



Postintensive Care Syndrome: Feasibly Bridging Care at a Tertiary Trauma Center

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- BACKGROUND:** Advancements in critical care management have improved mortality rates of trauma patients; however, research has identified physical and psychological impairments that remain with patients for an extended time. Cognitive impairments, anxiety, stress, depression, and weakness in the postintensive care phase are an impetus for trauma centers to examine their ability to improve patient outcomes.
- OBJECTIVE:** This article describes one center's efforts to intervene to address postintensive care syndrome in trauma patients.
- METHODS:** This article describes implementing aspects of the Society of Critical Care Medicine's liberation bundle to address postintensive care syndrome in trauma patients.
- RESULTS:** The implementation of the liberation bundle initiatives was successful and well received by trauma staff, patients, and families. It requires strong multidisciplinary commitment and adequate staffing. Continued focus and retraining are requirements in the face of staff turnover and shortages, which are real-world barriers.
- CONCLUSIONS:** Implementation of the liberation bundle was feasible. Although the initiatives were positively received by trauma patients and their families, we identified a gap in the availability of long-term outpatient services for trauma patients after discharge from the hospital.
- KEY WORDS:** Chronic critical illness, Cognitive impairment, Critical care, Delirium, Depression, Postintensive care syndrome, Posttraumatic stress disorder

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BACKGROUND

Although admission to a trauma intensive care unit (ICU) is an unexpected and acute event, discharge from the ICU is merely the beginning of a journey to recovery for trauma survivors and their families. Over the last two decades, advances in critical care medicine, nursing, and technology have led to significant mortality improvements among patients admitted to ICUs, despite an increase in the overall severity of illness and injury (Zimmerman et al., 2013). Until recently, the primary focus of hospitalization was on physiological parameters and signs of recovery; however, current literature shows that survival from a critical injury can affect survivors' and caregivers' health in unanticipated ways (LaBuzetta et al., 2019). Brück et al. (2018) cite several studies showing a relationship between cognitive impairments and psychological outcomes, stating that up to 20% of ICU survivors have clinically significant

issues with anxiety, depression, and posttraumatic stress disorder (PTSD) the year after critical illness.

Improvements in the quality of care have engendered a growing population of ICU survivors who confront a wide range of impairments that may persist for years after hospital discharge (Brown et al., 2019). Impairments often include new or worsening weakness, muscle atrophy, cognitive impairment, delirium, decreased sleep quality, anxiety, depression, and PTSD. Millions of new ICU survivors now have a disability called postintensive care syndrome, which robs the survivor of their standard cognitive, physical, and emotional capability and limits their ability to resume their previous life (Ely, 2017). Postintensive care syndrome is defined by physical, mental, and emotional symptoms that continue after the patient moves out of the ICU (Rawal et al., 2017). Patients' survivability after admission to the ICU has increased; however, the complications of postintensive care syndrome still pose a threat (Colbenson et al., 2019). Taskar and Menon (2016) state that the most salutary lesson of critical care advancements over the last decade is minimizing iatrogenic injury, stressing its impact on cognitive function.

Although the primary purpose of a trauma center is to save patients' lives, the optimal goal is to help the trauma patient recover and be a functioning member of

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KEY POINTS

- As survival from trauma continues to increase, more patients are at risk of suffering postintensive care syndrome, defined as new or increased physical, mental, and emotional symptoms that continue after hospitalization in an ICU.
- Trauma centers should implement ICU liberation bundle activities to address postintensive care syndrome.
- ICU liberation bundles provide staff with an organized intervention framework to address postintensive care syndrome and optimize long-term trauma patient outcomes.

society (Livingston et al., 2020). The physiological and psychological effects of traumatic injury and an ICU admission can last years (Qi & Shalev, 2016). Recent research on postintensive care syndrome and its long-term impact on trauma survivors provided the impetus for this trauma center to review current practices and explore multidisciplinary initiatives to improve patient outcomes.

OBJECTIVE

This article describes one center’s efforts to intervene to address postintensive care syndrome in trauma patients.

METHODS

The setting is an American College of Surgeons verified Level II adult trauma center serving 18 counties in a primarily rural area of northeastern Georgia. Various departments within the organization implemented projects that can aid in the reduction of postintensive care syndrome. Projects that have been implemented include but are not limited to ICU liberation, progressive mobility initiative, coma stimulation therapy, PTSD screening, and dietary interventions.

