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NEWSLETTER
THE OFFICIAL JOURNAL OF THE ANESTHESIA PATIENT SAFETY FOUNDATION

CITATION: Xiao, Y. APSF awards 2025 grant recipients. *APSF Newsletter.* 2025:27–29.

APSF Awards 2025 Grant Recipients

by Yan Xiao, PhD

The APSF grant programs are key to the mission of APSF to support and advance anesthesia patient safety culture, knowledge, and learning. The programs have played an essential role in establishing and enhancing the careers of many anesthesia and other professionals in conducting safety research and education. Since 1987, APSF has supported more than 130 anesthesiologists and other researchers with more than $15 million in funding. The 2024-2025 APSF investigator-initiated research (IIR) grant program received 24 letters of intent from 18 organizations in the United States and Canada. The multidisciplinary Scientific Evaluation Committee (SEC) reviewed and discussed these letters, with the assistance of external statistical reviewers. The top five scoring projects were invited to submit full proposals, which were reviewed and discussed by the SEC for their potential impact on anesthesia patient safety and scientific rigor. Three proposals were recommended for funding to the APSF Board of Directors and received unanimous support. This year's recipients are Rodney A. Gabriel, MD, MAS, from the University of California, San Diego; Kelly Michaelsen, MD, PhD, from the University of Washington; and Elizabeth Mahanna-Gabrielli, MD, from the University of Miami. In addition, the 2024 Mentored Research Training Grant (MRTG) program, jointly funded with the Foundation for Anesthesia Education and Research (FAER), received seven letters of intent from six organizations. Full proposals were requested from three principal investigators. After reviewing, the recipient was Caoimhe Duffy, MD, MSc, from the University of Pennsylvania. The principal investigators provided the following description of their proposed work.

Rodney A. Gabriel, MD, MAS

Associate Professor of Anesthesiology, University of California, San Diego - Health Sciences

Dr. Gabriel's project is titled ***"PLATO (Perioperative Learning using Artificial intelligence for Timely surgical Optimization)—An Automated Approach for Triaging Surgical Patients for Preoperative Care Clinics."***

Background: Effective use of preoperative care clinics have demonstrated reductions in surgical cancellations, unneeded testing, hospital length of stay, and postoperative complications.[1,2] However, with the rise in surgical volume, the expansion of electronic health record (EHR) data management, and limited resources to keep up with these demands, care needs may outstrip clinic capacity. Using artificial intelligence (AI) to help automate the triaging process for preoperative care clinics have many patient safety-related benefits. While it may directly reduce production pressure, the primary goal of these automated processes is to optimize the thoroughness of the preoperative evaluation of every patient, especially among those who are high risk for postoperative complications.

Aim: The primary goal of our proposal is to develop tools that may reduce risk of major post-surgical complications, specifically cardiac-related events, by improving our ability, within a preoperative care clinic, for identifying high-risk patients prior to surgery. The objective of our proposal is to leverage AI modalities[3]—such as machine learning and large language models to process unstructured and structured data—to develop PLATO, which will process preoperative EHR data to calculate a patient's Revised Cardiac Risk Index[4] (RCRI) and summarize relevant clinical history to assess cardiac risk (Aim 1). PLATO will process unstructured data (e.g., clinical notes) and structured data (e.g., laboratory values, medications, diagnosis codes) to determine patient risk factors and, subsequently, to calculate 30-day risk of death, MI, or cardiac arrest. We hypothesize that we will be able to develop PLATO such that it will identify which RCRI components each patient has and thus calculate their preoperative cardiac risk. This information can then be used by the preoperative anesthesia care clinics to triage preoperative evaluation needs. In addition, risks for postoperative outcomes including cardiac complications, pneumonia, surgical site infections, urinary tract infections, venous thromboembolism, renal failure, unplanned reintubation, and mortality can be predicted (Aim 2).

