A Perioperative Intervention to Prevent and Treat Emergence Delirium at a Veterans Affairs Medical Center

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Emergence delirium (ED) is a temporary condition associated with a patient awakening from an anesthetic and/or adjunct agent (e.g., sedatives and analgesics). During the condition, patients risk harming themselves or staff by engaging in dangerous behavior, which may include thrashing, kicking, punching, and attempting to exit the bed/table.

A multidisciplinary team at Veterans Affairs Pittsburgh Healthcare System (VAPHS) developed and implemented a multicomponent intervention to reduce the severity and occurrence of ED. The intervention consists of a training component and 21 clinical components. The 21 clinical components are implemented on a patient-by-patient basis and include routine screening for risk factors, enhanced communication among staff, adjusting the environment, following a specific medication strategy, and application of manual restraint (hands-on). The authors provide 15 online **Supplemental Materials** (**S1–S15**) to promote replication of the intervention.

To our knowledge, this is the first manuscript that describes this type of multicomponent intervention in sufficient detail to allow others to replicate it. Following implementation of the intervention at VAPHS, perioperative staff reported that they observed a substantial reduction in the occurrence and severity of ED, ED-related patient and staff injuries, and ED-related loss of intravenous access and airway patency. Despite staff's reported success of the intervention, rigorous research is needed to evaluate the efficacy of the intervention.

Keywords: *general anesthesia, monitored anesthesia care, MAC, post-traumatic stress disorder, PTSD, trauma, military veteran, agitation, aggression, PACU, propofol, dexmedetomidine, ketamine, midazolam, volatile anesthetic*

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Introduction

Emergence delirium (i.e., agitation or excitation) is a temporary behavioral condition associated with a patient awakening from an anesthetic and/or adjunct agent (e.g., sedatives and analgesics).[1-6] The condition is characterized by a wide range of patient behaviors and may include hallucinations, thrashing, kicking, punching, and attempting to exit the bed/table.[1,2,4-6]

At Veterans Affairs Pittsburgh Healthcare System (VAPHS), occurrences of emergence delirium (ED) have resulted in patients' loss of intravenous (IV) access and/or airway patency and have contributed to patient and staff injuries. Among the veteran patients at VAPHS, like at most VA healthcare facilities, many have a history of post-traumatic stress disorder (PTSD), which is a risk factor for ED.[6,7] As a result, ED was a considerable challenge at VAPHS and further intervention was needed to prevent and treat ED.

Previous literature proposed an outline of a multicomponent intervention to prevent and treat ED;[1,6,8] however, to our knowledge, none have published a detailed description of their intervention and supporting materials. Staff at VAPHS developed and implemented a multicomponent intervention to reduce the occurrence and severity of ED. The purpose of this manuscript is to describe the intervention in sufficient detail to allow others to replicate it.

Patients, Staff, and Setting

The Veterans Health Administration (VHA) is the largest integrated healthcare system in the United States, with 171 medical centers and serving approximately 9 million veterans each year.[9,10] Based on a patient sample from a recent national study, VHA patients were an average age of 57.5 years, 88.5% were male, 46.8% had a substance use disorder, 40.2% received mental health treatment, 31% had chronic pain, 30.1% had a sleep disorder, 21.8% had PTSD, and 0.7% had a traumatic brain injury.[11] Based on these rates of diagnoses/conditions among veteran patients and findings from previous studies of risk factors for ED,[1,5-8,12-16] the veteran population is at higher risk for ED compared to the general population.

This project was conducted at VAPHS's Level I medical center, which has 146 acute care beds and in 2020 served 72,647 patients.[17] During that same year, more than 9,078 procedures involved anesthesia (e.g., operating rooms, gastrointestinal, electrophysiology). The anesthesia department at VAPHS consists of 43 anesthesia providers, including 11 physician anesthesiologists and 32 certified registered nurse anesthetists (CRNAs), and each year approximately 10 student registered nurse anesthetists (SRNAs) and 48 physician anesthesia residents are trained. The anesthesia department practices a physician and CRNA team model; the attending physicians are assigned to one to three sites with one CRNA in attendance per site. During a surgical case in an operating room, the non-anesthesia staff vary depending on the case and patient acuity, but typically the following are present: one surgical technician, one surgical scrub registered nurse (RN), one circulating RN, and an attending surgeon.

Timeline of the Intervention

As shown in **Figure 1**, a multidisciplinary team began development of the multicomponent intervention in May 2017 and implementation began in June 2018. Implementation was kicked off at an anesthesia staff meeting and, during a five-month period, 17 training sessions were conducted that involved a total of 175 perioperative staff members (anesthesia providers, operating room nurses, gastrointestinal nurses, surgical technicians, preoperative and post-anesthesia care unit [PACU] nurses, medical residents, and SRNAs). By October 2018, nearly all required staff completed the training; thereafter, training continued to be offered to unrequired staff, all current staff as a "refresher," and to new staff.