ICU Liberation Bundle

We implemented the Society of Critical Care Medicine’s ICU liberation bundle, formerly the ABCDEF bundle (see Table 1) (Society of Critical Care Medicine, n.d.). The ICU liberation bundle is a quality improvement initiative designed to facilitate

pain, agitation, and delirium guidelines using the evidence-based ABCDEF bundle (Ely, 2017). The bundle aims to focus on the symptoms rather than the disease process to target postintensive care syndrome (Pun et al., 2019). Implementing the ABCDEF bundle benefits patients without regard to ventilation status in the ICU (Sosnowski et al., 2023). Critically ill patients managed with the ABCDEF bundle required 3 fewer days with breathing assistance, experienced less delirium, and were more likely to be mobilized during their ICU stay than patients treated with usual care (Balas et al., 2014). In 2017, we began implementing the ICU liberation bundle, which included the pain, agitation, and delirium guidelines and the ABCDEF

Table 2. ICU Education Key Points

Intervention	Education
Collaborative communication	Improve collaborative decision-making in daily rounds Coordinate breathing trials with respiratory therapy Work early with physical therapy to mobilize patients Understand the effects of mechanical ventilation on weakness and the ability to wean off the ventilator
Medical management and clinical assessment	Treat pain before administering sedation, then use the Richmond Agitation Sedation Scale (RASS) to guide sedation Understand the differences between sedation medications Use the ICU Confusion Assessment Method tool for all patients with an RASS >3 to detect early signs of delirium Understand differences between delirium and dementia
Family member involvement	Provide the family handbook (PICS/delirium education) Speak gently to patients using simple words Bring in sensory aids (eyeglasses and hearing aids) Decorate the room with reminders from home Provide physical comfort and emotional support
Sleep bundle	Minimize interruptions in the patient’s room Use the hospital television channel for white noise Eliminate unnecessary lights in the patient’s room Provide patients with eye covers and earplugs, when appropriate

Note. PICS = postintensive care syndrome.

Table 1. ABCDEF Bundle Interventions

Assess, prevent, and manage pain
Both spontaneous awakening trials and spontaneous breathing trials
Choice of analgesia and sedation
Delirium: assess, prevent, and manage
Early mobility and exercise
Family engagement and empowerment

bundle. The ICU educator was instrumental in developing and implementing classroom education on this ABCDEF bundle for bedside nurses and rehabilitation staff (see Table 2).

Education was provided on the correlation between oversedation, immobility, pain, and agitation on the trauma patient’s likelihood of developing postintensive care syndrome. Multiple studies have shown that low-dose ketamine is a safe and effective alternative to opiates for analgesia (Brinck et al., 2018; Pourmand et al., 2017; Schwenk et al., 2018). Similarly, dexmedetomidine provides a safe alternative to benzodiazepines for sedation, with the possible added benefit of reducing delirium (Pasero et al., 2018). Accordingly, we expanded on the ICU liberation bundle goal of reducing sedation with opiate and benzodiazepine use by enacting protocols for the monitored use of dexmedetomidine and ketamine outside the ICU.

Progressive Mobility Initiative With Physical Therapy

Another opportunity to decrease complications was the successful implementation of a progressive mobility initiative at this organization. Progressive early mobility has been shown to decrease mechanical ventilation days

and ICU length of stay, reduce physical decline and loss of muscle mass, and decrease delirium duration (Colbenson et al., 2019). Early mobilization benefits critically ill patients and enhances their recovery by reducing delirium and mortality (Wang et al., 2020). A systematic review by Menges et al. (2021) determined that intervention timing played a key role in the benefits of early mobilization. We used a multidisciplinary approach to implement progressive mobility in the ICU, incorporating rehabilitation, nursing, and trauma providers.

Additionally, the team created a visual mobility card to communicate mobility levels, barriers to safe transfer, and necessary equipment (see Figure 1). The mobility card was laminated and placed on the whiteboard inside patients’ rooms to increase visibility. The nursing and rehabilitation teams were instructed to use this mobility tool daily to track progress and identify obstacles. The trauma leadership team and nurse champions ensured compliance with this initiative by monitoring the visual mobility tool. Implementation of this mobility initiative has resulted in decreased ICU length of stay, decreased average ventilator days, decreased pressure injury rates, and decreased ventilator-associated pneumonia rates, per our trauma registry data.

