V. J., Blair, R., Jewkes, J., Bezdjian, L., . . . Hopkins, R. O. (2007). Early activity is feasible and safe in respiratory failure patients. *Critical Care Medicine*, 35, 139–145. http:// dx.doi.org/10.1097/01.CCM.0000251130.69568.87
- Balas, M. C., Vasilevskis, E. E., Burke, W. J., Boehm, L., Pun, B. T., Olsen, K. M., . . . Ely, E. W. (2012). Critical care nurses' role in implementing the "ABCDE bundle" into practice. *Critical Care Nurse*, 32, 35–47. http://dx.doi.org/10.4037/ccn2012229

- Barnard, D. (1990). Healing the damaged self: Identity, intimacy, and meaning in the lives of the chronically ill. *Perspectives in Biology and Medicine*, 33, 535–546. http://dx.doi.org/10.1353/pbm.1990.0053
- Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gélinas, C., Dasta, J. F., . . . The American College of Critical Care Medicine. (2013). Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine*, 41, 278–306. http://dx.doi.org/10.1097/CCM.0b013e3182783b72
- Bell, L. (2012). Family presence: Visitation in the adult ICU. American Association of Critical Care Nurses practice alert. http://www.aacn.org/ wd/practice/content/practicealerts/family-visitation-icu-practicealertpcms
- Benner, P. E., Hooper-Kyriakidis, P. L., & Stannard, D. (2011). Clinical wisdom and interventions in acute and critical care: A thinking-inaction approach. New York, NY: Springer.
- Bienvenu, O. J. (2014). Effective post-ICU rehabilitation of critical illness survivors: What do we know? *Critical Care Medicine*, 42, 1320–1321. http://dx.doi.org/10.1097/CCM.00000000000186
- Bienvenu, O. J., Colantuoni, E., Mendez-Tellez, P. A., Shanholtz, C., Dennison-Himmelfarb, C. R., Pronovost, P. J., & Needham, D. M. (2015). Cooccurrence of and remission from general anxiety, depression, and posttraumatic stress disorder symptoms after acute lung injury: A 2-year longitudinal study. *Critical Care Medicine*, 43, 642–653. http:// dx.doi.org/10.1097/CCM.00000000000752
- Bishop, M. (2005). Quality of life and psychosocial adaptation to chronic illness and disability: Preliminary analysis of a conceptual and theoretical synthesis. *Rehabilitation Counseling Bulletin*, 48, 219–231. http:// dx.doi.org/10.1177/00343552050480040301
- Blows, E., Bird, L., Seymour, J., & Cox, K. (2012). Liminality as a framework for understanding the experience of cancer survivorship: A literature review. *Journal of Advanced Nursing*, 68, 2155–2164. http:// dx.doi.org/10.1111/j.1365-2648.2012.05995.x
- Bobrovitz, N., Santana, M. J., Ball, C. G., Kortbeek, J., & Stelfox, H. T. (2012). The development and testing of a survey to measure patient and family experiences with injury care. *Journal of Trauma and Acute Care Surgery*, *73*, 1332–1339. http://dx.doi.org/10.1097/TA.0b013e31825 c4d57
- Burke, P. J. (1996). Social identities and psychosocial stress. In H. B. Kaplan (Ed.), *Psychosocial stress: Perspectives on theory, life-course,* and methods (pp. 141–173). San Diego, CA: Academic Press.
- Burke, R. E., Juarez-Colunga, E., Levy, C., Prochazka, A. V., Coleman, E. A., & Ginde, A. A. (2015). Rise of post-acute care facilities as a discharge destination of U.S. hospitalizations. *Journal of the American Medical Association Internal Medicine*, 175, 295–296. http://dx.doi.org/ 10.1001/jamainternmed.2014.6383
- Burnham, J. C. (2014). Why sociologists abandoned the sick role concept. *History of the Human Sciences*, 27, 70–87. http://dx.doi.org/10.1177/ 0952695113507572
- Butt, L., & Fitting, M. (1993). Psychological adaptation. In G. G. Whiteneck & M. H. Jawad (Eds.), *Aging with a spinal cord injury* (199–210). New York, NY: Demos.
- Camicia, M., Black, T., Farrell, J., Waites, K., Wirt, S., Lutz, B., & The Association of Rehabilitation Nurses Task Force. (2014). The essential role of the rehabilitation nurse in facilitating care transitions: A white paper by the association of rehabilitation nurses. *Rehabilitation Nursing*, *39*, 3–15. http://dx.doi.org/10.1002/rnj.135
- Caplan, A. L., Callahan, D., & Haas, J. (1987). Ethical and policy issues in rehabilitation medicine. A Hastings Center Report Special, 17, 1–19.
- Caplan, G. (1964). *Principles of preventive psychiatry*. New York, NY: Basic Books.
- Carson, S. S. (2006). Outcomes of prolonged mechanical ventilation. *Current Opinion in Critical Care, 12,* 405–411. http://dx.doi.org/10 .1097/01.ccx.0000244118.08753.dc