Figure 1. Timeline of the Intervention

Table 1. Materials Supporting Staff Training and the Intervention

TItle of Material	How Material is Used	Supplemental Material #
Essentials of the Intervention	Clinical Reference	S1
Clinical Components of the Perioperative Intervention to Prevent and Treat Emergence Delirium	Clinical Reference	S2 (duplicate of **Table 2**)
PAASO Form: Preoperative Anesthesia Assessment, Medication Strategy, and Outcome	Clinical Documentation	S3
Timeline of Anesthesia Activities and Perioperative Care	Clinical Reference	S4
Medication Strategy for Emergence Delirium	Clinical Reference	S5
Literature Review in Support of the Medication Strategy	Clinical Reference	S6
General Information	Training (Lecture and Hands-On)	S7
Agenda	Training (Lecture and Hands-On)	S8
Perioperative Intervention To Prevent and Treat Emergence Delirium (PowerPoint, 19 slides plus talking points)	Training (Lecture)	S9
Outline of Phases, Roles, and Materials	Training (Hands-On)	S10
Prebrief	Training (Hands-On)	S11
Guided Practice	Training (Hands-On)	S12
Simulation Pre- and Post-Scenario Talking Points	Training (Hands-On)	S13
Simulation Scenarios 1 and 2	Training (Hands-On)	S14
Simulation Checklist	Training (Hands-On)	S15

Note: Training ranges in duration from 60 to 120 minutes, depending on time constraints. **Supplemental Materials S1-S15** are available as editable Word and PowerPoint files on the webpage for this article (Vol. 4, No. 4 at PatientSafetyJ.com). We encourage readers to download and customize the files to meet their clinical needs.

Description of the Multicomponent Intervention

The intervention, consisting of a training component and 21 clinical components, was revised and enhanced throughout the project. All online **Supplemental Materials** (**S1–S15**) were developed by the authors of this manuscript. In this section we describe the most current version of the intervention in detail to promote replication and to reduce effort, time, cost, and other barriers to implementation.

The training component involves a lecture and hands-on training of staff, which entails guided practice and simulation with a patient actor (e.g., standardized patient). Each training session covers all clinical components of the intervention and ranges in duration from 60–120 minutes. Each training is conducted by two or more instructors who collectively have expertise in all areas of the intervention. For more information about the training, see **Table 1** and online **Supplemental Materials S7–S15**.

Following the staff training, the clinical components of the intervention are implemented on a patient-by-patient basis (**Table 2**). Anesthesia providers at VAPHS, like at most healthcare facilities, have a high degree of autonomy in their practice, including choice and timing of medications. Nevertheless, many of the providers and staff at VAPHS chose to implement the 21 clinical components. For more information about the clinical components of the intervention, see **Table 2**, online **Supplemental Materials S1–S6** and **S9–S15,** and the following subsections.

Table 2. Clinical Components of the Perioperative Intervention to Prevent and Treat Emergence Delirium

Phases	Clinical Components	Supplemental Material #
Patient evaluation with individualized plan[1,6,8]	1. Use the PAASO Form to conduct a preoperative anesthesia assessment A. Review patient's record and interview patient to assess (screen) for emergence delirium risk factors B. Meet with the high-risk patient and family to gather information to facilitate wake-up	S1–S3, S9
	2. Communication; call ahead to procedure room to initiate intervention protocol	S1, S2, S9
Preoperative actions[1,6,8]	3. Communication; patient wears a unique colored surgical cap and bracelet to help staff recognize them as high-risk for ED	S1, S2, S9
	4. Adjust environment A. Low stimulation B. Prepare equipment/apparatuses to mitigate risk in the event of dangerous behavior	S1, S2, S9
	5. Follow medication strategy and document in the PAASO Form	S1–S6, S9
	6. Communication during time-out A. Remind staff of patient's high risk for ED B. Inform staff of IV location and type of airway (e.g., O2 mask, endotracheal tube)	S1, S2, S9
Intraoperative actions[1,6,8]	7. Follow medication strategy and document in the PAASO Form	S1–S6, S9
	8. Communication; as case concludes, call the recovery room/ post-anesthesia care unit to initiate intervention protocol	S1, S2, S9
Postoperative actions[1,6,8]	9. Adjust environment A. Low stimulation B. Prepare equipment/apparatuses to mitigate risk in the event of dangerous behavior	S1, S2, S9
	10. Communication; consider proactively requesting additional staff due to anticipated risk for ED	S1, S2, S9
	11. Staff should be prepared to protect IV access and maintain the airway	S1, S2, S9, S10, S12, S13, S15
	12. Follow medication strategy and document on the PAASO Form	S1–S6, S9
	13. Use the PAASO Form to document the patient's outcome and note in patient's record	S1–S3, S9
Actions in response to an episode of emergence delirium[1,6,8]	14. Communication; if needed, call for immediate staff support by using a standardized code (e.g., Anesthesia stat!)	S1, S2, S9, S10, S13, S15
	15. If needed, staff should apply manual restraint (hands-on) to the patient to mitigate risk of harm to the patient and staff (note: special training and technique are required to ensure safety)	S1, S2, S9–S15
	16. If needed, follow medication strategy	S1, S2, S4–S6, S9, S10, S13, S15
	17. Attempt to orient the patient by stating familiar people and places (e.g., patient name, partner name, location of hospital)	S1-S3, S9, S11, S13–S15
Actions following an episode of emergence delirium[1,6,8]	18. Debrief meeting with patient and family, which includes providing them with a prepared brochure about emergence delirium and a referral to behavioral health, if desired	S1, S2, S9
	19. Debrief meeting among staff to discuss alternative explanations for the ED and the effectiveness of their intervention	S1, S2, S9
	20. If applicable, in the PAASO Form document any medications administered in response to emergence delirium	S1–S3, S9
	21. If applicable, file an event report with the patient safety office or risk management, and add a detailed note to the patient's record	S1–S3, S9

Note: The supplemental materials consist of information that either directly pertains to staff skill development (training or clinical reference) or are a tool integral to the clinical component.