Implications: Preoperative care clinics are associated with improved patient outcomes. The objective of our proposal is to leverage AI to develop PLATO, which will process structured and unstructured EHR data to identify postoperative risk based on the preoperative RCRI score as well as predict probability of various postsurgical complications. Such an approach may provide an automated tool to screen high-risk patients so that preoperative clinics may more effectively triage available resources for preoperative evaluations (e.g., patients identified as high risk from PLATO may be allocated to in-person preoperative clinic visits while those who are low risk may be allocated to either day of surgery or phone call evaluation).

Funding: $150,000 (January 1, 2025–December 31, 2026). The grant was designated as the APSF/American Society of Anesthesiologists (ASA) President's Research Award.

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Kelly Michaelsen, MD, PhD

Assistant Professor of Anesthesiology, University of Washington

Dr. Michaelsen's project is titled ***"An Integrated, Centralized Anesthesia Alarm System Based on Aviation Alarm Systems Principles."***

Background: Medical equipment alarms are widely recognized as a dysfunctional system that produces a cacophony of distracting sounds that lead to "alarm fatigue" and can jeopardize patient safety.[1] Equipment alarms

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APSF Has Awarded Over 15 Million Dollars in Funding to Researchers

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frequently occur in operating rooms, and the majority of alarms do not have any clinical significance and do not require immediate action.[2,3] The Joint Commission has recognized the problem of medical alarms since 2013 and still considers the safe use of alarms to be a National Patient Safety Goal in 2024.[4] This project proposes a shift in the philosophy of anesthesia equipment alarms by applying design best practices from the aviation industry. Unlike medical alarms, flight deck alarms are centralized. When an alarm from any aircraft system or sensor is triggered, the condition is displayed on a central panel according to a hierarchy of importance, with alarms requiring an immediate response at the top of the hierarchy. Attention is drawn to the most important conditions with a red "master warning" light and a distinct persistent tone. In a few instances of the most important alarms, they will be accompanied by an audible announcement (CRITICAL alarms). Alarms that have lesser priority are presented with a yellow "master caution" light and a single tone (WARNINGS and CAUTIONS), or no tone at all (ADVISORIES), along with the condition message on the display.

Aims: We aim to create a proof-of-concept version of a centralized anesthesia alarm system with a commercial aviation-style architecture adapted to the anesthesia setting. We will test the proof-of-concept system in a full-size operating room simulator environment. Our hypothesis is that our alarm system will result in rare CRITICAL alarms, few WARNINGS, and mostly lower-level, unobtrusive messages. We further hypothesize that our system will provide caregivers with a simple, intuitive, central source of alarm information that reliably presents alarms in priorities that match caregiver's expectations and needs, to best support their actions in the interest of patient safety.

Implications: The key novel aspect of this design is a centralized system that pulls information from all the anesthesia-related monitors and devices in the operating room, including the patient monitor and the anesthesia machine, into a single system that presents alarms and status messages from all of the devices. This design will integrate and replace all aural and visual alarms with a single, prioritized scheme including a master alarm light, two different aural alarms (reserved for WARNING and CAUTION), and in rare instances, a voice aural alarm for CRITICAL alarms that require immediate action, and a centralized alarm screen display with detailed information about active alarms. Ultimately, the centralized anesthesia alarm system could integrate data from all anesthesia-related devices. A similar system could be designed for other environments such as the emergency room and intensive care units.

Funding: $150,000 (January 1, 2025–December 31, 2026). The grant was designated as the APSF/Medtronic Research Award, and was also designated as the APSF Ellison C. Pierce, Jr., MD, Merit Award with $10,000 unrestricted research support.

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Elizabeth Mahanna-Gabrielli, MD

Associate Professor of Anesthesiology, Miller School of Medicine of the University of Miami

Dr. Mahanna-Gabrielli's project is titled ***"Does ongoing comprehensive geriatric assessment reduce the incidence of postoperative delirium in older, frail patients undergoing elective inpatient surgery?"***