- Centre for Clinical Practice at NICE. (2009). Rehabilitation after critical illness. *NICE clinical guideline 83*. Retrieved from http://www.guidance.nice.org.uk/cg83
- Dammeyer, J., Dickinson, S., Packard, D., Baldwin, N., & Ricklemann, C. (2013). Building a protocol to guide mobility in the ICU. *Critical Care Nursing Quarterly*, 36, 37–49. http://dx.doi.org/10.1097/CNQ .0b013e3182750acd
- Dammeyer, J. A., Mapili, C. D., Palleschi, M. T., Eagle, S., Browning, L., Heck, K., . . . George, C. (2012). Nurse-led change: A statewide multidisciplinary collaboration targeting intensive care unit delirium. *Critical Care Nursing Quarterly*, 35, 2–14. http://dx.doi.org/10.1097/ CNQ.0b013e31823b1fec
- Davydow, D. S., Gifford, J. M., Desai, S. V., Bienvenu, O. J., & Needham, D. M. (2009). Depression in general intensive care unit survivors: A systematic review. *Intensive Care Medicine*, 35, 796–809. http://dx.doi .org/10.1007/s00134-009-1396-5
- Dunn, D. S. (2011). Situations matter: Teaching the Lewinian link between social psychology and rehabilitation psychology. *History of Psychology*, 14, 405–411. http://dx.doi.org/10.1037/a0023919
- Elliott, D., Davidson, J. E., Harvey, M. A., Bemis-Dougherty, A., Hopkins, R. O., Iwashyna, T. J., . . . Needham, D. M. (2014). Exploring the scope of post-intensive care syndrome therapy and care: Engagement of noncritical care providers and survivors in a second stakeholders meeting. *Critical Care Medicine*, 42, 2518–2526. http://dx.doi.org/10.1097/CCM .000000000000525
- Ely, E. W., Margolin, R., Francis, J., May, L., Truman, B., Dittus, R., . . . Inouye, S. K. (2001). Evaluation of delirium in critically ill patients: Validation of the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). *Critical Care Medicine*, 29, 1370–1379. http://dx.doi .org/10.1097/00003246-200107000-00012
- Engel, H. J., Needham, D. M., Morris, P. E., & Gropper, M. A. (2013). ICU early mobilization: From recommendation to implementation at three medical centers. *Critical Care Medicine*, 41, 69–80. http://dx.doi.org/ 10.1097/CCM.0b013e3182a240d5
- European Delirium Association and American Delirium Society. (2014). The *DSM*–5 criteria, level of arousal and delirium diagnosis: Inclusiveness is safer. *BMC Medicine*, *12*, 141. http://dx.doi.org/10.1186/s12916-014-0141-2
- Ewens, B. A., Hendricks, J. M., & Sundin, D. (2015). The use, prevalence and potential benefits of a diary as a therapeutic intervention/tool to aid recovery following critical illness in intensive care: A literature review. *Journal of Clinical Nursing*, 24, 1406–1425. http://dx.doi.org/10.1111/ jocn.12736
- Florida Department of Health. (2013). *The brain and spinal cord injury* program: Facility designation standards. Tallahassee, FL: Author.
- Fumagalli, S., Boncinelli, L., Lo Nostro, A., Valoti, P., Baldereschi, G., Di Bari, M., . . . Marchionni, N. (2006). Reduced cardiocirculatory complications with unrestrictive visiting policy in an intensive care unit: Results from a pilot, randomized trial. *Circulation*, 113, 946–952. http://dx.doi.org/10.1161/CIRCULATIONAHA.105.572537
- Gasquoine, P. G. (2011). Cognitive impairment in common, noncentral nervous system medical conditions of adults and the elderly. *Journal of Clinical and Experimental Neuropsychology*, 33, 486–496. http://dx.doi .org/10.1080/13803395.2010.536759
- Gennep, A. (1960). *The rites of passage*. Chicago, IL: University of Chicago Press.
- Girard, T. D., Pandharipande, P. P., & Ely, E. W. (2008). Delirium in the intensive care unit. *Critical Care*, 12, 3. http://dx.doi.org/10.1186/ cc6149
- Girard, T. D., Shintani, A. K., Jackson, J. C., Gordon, S. M., Pun, B. T., Henderson, M. S., . . . Ely, E. W. (2007). Risk factors for post-traumatic stress disorder symptoms following critical illness requiring mechanical ventilation: A prospective cohort study. *Critical Care (London, England)*, 11, R28. http://dx.doi.org/10.1186/cc5708

