

Posttraumatic Stress Disorder and Anesthesia Emergence

Donnamarie Lovstrand, RN

MAJ P. Steven Phipps, CRNA, USAR

Steven Lovstrand, PhD

Emergence agitation or delirium is a known phenomenon in the postanesthesia period. The underlying cause is not definitively understood. In a US Army hospital's postanesthesia care unit, combat-related posttraumatic stress disorder (PTSD) can complicate interventions. Scant evidence-based research exists on the issue. By presenting case studies of 2 patients who underwent different surgical procedures, the authors argue that traditional modalities to reorient and calm patients experiencing emergence agitation who have PTSD are not shown to be effective. The first procedure demonstrates outcomes in a situation handled through traditional interventions. The second procedure demonstrates outcomes after incorporation of

evidence-driven interventions. The authors conclude that best practice includes a proper identification of patients at risk of emergence agitation, a minimally stimulating environment, intraoperative sympatholytic therapy, and patient and staff education. Although the case studies presented support these principles, research is needed to provide stronger evidence. Military medical and research personnel can take the lead on this issue and be a source for improved outcomes and high-quality patient care.

Keywords: Emergence agitation, emergence delirium, flashbacks, general anesthesia, posttraumatic stress disorder.

Emergence agitation in the general population is characterized by restlessness and confusion, with an overall occurrence of 4.7%.¹ However, in a recent study, a Certified Registered Nurse Anesthetist (CRNA) suggests that the occurrence of emergence delirium among combat veterans could be 20%.²

In our postanesthesia care unit (PACU) in a US Army community hospital, nurses witnessed a particular pattern of emergence from anesthesia in 5 different soldiers over a span of 6 months. Contrary to a normal agitation presentation, these soldiers reexperienced battlefield events after general anesthesia, which mentally placed them in a combat situation. In conjunction with the flashbacks, these soldiers attempted to get out of bed to “get to the lines,” pulled at monitoring equipment, and yelled battle instructions. Attempts to reorient by the conventional method of verbal reorientation proved ineffective. In addition to the conventional nursing method of reorientation, fellow soldiers placed at the bedside to provide familiarity proved ineffective in reorientation. A common denominator in the history of these patients was a prior exposure to combat and likely posttraumatic stress disorder (PTSD).

The nursing staff was perplexed by the ineffectiveness of standard nursing practice and interventions. Therefore, we initiated a search for evidence-based practice guidelines for patients with PTSD and any association of PTSD with emergence agitation. The search produced a substan-

tial amount of literature for the treatment, diagnosis, and nursing interventions for PTSD in the outpatient setting. However, a gap exists in the treatment of patients with PTSD in the acute care setting, in particular during emergence from anesthesia. Anesthesia providers consider the time of emergence from anesthesia more difficult to control than other phases of anesthesia.³ Furthermore, psychiatric disease is not commonly identified by surgeons in the preoperative assessment as a comorbid condition and a potential cause for complications.⁴ Therefore, in an effort to provide evidence-based practice in the anesthetic care of soldiers experiencing this phenomenon, the first author performed a literature search, which yielded little in the way of best practice. Because there is a huge void in the literature, the purpose of this article is to report on the care and recommendations resulting from 2 case studies of soldiers with suspected PTSD who underwent surgical procedures. In addition, the authors hope to stimulate research on the perianesthesia best practice of the care of the soldier with PTSD.

Posttraumatic Stress Disorder

Posttraumatic stress disorder is an anxiety disorder which the classification in the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision), or *DSM-IV-TR*, describes as exposure to a traumatic event followed by a triad of symptom clusters, including re-experiencing, avoidance/numbing, and hyperarousal.⁵ In the case of combat-related PTSD, the soldier experi-

ences a trauma such as from injury in combat, witnessing injury or death in combat, or experiencing the threat of death or injury. After that traumatic event, the individual continues to reexperience the event through nightmares or intrusive thoughts. The patient develops hyperarousal symptoms along with cognitive biases that cause him or her to perceive as dangerous that which objectively is not considered dangerous. As a response, the patient avoids perceived stimuli associated with the trauma.⁶ These symptoms tend to support each other: intrusive memories can lead to increased anxiety, and nightmares can lead to sleep disturbances. Patients with PTSD can experience triggers that may cause flashbacks to the initial trauma, in which patients act as if the original event is recurring. The incidence of PTSD-related flashbacks is not known, but 11% to 20% of all combat veterans of the Iraqi and Afghanistan conflicts experience PTSD,⁷ many of whom may go undiagnosed for years. Many more soldiers may experience some signs and symptoms of PTSD that are below the threshold for diagnosis.