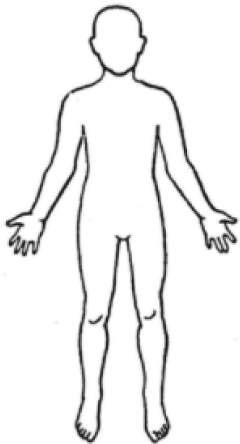










MOBILITY GOAL		WEIGHT BEARING STATUS		FALLS INTERVENTIONS		
Circle Activity Level X		Mark or write limits to mobility below				
Date:				<input type="checkbox"/> STANDARD PRECAUTIONS NO INTERVENTIONS		
 Bedrest	Right Arm/Hand			Left Arm/Hand	<input type="checkbox"/>  Leave Door Open	<input type="checkbox"/>  Bedside Commode
 Up to Chair	Right Leg/Foot			Left Leg/Foot	<input type="checkbox"/>  Bed Alarm (Zone 2)/Chair Alarm	<input type="checkbox"/>  Mat
 Walking in Hall	Other Mobility Restrictions			# Staff Needed	<input type="checkbox"/>  Hip Protector	
				<input type="checkbox"/>  Helmet		

Figure 1. Mobility card.

Addressing Cognitive Impairments

Understanding that coma stimulation therapy has the potential to significantly improve patients' Glasgow Coma Scale and their Coma Recovery Scale (Deiva et al., 2017), our occupational therapy team identified an opportunity to improve care for trauma patients by implementing a coma stimulation bundle. The goals of this bundle were to help the patient organize thought processes and increase the patient's awareness of the environment by addressing one sensory area at a time, limiting the background activity and noises to a minimum, limiting sessions to approximately 15 minutes and limiting visitors to two individuals during this therapy. Coma or sensory stimulation programs improve patient consciousness level and cognitive function (Moattari et al., 2016). The coma stimulation bundle (see Table 3) includes activities for nursing, rehabilitation, and family. Family participation is highly encouraged by explaining the benefits of simple activities such as reading aloud to the patient, playing simple card games with the patient, and encouraging the patient to take time to sleep.

This coma stimulation therapy begins in the ICU and continues throughout the patient's hospitalization. Implementing early coma stimulation therapy can enhance cognitive recovery (Mandeep, 2012). A handout was also developed for families to understand their role in the patient's cognitive recovery. Education on the coma stimulation bundle, understanding the Rancho levels, and appropriate interventions for each Rancho level were developed by our occupational therapists and provided to staff caring for trauma patients.

Table 3. Coma Stimulation Bundle

Senses	Interventions
Vision	Encourage patients to open their eyes Move objects and encourage patients to track with eyes Change room lighting to encourage sleep/wake patterns Show bright colors and lights Include photographs of family, friends, and pets in room
Tactile	Stimulate the skin by using gentle massage Touch the patient's hand with a variety of textures while describing how it feels Encourage family to touch the patient
Olfactory	Provide and identify a variety of pleasant scents
Gustatory	Ensure that patients can eat food by mouth Present and identify various foods/flavors
Auditory	Encourage family to talk to the patient Play the patient's favorite music for short intervals Describe sounds you hear in the room

Posttraumatic Stress Disorder Screening and Interventions

Realizing that ICU survivors are at an increased risk for developing long-term psychopathology issues such as PTSD, Hatch et al. (2018) reported a prevalence of 46%, 40%, and 22% for anxiety, depression, and PTSD 1 year after hospital discharge. The American College of Surgeons, Committee on Trauma (ACS-COT, 2022) has highlighted the impact of PTSD after a patient has experienced a traumatic injury, stating that 20%–40% of these patients develop PTSD. The ACS-COT requires trauma centers to develop ways to assist patients in adjusting to their postinjury life outside the hospital.

As described by Lee (2023), our team now includes a trauma nurse navigator who visits with trauma patients in the hospital, provides education (regarding injuries, treatment plans, medications, and rehabilitation plans), serves as a patient resource, and utilizes creative problem-solving to optimize care. In 2021, our trauma nurse navigator developed and implemented a program to complete PTSD screenings on trauma patients, document results in our electronic health record, and include a discussion with the patient on acute stress after a traumatic injury (Lee, 2023). Although many patients are open to talking with our trauma nurse navigator about their traumatic event and the psychosocial implications on their life, our hospital-based mental health team is also available to evaluate the patient, provide counseling sessions as needed, and develop a follow-up plan.