- Goffman, E. (1961). Asylums: Essays on the social situation of mental patients and other inmates. New York, NY: Doubleday.
- Govindan, S., Iwashyna, T. J., Watson, S. R., Hyzy, R. C., & Miller, M. A. (2014). Issues of survivorship are rarely addressed during intensive care unit stays. Baseline results from a statewide quality improvement collaborative. *Annals of the American Thoracic Society*, 11, 587–591. http://dx.doi.org/10.1513/AnnalsATS.201401-007BC
- Granberg, A., Engberg, I. B., & Lundberg, D. (1999). Acute confusion and unreal experiences in intensive care patients in relation to the ICU syndrome: Part II. *Intensive and Critical Care Nursing*, 15, 19–33. http://dx.doi.org/10.1016/S0964-3397(99)80062-7
- Granja, C., Lopes, A., Moreira, S., Dias, C., Costa-Pereira, A., Carneiro, A., & The JMIP Study Group. (2005). Patients' recollections of experiences in the intensive care unit may affect their quality of life. *Critical Care*, 9, 96–109. http://dx.doi.org/10.1186/cc3026
- Haan, N. (1993). The assessment of coping, defense, and stress. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (2nd ed., pp. 258–273). New York, NY: Free Press.
- Haines, K. J., Denehy, L., Skinner, E. H., Warrillow, S., & Berney, S. (2015). Psychosocial outcomes in informal caregivers of the critically ill: A systematic review. *Critical Care Medicine*, 43, 1112–1120. http://dx .doi.org/10.1097/CCM.00000000000865
- Hall, R. J., Meagher, D. J., & MacLullich, A. M. (2012). Delirium detection and monitoring outside the ICU. *Best Practice & Research Clinical Anaesthesiology*, 26, 367–383. http://dx.doi.org/10.1016/j.bpa .2012.07.002
- Happ, M. B., Seaman, J. B., Nilsen, M. L., Sciulli, A., Tate, J. A., Saul, M., & Barnato, A. E. (2015). The number of mechanically ventilated ICU patients meeting communication criteria. *Heart & Lung: The Journal of Acute and Critical Care, 44*, 45–49. http://dx.doi.org/10.1016/j.hrtlng .2014.08.010
- Hatch, R., McKechnie, S., & Griffiths, J. (2011). Psychological intervention to prevent ICU-related PTSD: Who, when, and for how long? *Critical Care*, 15, 141. http://dx.doi.org/10.1186/cc10054
- Heffelfinger, S., Calamari, J. E., Workman, D. E., Lawm, G., & Kelly, J. (2006). Anxiety sensitivity and ventilator weaning: A preliminary analysis. Anxiety, Stress, and Coping, 19, 211–226. http://dx.doi.org/10 .1080/10615800600661598
- Hermans, G., De Jonghe, B., Bruyninckx, F., & Van den Berghe, G. (2014). Interventions for preventing critical illness polyneuropathy and critical illness myopathy. *The Cochrane Library*, *1*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006832 .pub3/pdf
- Hewitt, J. (2002). Psycho-affective disorder in intensive care units: A review. *Journal of Clinical Nursing*, 11, 575–584.
- Hofhuis, J. G., Spronk, P. E., van Stel, H. F., Schrijvers, A. J., Rommes, J. H., & Bakker, J. (2008). Experiences of critically ill patients in the ICU. *Intensive and Critical Care Nursing*, 24, 300–313. http://dx.doi .org/10.1016/j.iccn.2008.03.004
- Hope, C., Estrada, N., Weir, C., Teng, C. C., Damal, K., & Sauer, B. C. (2014). Documentation of delirium in the VA electronic health record. *BMC Research Notes*, 7, 208. http://dx.doi.org/10.1186/1756-0500-7-208
- Hopkins, R. O., Key, C. W., Suchyta, M. R., Weaver, L. K., & Orme, J. F., Jr. (2010). Risk factors for depression and anxiety in survivors of acute respiratory distress syndrome. *General Hospital Psychiatry*, 32, 147– 155. http://dx.doi.org/10.1016/j.genhosppsych.2009.11.003
- Hopkins, R. O., Suchyta, M. R., Snow, G. L., Jephson, A., Weaver, L. K., & Orme, J. F., Jr. (2010). Blood glucose dysregulation and cognitive outcome in ARDS survivors. *Brain Injury*, 24, 1478–1484. http://dx.doi .org/10.3109/02699052.2010.506861
- Hopkins, R. O., Weaver, L. K., Collingridge, D., Parkinson, R. B., Chan, K. J., & Orme, J. F., Jr. (2005). Two-year cognitive, emotional, and quality-of-life outcomes in acute respiratory distress syndrome. *Ameri-*

can Journal of Respiratory and Critical Care Medicine, 171, 340–347. http://dx.doi.org/10.1164/rccm.200406-763OC