Background: Frail, older patients have 2–3 times the odds of postoperative delirium (POD) as compared to robust counterparts.[1] Frailty is a syndrome of comorbidities, weakness, and poor resilience to recover from stressors. Comprehensive Geriatric Assessment (CGA) evaluates the complex interaction of frailty, comorbidities, and risk factors for POD. Expert consensus has recommended CGA in at-risk patients.[2,3] However, equipoise exists as to whether CGA reduces older patients' risk of POD, possibly due to the inclusion of robust, older patients in prior studies.[4] We hypothesize that postoperative assessment and individualized recommendations, including adherence to delirium prevention strategies, provided by a dedicated geriatric medicine service ("CGA") will be superior to simple EHR frailty identification, anesthetic guidelines, and generic recommendations for reducing POD ("standard care") in frail, older patients, ≥ 60 years old, who are scheduled for elective inpatient surgery (≥ 2 day anticipated length of stay).

Aims: 1. To determine if CGA is superior to standard care with respect to reducing POD. **2.** To explore if CGA is superior to standard care with respect to discharge to the same or a lower preoperative level of care. **3.** To explore if CGA differs from standard care with respect to prolonged length of stay.

Implication: Delirium is a serious, common, preventable patient safety problem occurring across surgical subspecialties with significant associated morbidity, mortality and cost.[5] Evidence-based delirium prevention is often poorly followed.[2] CGA is a proposed strategy to reduce POD with current equipoise in the literature.[4] Models of CGA can vary and need not be comprised of only geriatricians, but rather providers with in-depth knowledge of geriatric best practices, including geriatric anesthesiologists. This proposal includes only frail, older patients with a high risk of POD and thus more potential to demonstrate benefit than robust patients. If superiority is shown, this will be strong evidence supporting postoperative CGA over EHR frailty identification and generic recommendations to reduce POD.

Funding: $150,000 (January 1, 2025–December 31, 2026).

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Caoimhe Duffy, MD, MSc

Assistant Professor of Anesthesia and Critical Care Medicine, University of Pennsylvania, Perelman School of Medicine

Dr. Duffy's project is titled: ***"Resilience training to prevent intubation harm: the One Safe Act-Airway study."***

Background: Over 15 million tracheal intubations are performed each year in the United States.[1] This practice, commonly perceived as routine, represents a high-risk medical intervention since major airway complications contribute to 25% of anesthesia-related deaths.[2] Neither technologic advancement nor continuous guideline refinement have successfully decreased airway-associated adverse events over the past two decades.[3] The largest study of airway complications to date, National Audit Project 4 (NAP4), highlighted a causal link between cognitive errors and adverse airway events.[2] Lapses in decision-making arise when subconscious processes and mental shortcuts are inappropriately applied. These lapses have been implicated in up to 80% of anesthetic critical incidents, yet actionable targets for improving anesthesia safety remain relatively underexamined.[4,5]

Cognitive error-mitigation techniques, dubbed "forcing strategies," leverage metacognitive (thinking about thinking) promotion of structured preprocedural planning and decision-making self-assessment.[6]

Our proposed intervention, One Safe Act-Airway (OSA-A), will address this gap and build on our prior pilot study that demonstrated that OSA-A prompts consideration of proactive safety behaviors among clinicians.[7] Aligning with the Safety-II approach, OSA-A promotes consideration of why processes succeed rather than the traditional focus on debriefing failures. Through this emphasis, OSA-A shifts clinicians' focus from just-in-time error mitigation towards deliberate, planned error prevention. OSA-A simply, efficiently, and seamlessly integrates into existing workflows to improve safety without significant costs.

Aim: To evaluate whether OSA-A can reduce errors during tracheal intubation through enhancement of clinicians' metacognition and resilience. Specifically, we will assess whether participation in this intervention leads to a reduction in hypoxic events during tracheal intubation and improves clinicians' perceptions of successful and safe intubation practices.

Implications: The outcomes of this project will lay the foundation for implementing proactive error-prevention behaviors in airway management. It will offer valuable insights into cognitive techniques related to intubation, as well as demonstrate the implementation and sustainment of the OSA-A. Future work will focus on identifying proactive behaviors in clinical practice and subsequently disseminating these strategies to further enhance safe airway management.

Funding: $300,000 as 2024 APSF/FAER Mentored Research Training Grant (MRTG).

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The author has no conflicts of interest.