The literature suggests a relationship between PTSD and neurobiological functioning, including alterations in catecholamine, hypothalamic-pituitary-adrenocorticoid, and neurotransmitter system functioning.⁸ In light of these documented neurobiological causes of PTSD, surgery and anesthesia may be considered potential triggers for flashbacks.

Case Reports

• **Case 1.** A 30-year-old, 172.7-cm (68-in) man who underwent elective repair of a right inguinal hernia had a severe presentation of flashbacks in our PACU. The experience of this patient provided the stimulus for this exploration. He gave no history of PTSD, but current medications included amitriptyline and sertraline. Although amitriptyline (Elavil) and sertraline (Zoloft) are agents used in the treatment of psychiatric disorders, at the time of preoperative assessment and treatment planning, we did not attribute any clinical significance to these medications. The preoperative nurse anesthetist did not have access to behavioral health records; therefore, the indications for these medications were unknown to the surgical staff.

The patient received midazolam, fentanyl, lidocaine, propofol, hydromorphone (Dilaudid), dexamethasone, and ondansetron intraoperatively. After an uneventful operative anesthetic course, during emergence from anesthesia in the PACU, the patient began to have flashbacks. He was convinced he was back in battle and had to get to his buddies who needed his help. Civilian staff members attempted to reorient the patient but were unsuccessful. Military staff attempted to gain control of the patient's orientation through military language such as addressing him by rank and issuing orders, but these attempts also were unsuccessful. The patient was placed

in a private room to promote a quiet environment. At this point, his wife was briefed on the patient's status and was brought to the bedside in order to bring familiarity to the patient, but this was also unsuccessful. One and a half hours later, the patient began experiencing postoperative nausea and vomiting (PONV); we treated this with a repeated dose of ondansetron, with no effect, and then with promethazine, which relieved his PONV and also sedated him. When he awoke following treatment of PONV, he was fully oriented to reality.

Questions arising from this situation included the following: Why could we not reorient this soldier with family members and fellow soldiers; did the promethazine produce any effect that caused reorientation; did any anesthetic agent produce this scenario; did pain play a part in the scenario, and was the PONV a sequela of the emergence delirium?

• **Case 2.** A 21-year-old, 175.2-cm (69-in), 77-kg man presented for a preoperative assessment for elective removal of bilateral breast tissue. His case is presented as an example of attempts at anesthetic and PACU nursing interventions through the continuum of the perioperative period after staff education and a literature review. This patient had a history of a traumatic brain injury and PTSD. No history of preexisting psychiatric disease or substance abuse before the traumatic brain injury was noted. He returned from deployment approximately 3 months before this planned surgery. During the preoperative anesthesia assessment, the patient's behavior was evaluated for body language suggestive of mild hyperarousal. The patient was also assessed for any evidence of self-harm. None was noted. After the initial anesthesia and PACU staff assessment, a collaborative plan of care was developed with anesthesia and nursing with the new-found information gleaned from the staff research.

• **Anesthetic Plan of Care.** The anesthetic plan was formulated with knowledge gathered after case 1 occurred. The plan included identifying patients at risk of PTSD symptoms. Once the anesthetist identified the history of PTSD in case 2, he set the goals of minimizing noxious irritating stimuli; providing a positive, quiet, reassuring environment; and optimal analgesia. All staff members providing care throughout the continuum of the patient's surgical stay (preoperative, intraoperative, and postoperative) who came into contact with the patient were informed of the patient's specific care needs. The staff emphasized providing a quiet, comfortable, and calming environment, especially during induction and emergence.

Medications included midazolam, fentanyl, propofol, ondansetron, dexamethasone (Decadron), ketorolac, and clonidine. The surgeon also localized the operative areas with bupivacaine (Marcaine). Intraoperative sympatholytics (clonidine) were employed to reduce stress emergence from anesthesia by decreasing catecholamine release from the central nervous system.⁹ Clonidine is an

α 2 agonist. When it binds to α 2-mediated receptors, it decreases presynaptic calcium levels, thus inhibiting the release of norepinephrine. This decreases sympathetic tone and, in turn, decreases the sympathetic cascade, which is associated with flight or fight response.¹⁰ To achieve optimal pain control, we used local anesthetics and long-acting opioid (morphine).¹¹ Although midazolam was used in this case, we avoided benzodiazepines in later cases because they have a relative contraindication in PTSD¹² and are known to produce postoperative confusion.¹ The same anesthetist cared for the patient throughout the preoperative and perioperative course. The patient received a balanced general anesthetic with a deep extubation (part volatile anesthetic gases and part intravenous anesthetic) in an effort to minimize the risk of emergence delirium that is commonplace with an awake extubation from total volatile anesthetics. Although desflurane has a low brain solubility and may have implications in this issue, our hospital does not have access at present to desflurane vaporizers because of hospital contractual limitations. The providers had access only to sevoflurane, isoflurane, and nitrous oxide.