- Hopkins, R. O., Weaver, L. K., Pope, D., Orme, J. F., Jr., Bigler, E. D., & Larson-LOHR, V. (1999). Neuropsychological sequelae and impaired health status in survivors of severe acute respiratory distress syndrome. *American Journal of Respiratory and Critical Care Medicine*, 160, 50–56. http://dx.doi.org/10.1164/ajrccm.160.1.9708059
- Innes, S., & Payne, S. (2009). Advanced cancer patients' prognostic information preferences: A review. *Palliative Medicine*, 23, 29–39. http://dx.doi.org/10.1177/0269216308098799
- Iwashyna, T. J., Ely, E. W., Smith, D. M., & Langa, K. M. (2010). Long-term cognitive impairment and functional disability among survivors of severe sepsis. *JAMA: Journal of the American Medical Association*, 304, 1787–1794. http://dx.doi.org/10.1001/jama.2010.1553
- Iwashyna, T. J., & Netzer, G. (2012). The burdens of survivorship: An approach to thinking about long-term outcomes after critical illness. *Seminars in Respiratory and Critical Care Medicine*, 33, 327–338. http://dx.doi.org/10.1055/s-0032-1321982
- Jackson, J. C., Ely, E. W., Morey, M. C., Anderson, V. M., Denne, L. B., Clune, J., . . . Hoenig, H. (2012). Cognitive and physical rehabilitation of intensive care unit survivors: Results of the RETURN randomized controlled pilot investigation. *Critical Care Medicine*, 40, 1088–1097. http://dx.doi.org/10.1097/CCM.0b013e3182373115
- Jackson, J. C., Hart, R. P., Gordon, S. M., Hopkins, R. O., Girard, T. D., & Ely, E. W. (2007). Post-traumatic stress disorder and post-traumatic stress symptoms following critical illness in medical intensive care unit patients: Assessing the magnitude of the problem. *Critical Care*, 11, 27. http://dx.doi.org/10.1186/cc5707
- Jackson, J. C., Pandharipande, P. P., Girard, T. D., Brummel, N. E., Thompson, J. L., Hughes, C. G., . . . Bringing to light the Risk Factors And Incidence of Neuropsychological dysfunction in ICU survivors (BRAIN-ICU) study investigators. (2014). Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: A longitudinal cohort study. *The Lancet Respiratory Medicine*, 2, 369–379. http://dx.doi.org/10.1016/S2213-2600(14)70051-7
- Jackson, J. C., Santoro, M. J., Ely, T. M., Boehm, L., Kiehl, A. L., Anderson, L. S., & Ely, E. W. (2014). Improving patient care through the prism of psychology: Application of Maslow's hierarchy to sedation, delirium, and early mobility in the intensive care unit. *Journal of Critical Care*, 29, 438–444. http://dx.doi.org/10.1016/j.jcrc.2014.01.009
- Jackson, W., Novack, T., & Dowler, R. (1998). Effective serial measurement of orientation in rehabilitation: Reliability of the orientation log. *Archives of Physical Medicine and Rehabilitation*, 79, 718–720. http:// dx.doi.org/10.1016/S0003-9993(98)90051-X
- Jennings, B., Callahan, D., & Caplan, A. L. (1988). Ethical challenges of chronic illness. *The Hastings Center Report*, 18, 1–16. http://dx.doi.org/ 10.2307/3562022
- Johns Hopkins Medicine. (2013). PTSD symptoms common among ICU survivors. Retrieved from www.sciencedaily.com/releases/2013/02/ 130226081238.htm
- Jones, C. (2014). Recovery post ICU. *Intensive and Critical Care Nursing*, 30, 239–245. http://dx.doi.org/10.1016/j.iccn.2014.06.001
- Jones, C., Backman, C. G., Capuzzo, M., Egerod, I., Flaatten, H., Granja, C., . . . Griffiths, R. D. (2010). Intensive care diaries reduce new onset post traumatic stress disorder following critical illness: A randomised, controlled trial. *Critical Care*. Retrieved from http:// ccforum.com/content/14/5/R168
- Jones, C., Griffiths, R. D., & Humphris, G. (2000). Disturbed memory and amnesia related to intensive care. *Memory*, 8, 79–94. http://dx.doi.org/ 10.1080/096582100387632
- Jones, C., Skirrow, P., Griffiths, R. D., Humphris, G. H., Ingleby, S., Eddleston, J., . . . Gager, M. (2003). Rehabilitation after critical illness:

A randomized, controlled trial. *Critical Care Medicine*, *31*, 2456–2461. http://dx.doi.org/10.1097/01.CCM.0000089938.56725.33