Dietary Interventions

Critically injured trauma patients may lose 16% of their total body protein in 3 weeks, 67% of which comes from skeletal and diaphragmatic muscles (Mendez-Tellez & Needham, 2012). Interventions were implemented to include the inpatient dietician during multidisciplinary rounding, as needed, to determine the number of calories, protein, fluids, and any particular vitamins a patient needs based on their height, weight, condition, and medical history. Nutritional supplement drinks may also be offered with meals to provide extra calories and protein.

RESULTS

Since 2017, the organization has implemented the ICU liberation bundle, progressive mobility initiative, coma stimulation bundle, PTSD screening, and dietary intervention. Trauma patients are being mobilized earlier, and our staff has seen that this step encourages patients to work more diligently with our physical therapy team. Early mobilization has also resulted in fewer days of breathing assistance needed by trauma patients. The coma stimulation bundle has helped patients and

families understand their traumatic injuries and provided specific tools to improve their cognitive impairments. These interventions have empowered our trauma patients to become more proactive in their rehabilitation and recovery.

One significant barrier has been staffing. Over the past 3 years, our inpatient rehabilitation leadership team has added 21 additional full-time positions to accommodate increased patient needs, including six additional physical therapists, five physical therapy assistants, five occupational therapists, two occupational therapy assistants, and three speech–language pathologists. Although these additional rehabilitation positions are not dedicated solely to trauma, it has made our rehabilitation therapists more available to our trauma patients. Even with these additional therapists, there is still an opportunity for increased rehabilitation staff on weekends.

Although these initiatives were making considerable progress, sustaining them during COVID was extremely difficult. Many temporary changes had to be made to our ICUs and medical/surgical units to accommodate the large numbers of COVID patients. Additionally, there were issues with nursing shortages, an increase in temporary agency nurses, nursing turnover, and team members who left the hospital environment for various reasons. Some of our valuable nurse champions have moved on to other hospitals, which gives us the opportunity and responsibility of empowering new employees with the passion and education to improve the long-term outcomes of patients.

DISCUSSION

Although we have made noteworthy progress in addressing postintensive care syndrome in trauma patients, research on this topic is blossoming. A recent study discussed the implementation of a multidisciplinary clinic to examine postintensive care syndrome in trauma and acute care surgery patients who spent at least 72 hours in the ICU (Bottom-Tanzer et al., 2021). In this study, an excessive proportion developed postintensive care syndrome, as demonstrated by physical impairments (96.2% of patients), cognitive impairments (34.6% of patients), and psychiatric impairments (40.4% of patients). Additionally, this study found that only 26.4% of previously employed patients had resumed work within the year after traumatic injury. Unfortunately, this study did not disclose the financial cost of implementing this multidisciplinary critical care outpatient clinic or discuss the societal costs of traumatically injured patients who do not return to the workforce. These statistics and other current research continue to stress the impact of intensive care stay on patients' lives and the need for change.

As our trauma team continues to focus on improving patient care and outcomes, research on the use of ICU diaries has been noted. The ICU diary is a tool to help patients gain clarity of their time in the ICU and aids patients in connecting their flashbacks and delusional memories to actual events (Levine et al., 2018). ICU diaries benefit patients following an ICU admission by reducing depression and improving quality of life (Barreto et al., 2019). McIlroy et al. (2019) showed a significant improvement in the quality of life following the use of an ICU diary with survivors of critical illness and called for further investigation of this topic. We recently received a hospital-funded change grant to implement ICU trauma diaries.



CONCLUSIONS

This trauma center successfully implemented multidisciplinary interventions to improve patient care and outcomes targeting postintensive care syndrome. The greatest challenge in maintaining these initiatives is the continued resolve of nursing, physician, and rehabilitation champions to work with and train new trauma team members on the importance of continuing these initiatives. Although we realize that our inpatient initiatives have had positive results with our trauma patients and their families, we have identified a gap in the availability of care and services for these patients after discharge from the hospital. Postintensive care syndrome remains underrecognized and complex to treat. Our experience with these initiatives and ongoing research shows that many trauma patients struggle with long-term symptoms for years, and there are no easy solutions to their problems.

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