Preoperative Anesthesia Assessment, Medication Strategy, and Outcome (PAASO) Form. Anesthesia providers and PACU nurses use the PAASO Form with the following objectives: identify (screen) patients who are at an elevated risk for ED, gather information to orient the patient upon emergence, facilitate patient hand-offs between staff, guide and document the medication strategy, and facilitate collection of information for the patient's record. Additionally, the form was designed to improve continuity of care, track and trend the intervention integrity (i.e., implementation fidelity) across staff, and monitor the overall effectiveness of the intervention. Without routine screening for risk factors, anesthesia providers may not adjust their individualized anesthesia care plan to account for the patient's risk status. VAPHS providers reported that patients who were identified as high risk for ED frequently had a history of the following risk factors: ED, PTSD, traumatic brain injury, and/or had been sexually assaulted. We urge those who adopt this intervention to reliably use the PAASO Form and create a dashboard to monitor the intervention. For more information about the PAASO Form and instructions for use, see **Table 2** and online **Supplemental Materials S1–S3** and **S9**.

Communication Between Staff. Communication is an important part of the intervention and is used in each of the phases identified in **Table 2**. Most of the communication between staff related to the intervention occurred during transitions from one phase to another and in response to ED. For additional information about the communication strategy, see online **Supplemental Materials S1, S2, S9, S10, S13,** and **S15**.

Adjust Environment. Preoperatively and postoperatively, staff attempt to create a low stimulation environment by moving the patient to a lower traffic area (e.g., private bay), dimming the lights, reducing noise, and consolidating/limiting unnecessary staff interactions (e.g., avoid interactions with trainees). Additionally, staff attempt to reduce the risk of patient harm by proactively adjusting the table or bed (e.g., reducing height to increase staff leverage, locking wheels, padding side rails, securing arm boards and/or stirrups) and securing the IV (e.g., extra tape and gauze). See **Table 2** and online **Supplemental Materials S1, S2,** and **S9** for more information**.**

Medication Strategy for Patients at Elevated Risk for Emergence Delirium. For patients identified as moderate to high risk for ED, providers are urged to use a specific medication strategy, which is avoidance of midazolam and volatile anesthetics, and, as an alternative, administration of propofol, dexmedetomidine, and ketamine. For additional information about the medication strategy, including sequence of medications, rates, and doses by perioperative phase, see **Table 2** and online **Supplemental Materials S1, S2, S4, S5,** and **S9**. Development of this medication strategy was guided by previous literature, which is summarized in oneline **Supplemental Material S6**.

Manual Restraint (Hands-On) of Patient. The purpose of manual restraint is to prevent a patient who is engaging in dangerous behavior from harming themselves and staff. Manual restraint refers to staff placing their hands directly on the patient to secure a limb or area of the body. Staff are taught to use specific techniques that focus on the management of the patient's arms, legs, head, oxygen apparatus, and IV location, as well as recommended positioning (e.g., supine, side, standing). Staff are also educated on the risks associated with use of manual restraint, including positional asphyxiation, aspiration, orthopedic injuries, and skin integrity. For additional information about the use of manual restraint, see **Table 2** and online **Supplemental Materials S1, S2,** and **S9–S15**.

Supplemental Materials S1–S15 are available as editable Word and PowerPoint files on the webpage for this article (Vol. 4, No. 4 at PatientSafetyJ.com). We encourage readers to download and customize the files to meet their clinical needs.

Findings and Conclusions

To our knowledge, this is the first manuscript that describes this type of multicomponent intervention in sufficient detail to allow others to replicate and adopt the intervention. Following implementation of the intervention at VAPHS, perioperative staff reported that they observed a substantial reduction in the occurrence and severity of ED, ED-related patient and staff injuries, and ED-related loss of IV access and airway patency. Despite staff's reported success of the intervention, rigorous research is needed to evaluate the efficacy of the intervention and identify which components are necessary to achieve the desired quality of care and safety. Future projects and studies should consider refining the choice and weight of risk factors, which may result in greater validity and reliability of routine screening for risk of ED. As a note to others who replicate this intervention, VAPHS staff identified the following challenges with implementation and maintenance: 1) buy-in among anesthesia providers, 2) consistent use of the medication strategy across all providers, 3) staff's reliable use of the PAASO Form, and 4) staff's time to develop and maintain the intervention.

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Note: References 18–105 are cited across the 15 online **Supplemental Materials** (**S1–S15**) that support the intervention.

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