- Julsonnet, S., Vereby, F., Westie, K. S., & Oborne, J. (1991, September). Psychological intervention in the intensive care unit and acute care period after spinal cord injury. American Association of Spinal Cord Injury Psychologists and Social Workers National Convention, Las Vegas, NV.
- Kamdar, B. B., Needham, D. M., & Collop, N. A. (2012). Sleep deprivation in critical illness: Its role in physical and psychological recovery. *Journal of Intensive Care Medicine*, 27, 97–111. http://dx.doi.org/10 .1177/0885066610394322
- Killgore, W. D. (2010). Effects of sleep deprivation on cognition. Progress in Brain Research, 185, 105–129. http://dx.doi.org/10.1016/B978-0-444-53702-7.00007-5
- Kirshblum, S. C., Botticello, A. L., DeSipio, G. B., Fichtenbaum, J., Shah, A., & Scelza, W. (2015). Breaking the news: A pilot study on patient perspectives of discussing prognosis after traumatic spinal cord injury. *The Journal of Spinal Cord Medicine*. Advance online publication. http://dx.doi.org/10.1179/2045772315Y.0000000013
- Krpan, K. M., Levine, B., Stuss, D. T., & Dawson, D. R. (2007). Executive function and coping at one-year post traumatic brain injury. *Journal of Clinical and Experimental Neuropsychology*, 29, 36–46. http://dx.doi .org/10.1080/13803390500376816
- Lewin, K. (1935). A dynamic theory of personality. New York, NY: McGraw-Hill.
- Lindberg, J., Kreuter, M., Taft, C., & Person, L. O. (2013). Patient participation in care and rehabilitation from the perspective of patients with spinal cord injury. *Spinal Cord*, 51, 834–837. http://dx.doi.org/10 .1038/sc.2013.97
- Lucca, U., Tettamanti, M., Mosconi, P., Apolone, G., Gandini, F., Nobili, A., . . . Riva, E. (2008). Association of mild anemia with cognitive, functional, mood and quality of life outcomes in the elderly: The "Health and Anemia" study. *PLoS One*, *3*(4), e1920.
- Macciocchi, S. N., & Eaton, B. (1995). Decision and attribution bias in neurorehabilitation. Archives of Physical Medicine and Rehabilitation, 76, 521–524. http://dx.doi.org/10.1016/S0003-9993(95)80505-2
- Macciocchi, S., Seel, R. T., Thompson, N., Byams, R., & Bowman, B. (2008). Spinal cord injury and co-occurring traumatic brain injury: Assessment and incidence. Archives of Physical Medicine and Rehabilitation, 89, 1350–1357. http://dx.doi.org/10.1016/j.apmr.2007.11.055
- Maldonado, J. R. (2014). Delirium. In G. O. Gabbard (Ed.), Gabbard's Treatments of Psychiatric Disorders (5th ed., pp. 947–958). Arlington, VA: American Psychiatric Association. http://dx.doi.org/10.1176/appi .books.9781585625048.gg63
- Marcantonio, E. R., Kiely, D. K., Simon, S. E., John Orav, E., Jones, R. N., Murphy, K. M., & Bergmann, M. A. (2005). Outcomes of older people admitted to postacute facilities with delirium. *Journal of the American Geriatrics Society*, 53, 963–969. http://dx.doi.org/10.1111/j.1532-5415 .2005.53305.x
- McGuire, B. E., Basten, C. J., Ryan, C. J., & Gallagher, J. (2000). Intensive care unit syndrome: A dangerous misnomer. *Archives of Internal Medicine*, 160, 906–909. http://dx.doi.org/10.1001/archinte.160.7.906
- McKiernan, M., & McCarthy, G. (2010). Family members' lived experience in the intensive care unit: A phemenological study. *Intensive and Critical Care Nursing*, 26, 254–261. http://dx.doi.org/10.1016/j.iccn .2010.06.004
- Mead, M. A., & Cronin, L. A. (2012). The expert patient and the selfmanagement of chronic conditions and disabilities. In P. Kennedy (Ed.), *Oxford handbook of rehabilitation psychology* (pp. 492–510). New York, NY: Oxford University Press. http://dx.doi.org/10.1093/oxfordhb/ 9780199733989.013.0027
- Mehlhorn, J., Freytag, A., Schmidt, K., Brunkhorst, F. M., Graf, J., Troitzsch, U., . . . Gensichen, J. (2014). Rehabilitation interventions for post-intensive care syndrome: A systematic review. *Critical Care Med-*

icine, *42*, 1263–1271. http://dx.doi.org/10.1097/CCM.0000000 00000148

- Misak, C. (2005). ICU psychosis and patient autonomy: Some thoughts from the inside. *The Journal of Medicine and Philosophy*, *30*, 411–430. http://dx.doi.org/10.1080/03605310591008603
- Mitchell, M. L., & Courtney, M. (2005). Improving transfer from the intensive care unit: The development, implementation and evaluation of a brochure based on Knowles' adult learning theory. *International Journal of Nursing Practice*, 11, 257–268. http://dx.doi.org/10.1111/j .1440-172X.2005.00533.x
- Mitchell, M. L., Courtney, M., & Coyer, F. (2003). Understanding uncertainty and minimizing families' anxiety at the time of transfer from intensive care. *Nursing & Health Sciences*, 5, 207–217. http://dx.doi.org/ 10.1046/j.1442-2018.2003.00155.x
- Moller, J. T., Cluitmans, P., Rasmussen, L. S., Houx, P., Rasmussen, H., Canet, J., . . . The International Study of Post-Operative Cognitive Dysfunction. (1998). Long-term postoperative cognitive dysfunction in the elderly ISPOCD1 study. *The Lancet*, 351, 857–861. http://dx.doi .org/10.1016/S0140-6736(97)07382-0
- Morandi, A., Jackson, J. C., & Wesley Ely, E. (2009). Delirium in the intensive care unit. *International Review of Psychiatry*, 21, 43–58.
- Morandi, A., Pandharipande, P. P., Jackson, J. C., Bellelli, G., Trabucchi, M., & Ely, E. W. (2012). Understanding terminology of delirium and long-term cognitive impairment in critically ill patients. *Best Practice & Research Clinical Anaesthesiology*, 26, 267–276. http://dx.doi.org/10 .1016/j.bpa.2012.08.001
- Mullins, P. M., Goyal, M., & Pines, J. M. (2013). National growth in intensive care unit admissions from emergency departments in the United States from 2002 to 2009. Academic Emergency Medicine, 20, 479–486. http://dx.doi.org/10.1111/acem.12134
- Myhren, H., Ekeberg, O., Toien, K., Karlsson, S., & Stokland, O. (2010). Posttraumatic stress, anxiety and depression symptoms in patients during the first year post intensive care unit discharge. *Critical Care, 14,* R14. Retrieved from http://ccforum.com/content/14/1/R14
- Needham, D. M., Davidson, J., Cohen, H., Hopkins, R. O., Weinert, C., Wunsch, H., . . . Harvey, M. A. (2012). Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders' conference. *Critical Care Medicine*, 40, 502–509. http://dx.doi.org/10 .1097/CCM.0b013e318232da75
- Nelson, J. E., Meier, D. E., Litke, A., Natale, D. A., Siegel, R. E., & Morrison, R. S. (2004). The symptom burden of chronic critical illness. *Critical Care Medicine*, 32, 1527–1534. http://dx.doi.org/10.1097/01 .CCM.0000129485.08835.5A
- Nilsson, J. P., Söderström, M., Karlsson, A. U., Lekander, M., Åkerstedt, T., Lindroth, N. E., & Axelsson, J. (2005). Less effective executive functioning after one night's sleep deprivation. *Journal of Sleep Research*, 14, 1–6. http://dx.doi.org/10.1111/j.1365-2869.2005.00442.x
- Novaes, M. A., Aronovich, A., Ferraz, M. B., & Knobel, E. (1997). Stressors in ICU: Patients' evaluation. *Intensive Care Medicine*, 23, 1282–1285. http://dx.doi.org/10.1007/s001340050500
- Ouimet, S., Riker, R., Bergeron, N., Cossette, M., Kavanagh, B., & Skrobik, Y. (2007). Subsyndromal delirium in the ICU: Evidence for a disease spectrum. *Intensive Care Medicine*, 33, 1007–1013. http://dx.doi .org/10.1007/s00134-007-0618-y
- Ownsworth, T., & Clare, L. (2006). The association between awareness deficits and rehabilitation outcome following acquired brain injury. *Clinical Psychology Review*, 26, 783–795. http://dx.doi.org/10.1016/j .cpr.2006.05.003
- Pandharipande, P. P., Girard, T. D., Jackson, J. C., Morandi, A., Thompson, J. L., Pun, B. T., . . . The BRAIN-ICU Study Investigators. (2013). Long-term cognitive impairment after critical illness. *The New England Journal of Medicine*, 369, 1306–1316. http://dx.doi.org/10.1056/ NEJMoa1301372