We notified the PACU staff before the arrival of the patient from the operating room in order to prepare a minimally stimulating environment. We provided immediate orders for pain control in the PACU to avoid an uncontrolled pain response. The plan also included the attendance of the anesthetist, or a 1:1 registered nurse in the PACU with the patient until he completely awoke from the anesthetic. We allowed family and friends to be at the bedside as soon as possible with respect to maintaining a minimally stimulating environment. The patient had an uneventful anesthetic course and smooth emergence from anesthesia. Care of the patient transferred to the PACU staff.

• *Postanesthesia Care Unit Nursing Plan of Care.* In addition to routine perioperative patient teaching, the nursing plan of care included providing preoperative patient and family teaching regarding the possibility of flashbacks. The nurse could then integrate patient and family concerns into the plan of care and build an environment of trust. Staff provided a quiet, calm, and safe environment, including the presence of other soldiers in the PACU should they be needed for orientation and safety issues. The same nurse and the same anesthetist cared for the patient throughout the perioperative course, which we recognize may not be logistically possible in all cases.

With the normal discharge instructions related to surgical site care and precautions, we combined information regarding the Army's RESPECT-Mil (Re-Engineering Systems of Primary Care Treatment in the Military) program, which is a collaboration between psychiatric and primary care providers, as a vehicle for the patient to follow up with PTSD issues.¹³ Although a universal screening tool is used at each visit to any soldier's primary

care provider in RESPECT-Mil, this patient did not see his primary care provider before surgery. Our military hospital incorporates an in-house outpatient behavioral health unit. This unit provides sources for individual counseling, drug and alcohol abuse, and suicide prevention.

Discussion

In this case report we have described our experience in perioperative care for 2 soldiers with PTSD, one of whom experienced emergence agitation and subsequent changes in practice. These perioperative care techniques are highlighted in the Table. Although preoperative planning and interventions in emergency situations in the PACU are part of routine work, the staff must be vigilant for the occurrence of unusual challenges such as might occur with a patient with PTSD. The military hospital must be prepared to meet the needs of its specific population. First, as evidenced through case 1, the preoperative assessment should include medication reconciliation to identify medication used for psychiatric conditions. Medications such as prazosin, used specifically for persistent nightmares, raise the index of suspicion as to the risk of complications during anesthesia emergence. Additionally, both military and civilian hospitals need to be alerted to PTSD symptoms because, as soldiers complete their terms of service or retire from the military, increasing numbers of veterans with PTSD symptoms will be treated by civilian healthcare facilities. Both military and civilian hospitals could benefit from an evidence-based plan of care for the patient with flashbacks in the PACU. To develop that plan of care, we consider pharmacologic and nonpharmacologic interventions.

• *Pharmacologic Psychiatric Considerations.* Of the wide variety of treatment options for PTSD, only some lend themselves to the perioperative period. Treatment of PTSD in the outpatient setting includes psychotherapy and pharmacologic therapy.¹⁴ Both modalities were taken into consideration in the plan of care for the patient in case 2. Pharmacologically, prazosin has been identified as effective in the treatment of nightmares and sleep disturbances in PTSD. It is part of the outpatient plan of care in the Army's medication regimen for such problems.¹⁵ Selective serotonin reuptake inhibitors (SSRIs), which are routinely prescribed in the outpatient treatment of depression, are also used for treating anxiety disorders such as PTSD. Two of them, paroxetine and sertraline, carry indications from the Food and Drug Administration for PTSD. However, others in the SSRI class and medications in the serotonin norepinephrine reuptake inhibitor class are also used. The onset of action for these oral agents, however, is generally in the 2- to 6-week range, which limits their utility in the perioperative setting.

Other agents have been useful in perioperative settings. Clonidine and trazodone have been noted to help with sleep disturbances. Clonidine is available in an

Timing of care	Standard practice	PTSD treatment recommendations
Preoperative assessment	PTSD not a consideration	Include specific history of PTSD in assessment
	No special significance given to psychiatric medications on reconciliation	Alert to psychiatric medications, especially those prescribed for nightmares
	Patient teaching does not include preparation for emergence agitation	Focus patient teaching on emergence agitation and interventions
Intraoperative concerns	Standard use of benzodiazepines	Avoid use of benzodiazepines, particularly midazolam
	Avoidance of ketamine when PTSD is known in history	No need to avoid use of ketamine
	No routine pharmacologic interventions to reduce risk of emergence agitation	Intraoperatively administer clonidine, dexmedetomidine, droperidol, promethazine
After anesthesia to discharge	No attention paid to PACU noise level	Provide a minimally stimulating environment
	Staffing based on availability	Employ the principle of consistency
	No psychiatric referrals	Refer to RESPECT-Mil and other appropriate programs