- Parker, A. M., Sricharoenchai, T., & Needham, D. M. (2013). Early rehabilitation in the intensive care unit: Preventing impairment of physical and mental health. *Current Physical Medicine and Rehabilitation Reports*, 1, 307–314.
- Peris, A., Bonizzoli, M., Iozzelli, D., Migliaccio, M. L., Zagli, G., Bacchereti, A., . . . Belloni, L. (2011). Early intra-intensive care unit psychological intervention promotes recovery from post traumatic stress disorders, anxiety and depression symptoms in critically ill patients. *Critical Care*, 15, R41. http://dx.doi.org/10.1186/cc10003
- Pisani, M. A., Araujo, K. L., Van Ness, P. H., Zhang, Y., Ely, E. W., & Inouye, S. K. (2006). A research algorithm to improve detection of delirium in the intensive care unit. *Critical Care*, 10, 121. http://dx.doi .org/10.1186/cc5027
- Pisani, M. A., Friese, R. S., Gehlbach, B. K., Schwab, R. J., Weinhouse, G. L., & Jones, S. F. (2015). Sleep in the intensive care unit. *American Journal of Respiratory and Critical Care Medicine*, 191, 731–738. http://dx.doi.org/10.1164/rccm.201411-2099CI
- Plant, M. A., Richards, J. S., & Hansen, N. K. (1998). Potential for bias of data from functional status measures. *Archives of Physical Medicine and Rehabilitation*, 79, 104–106. http://dx.doi.org/10.1016/S0003-9993(98)90216-7
- Powers, M. B., Warren, A. M., Rosenfield, D., Roden-Foreman, K., Bennett, M., Reynolds, M. C., . . . Smits, J. A. (2014). Predictors of PTSD symptoms in adults admitted to a Level I trauma center: A prospective analysis. *Journal of Anxiety Disorders*, 28, 301–309. http://dx.doi.org/10.1016/j.janxdis.2014.01.003
- Radnitz, C. L., & Tiersky, L. (2007). Psychodynamic and cognitive theories of coping. In E. Martz & H. Livneh (Eds.), *Coping with chronic illness and disability: Theoretical, empirical, and clinical aspects* (pp. 29–48). New York, NY: Springer. http://dx.doi.org/10.1007/978-0-387-48670-3_2
- Radomski, M. V. (2011). More than good intentions: Advancing adherence to therapy recommendations. *The American Journal of Occupational Therapy*, 65, 471–477. http://dx.doi.org/10.5014/ajot.2011.000885
- Ratzer, M., Romano, E., & Elklit, A. (2014). Posttraumatic stress disorder in patients following intensive care unit treatment: A review of studies regarding prevalence and risk factors. *Journal of Treatment and Trauma*, *3*, 1–15. http://dx.doi.org/10.4172/2167-1222.1000190
- Reade, M. C., & Finfer, S. (2014). Sedation and delirium in the intensive care unit. *The New England Journal of Medicine*, 370, 444–454. http:// dx.doi.org/10.1056/NEJMra1208705
- Reynolds, R. M., Padfield, P. L., & Seckl, J. R. (2006). Disorders of sodium balance. *British Medical Journal: British Medical Journal*, 332, 702–705. http://dx.doi.org/10.1136/bmj.332.7543.702
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 10, pp. 174–221). New York, NY: Academic Press.
- Roth, E., Davidoff, G., Thomas, P., Doljanac, R., Dijkers, M., Berent, S., . . Yarkony, G. (1989). A controlled study of neuropsychological deficits in acute spinal cord injury patients. *Spinal Cord*, 27, 480–489. http://dx.doi.org/10.1038/sc.1989.75
- Rotondi, A. J., Chelluri, L., Sirio, C., Mendelsohn, A., Schulz, R., Belle, S., . . . Pinsky, M. R. (2002). Patients' recollections of stressful experiences while receiving prolonged mechanical ventilation in an intensive care unit. *Critical Care Medicine*, 30, 746–752.
- Salisbury, D. B., Baños, J. H., Novack, T. A., & Schneider, J. J. (2005). Significance of decreased orientation performance during rehabilitation. *Rehabilitation Psychology*, 50, 174–176. http://dx.doi.org/10.1037/ 0090-5550.50.2.174
- Schmitt, M. M., & Elliott, T. R. (2004). Verbal learning ability and adjustment to recent-onset spinal cord injury. *Rehabilitation Psychology*, 49, 288–294. http://dx.doi.org/10.1037/0090-5550.49.4.288

- Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., . . Kress, J. P. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: A randomised controlled trial. *The Lancet*, 373, 1874–1882. http://dx.doi .org/10.1016/S0140-6736(09)60658-9
- Scragg, P., Jones, A., & Fauvel, N. (2001). Psychological problems following ICU treatment. *Anaesthesia*, 56, 9–14. http://dx.doi.org/10.1046/ j.1365-2044.2001.01714.x
- Sinuff, T., Giacomini, M., Shaw, R., Swinton, M., & Cook, D. J. (2009). "Living with dying": The evolution of family members' experience of mechanical ventilation. *Critical Care Medicine*, 37, 154–158. http://dx .doi.org/10.1097/CCM.0b013e318192fb7c
- Sommerfield, A. J., Deary, I. J., & Frier, B. M. (2004). Acute hyperglycemia alters mood state and impairs cognitive performance in people with type 2 diabetes. *Diabetes Care*, 27, 2335–2340. http://dx.doi.org/ 10.2337/diacare.27.10.2335
- Sprangers, M. A., Tempelaar, R., van den Heuvel, W. J., & de Haes, H. C. J. M. (2002). Explaining quality of life with crisis theory. *Psycho-Oncology*, 11, 419–426. http://dx.doi.org/10.1002/pon.601
- Stevenson, J. E., Colantuoni, E., Bienvenu, O. J., Sricharoenchai, T., Wozniak, A., Shanholtz, C., . . Needham, D. M. (2013). General anxiety symptoms after acute lung injury: Predictors and correlates. *Journal of Psychosomatic Research*, 75, 287–293. http://dx.doi.org/10 .1016/j.jpsychores.2013.06.002
- Stevenson, J. E., & Dowdy, D. W. (2012). Thinking outside the box: Intensive care unit diaries to improve psychological outcomes in family members. *Critical Care Medicine*, 40, 2231–2232. http://dx.doi.org/10 .1097/CCM.0b013e3182514c00
- Swigart, S. E., Kishi, Y., Thurber, S., Kathol, R. G., & Meller, W. H. (2008). Misdiagnosed delirium in patient referrals to a university-based hospital psychiatry department. *Psychosomatics*, 49, 104–108. http://dx .doi.org/10.1176/appi.psy.49.2.104
- Taylor, S. E., Pham, L. B., Rivkin, I. D., & Armor, D. A. (1998). Harnessing the imagination. Mental simulation, self-regulation, and coping. *American Psychologist*, 53, 429–439. http://dx.doi.org/10.1037/ 0003-066X.53.4.429
- Thoits, P. A. (2013). Self, identity, stress, and mental health. In C. S. Aneshenselj, C. Phelan, & A. Bierman (Eds.), *Handbook of the sociology of mental health* (pp. 357–377). Dordrecht, the Netherlands: Springer.
- Thomas, E. J., Levack, W. M., & Taylor, W. J. (2015). Rehabilitation and recovery of self-identity. In K. McPherson, B. E. Gibson, & A. Leplege (Eds.), *Rethinking rehabilitation: Theory and practice* (pp. 163–188). Boca Raton, FL: CRC Press.
- Torio, C. M., & Andrews, R. M. (2014). National inpatient hospital costs: The most expensive conditions by payer, 2011. *HCUP Statistical Brief* #160. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from http://www.hcup-us.ahrq.gov/reports/statbriefs/sb160 .pdf
- Turner, V. (1995). The ritual process: Structure and anti-structure. London, England: Routledge.
- Turner, V. W. (1967). The forest of symbols: Aspects of Ndembu ritual (Vol. 101). Cornell University Press.
- Van Horn, E. R., & Kautz, D. (2007). Promotion of family integrity in the acute care setting: A review of the literature. *Dimensions of Critical Care Nursing*, 26, 101–107.