Table. Proposed Perioperative Care for Soldiers With Posttraumatic Stress Disorder

Abbreviations: PACU, postanesthesia care unit; PTSD, posttraumatic stress disorder; RESPECT-Mil, Re-Engineering Systems of Primary Care Treatment in the Military.

intravenous preparation and was therefore used intraoperatively in this case. One Army medical center uses dexmedetomidine to prevent emergence agitation in at-risk patients.¹⁶ Dexmedetomidine is more costly than clonidine. Anxiolytics may be indicated. Lorazepam is preferred in PTSD over midazolam because some literature suggests that midazolam enhances the patient's memory of events surrounding the trauma.¹⁷ Despite intuitive concern that ketamine may initiate or worsen PTSD, current research suggests the opposite with ketamine.¹⁸ Ketamine as an analgesic and anesthetic has been shown to possibly reduce the incidence of PTSD¹⁹ but was not used for this patient. The use of stellate ganglion block for the treatment of combat-related PTSD is being investigated, but for these purposes seems too invasive for consideration without substantiation that less invasive methods are ineffective.²⁰ The literature on the use of atypical antipsychotic agents is inconclusive for efficacy in PTSD, although ziprasidone in parenteral form could be studied for perioperative use.¹²

• **Nonpharmacologic Psychiatric Considerations.** In the outpatient psychiatric setting, PTSD is treated with a combination of relaxation training, graduated reintroduction to triggering situations that have been avoided, along with cognitive therapy regarding the original traumatic event and discussion of the trauma to facilitate emotional processing. These occur in the context of a trusting relationship with a caring, consistent therapist.⁸

Although these treatment methods are not available in the perioperative setting, we were able to incorporate the principle of consistency. After the experience of case 1 and subsequent research into best practice, the PACU

staff assigned the same staff to the second patient in order to promote orientation. The same nurse anesthetist who performed the preoperative assessment also was the anesthetic provider during the procedure. The same registered nurse who performed the nursing preoperative assessment was the caregiver in the PACU and provided the discharge instructions to the patient and family. We also incorporated the principle of relaxation by attempting to provide a minimally stimulating environment.

• **Future Considerations.** Future considerations for research would include investigating the efficacy of the quiet environment, the presence of other soldiers or family in calming or orienting the patient, the interactions of anesthetic agents on flashbacks in the PTSD population, and the appropriate use of antipsychotic agents with anesthesia. Limited research is available on the effects of midazolam, morphine, and ketamine intraoperatively in the patient with PTSD. The trigger events during the perioperative period are not isolated. An exploration of the potential trigger events for PTSD flashbacks in the PACU is in order. Some suggestions include pain, specific anesthetic agents, induction of the sleep state, confusion, noise stimuli, and the unfamiliar environment. One level 1 Army trauma center routinely uses touching the foot as the only type of tactile stimuli in order to reduce the risk of eliciting fear in touching the upper body of a soldier. Anecdotally, some soldiers have corroborated the effectiveness of the "foot touch" in reducing agitation in waking soldiers.

Currently, the team in our Army PACU is identifying any soldier with a diagnosis of PTSD or who already has documented sleep disturbances and nightmares as being

at higher risk of flashbacks. Once the risk is identified, we plan special anesthetic and nursing interventions as listed in this article. Most information on the nursing care of patients with PTSD-related flashbacks is weak evidence.²¹ A network throughout the military that consolidates experiences, data, and expertise will maximize the likelihood of the development of an evidence-based nursing and anesthetic plan for this population of patient. The civilian world looks to the military world for expert opinion on issues peculiar to military experience. Because data are needed for the military and civilian environments, we cannot ignore the mission to address this phenomenon.

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AUTHORS

Donnamarie Lovestrand, RN, the principal author, works as a staff nurse in the postanesthesia care unit at Bayne-Jones Army Community Hospital, Fort Polk, Louisiana, and is an MSN graduate student. Email: Donnamarie.d.lovestrand.civ@mail.mil.

MAJ P. Steven Phipps, CRNA, USAR, is a CRNA Army reservist who works at Dartmouth Hitchcock Medical Center in Lebanon, New Hampshire, and recently served duty at Bayne-Jones Army Community Hospital.

Steven Lovestrand, PhD, is a clinical psychologist at Bayne-Jones Army Community Hospital.

ACKNOWLEDGMENT

The authors would like to acknowledge the editorial assistance of Roy Beltz, PhD; William Disch, PhD; and COL(ret) Thomas Ceremuga, CRNA, PhD.

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