- Vasilevskis, E. E., Ely, E. W., Speroff, T., Pun, B. T., Boehm, L., & Dittus, R. S. (2010). Reducing iatrogenic risks: ICU-acquired delirium and weakness—Crossing the quality chasm. *Chest*, *138*, 1224–1233. http:// dx.doi.org/10.1378/chest.10-0466
- Velilla, N. M., Bouzon, C. A., Contin, K. C., Beroiz, B. I., Herrero, A. C., & Renedo, J. A. (2012). Different functional outcomes in patients with delirium and subsyndromal delirium one month after hospital discharge. *Dementia and Geriatric Cognitive Disorders*, 34, 332–336. http://dx.doi .org/10.1159/000345609
- Volk, B., & Grassi, F. (2009). Treatment of the post-ICU patient in an outpatient setting. *American Family Physician*, 79, 459–464.
- Wade, D. M., Howell, D. C., Weinman, J. A., Hardy, R. J., Mythen, M. G., Brewin, C. R., . . . Raine, R. A. (2012). Investigating risk factors for psychological morbidity three months after intensive care: A prospective cohort study. *Critical Care*, 16, 192. http://dx.doi.org/10.1186/cc11677
- Waked, W. J., Gordon, R. M., Whiteson, J. H., & Baron, E. M. (2015). Recognizing encephalopathy and delirium in the cardiopulmonary rehabilitation setting. *Rehabilitation Psychology*, 60, 201–210. http://dx.doi .org/10.1037/rep0000026
- Warren, A. M., Stucky, K., & Sherman, J. J. (2013). Rehabilitation psychology's role in the Level I trauma center. *Journal of Trauma and Acute Care Surgery*, 74, 1357–1362.
- Weiner, B. K. (2008). Spine update: The biopsychosocial model and spine care. Spine, 33, 219–223. http://dx.doi.org/10.1097/BRS.0b013 e3181604572
- Westie, K. S., & McKeon, W. (1987, September). Multiple-family group psychotherapy in the treatment of spinal cord injury families. Paper presented at the American Association of Spinal Cord Injury Psychologists and Social Workers, Las Vegas, NV.
- Westie, K. S., Olavarria, M., & Galarneau, L. (2009, September). A successful behavioral pressure ulcer prevention program for acutely injured persons with spinal cord injury. Paper presented at the joint national conference of the American Spinal Injury Association (ASIA) and Congress of Spinal Cord Injury Medicine and Rehabilitation, Dallas, TX.
- Wilcox, M. E., Brummel, N. E., Archer, K., Ely, E. W., Jackson, J. C., & Hopkins, R. O. (2013). Cognitive dysfunction in ICU patients: Risk factors, predictors, and rehabilitation interventions. *Critical Care Medicine*, 41, 81–98. http://dx.doi.org/10.1097/CCM.0b013e3182a16946
- Williams, C. M. (2005). The identification of family members' contribution to patients' care in the intensive care unit: A naturalistic inquiry. *Nursing in Critical Care*, 10, 6–14. http://dx.doi.org/10.1111/j.1362-1017.2005.00092.x
- Wilmot, C. B., Cope, D. N., Hall, K. M., & Acker, M. (1985). Occult head injury: Its incidence in spinal cord injury. *Archives of Physical Medicine* and Rehabilitation, 66, 227–231. http://dx.doi.org/10.1016/0003-9993(85)90148-0
- Wiseman, T., Foster, K., & Curtis, K. (2013). Mental health following traumatic physical injury: An integrative literature review. *Injury*, 44, 1383–1390. http://dx.doi.org/10.1016/j.injury.2012.02.015
- Woolley, N. (1990). Crisis theory: A paradigm of effective intervention with families of critically ill people. *Journal of Advanced Nursing*, 15, 1402–1408. http://dx.doi.org/10.1111/j.1365-2648.1990.tb01782.x
- World Health Organization. (2002). *Towards a common language for functioning, disability, and health.* Geneva, Switzerland: Author. Retrieved from http://www.who.int/classifications/icf/en/

Appendix

Intensive Care Unit (ICU) and Post-ICU Resources

The following resources are available to increase awareness and knowledge among ICU and post-ICU providers. The delirium prevention site (http://www.icudelirium.org/) provides back-ground, evidence for interventions, case studies, videos and pod-casts, and other tools for implementation of delirium prevention and treatment, for example: http://www.icudelirium.org/docs/ WakeUpAndBreathe.pdf. The Michigan Health and Hospital Association's Keystone ICU Project published work on how a collaborative constructed a toolkit for the state (Dammeyer et al., 2012). The American Association of Critical Care Nurses has a web page with links to tools (http://www.aacn.org/wd/practice/content/actionpak/withlinks-ABCDE-ToolKit), and the American Nursing Association web page describes PICS and PICS amelioration at http://www.americannursetoday.com/post-intensive-care-syndrome-what-it-is-and-how-to-help-prevent-it/. The Society of Critical Care Medicine's work on http://www.iculiberation.org brings together the elements of ABCDEF with the guidelines on pain, agitation and delirium. The Intensive Care Foundation in the United Kingdom is an excellent resource for families (http://www ics.ac.uk/icf/patients-and-relatives/rehabilitation/psychologicalrehabilitation/), although U.S. families will be disappointed that the recommended ICU follow up clinics are much less available in the States (Bienvenu, 2014). An international ICU Diary Network (www.icu-diary.org) is available to assist and support use of ICU diaries. Family members can be encouraged to request follow-up services including psychological/neuropsychological care.

> Received April 30, 2015 Revision received January 22, 2016

> > Accepted January 29, 2016 ■