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APSF Awards 2024 Grant Recipients

Yan Xiao, PhD

The APSF grant program supports and advances anesthesia patient safety culture, knowledge, and learning, a part of the APSF mission. The program has played an essential role in establishing and enhancing careers of many health care professionals in conducting safety research and education. Since 1987, ASPF has supported more than 130 anesthesia professionals and other researchers with more than $14 million in funding.

The 2023–2024 APSF investigator-initiated grant program received 29 letters of intent from 20 organizations in the United States and Canada. The Scientific Evaluation Committee scored and discussed these letters, with the assistance of external statistical reviews. The top five scoring letters were invited to submit full proposals. Five full proposals were received and were discussed via a hybrid meeting on October 14, 2023. Two proposals were recommended for funding to the APSF Executive Committee and Board of Directors, and both received unanimous support. This year's recipients are Garrett Burnett, MD, from Icahn School of Medicine at Mount Sinai and Matteo Parotto, MD, PhD, from the University Health Network, Toronto General Hospital. They provided the following description of their proposed work.

Garrett Burnett, MD

Assistant Professor of Anesthesiology, Perioperative & Pain Medicine, Icahn School of Medicine at Mount Sinai

Dr. Burnett's project is entitled ***"Pulse Oximetry Accuracy and Skin Pigmentation in Congenital Heart Disease: A Prospective Observational Study."***

Background: Pulse oximetry (SpO_2) has been an essential perioperative monitor for noninvasively estimating arterial oxygen saturation (SaO_2). The incorporation of pulse oximetry into routine care has coincided with a significant reduction in anesthesia-related fatalities.[1] Recent retrospective studies have demonstrated discrepancies between measured pulse oximeter values and measured arterial oxygen saturation in patients self-identifying as Black or Hispanic.[2] These findings have demonstrated elevated rates of occult hypoxemia (i.e., SpO_2 ≥92% despite SaO_2≤88%) in non-White patients and linked occult hypoxemia to increased mortality and changes in treatment.[3-5] These previous retrospective studies have utilized self-identified race/ethnicity as a surrogate marker for skin pigmentation, but this may not be an accurate metric for skin pigmentation because a wide variety of skin pigmentations can be observed within a given racial or ethnic group. While several small prospective studies have investigated this discrepancy outside the clinical setting, all have utilized color-matching techniques (i.e., Fitzpatrick Scale) to quantify skin pigmentation.[6] Color-matching represents a more objective measure of skin pigmentation when compared to self-identified race/ethnicity, but its utility is limited by factors such as ambient lighting and variability in practitioner interpretation. Further, commonly used color-matching techniques (i.e., Fitzpatrick scale) were not developed to evaluate skin pigmentation. Color spectrophotometry (CS) represents an objective method for skin pigmentation measurement and overcomes the limitations of color-matching.[7] It is imperative that the relationship between pulse oximeter accuracy and CS-measured skin pigmentation be determined in order to improve equity in pulse oximeter function across all patients.

Aims: This study aims to evaluate the relationship between pulse oximeter accuracy and CS-measured skin pigmentation in pediatric patients with congenital heart disease having cardiac surgery. Accuracy will be tested using United States Food & Drug Administration guidelines (Accuracy Root Mean Square, Mean Bias, and Bland-Altman analysis). As a secondary aim, the correlation between pulse oximetry accuracy with CS-measured skin pigmentation, self-reported race/ethnicity, and measures using Fitzpatrick scale will be assessed. As a final secondary aim, we will evaluate the relationship of occult hypoxemia undetected by pulse oximetry with CS-measured skin pigmentation.

Implications: This project addresses the APSF's priority on Clinical Deterioration by working to improve a commonly utilized perioperative monitor for patients of all races and ethnicities. Pulse oximetry is utilized for all patients throughout the perioperative period. Inaccuracies in pulse oximetry may have impacts on patient outcomes and treatments. Determining the relationship between pulse oximetry and CS-measured skin pigmentation works towards the goal of making pulse oximetry equitable for all patients. Results from this study will potentially improve pulse oximeter accuracy in the congenital heart disease population and inform future studies evaluating this relationship in the more general population as a whole.

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Matteo Parotto, MD, PhD

Associate Professor, Anesthesia & Pain Management, University Health Network, Toronto General Hospital

Dr. Parotto's project is entitled: ***"EXtubation-related complications—an international observational study To Understand the impact and BEst practices in the operating room and intensive care unit—the EXTUBE study."***

Background: Globally, over 200 million people each year require extubation. While routinely performed, extubation is a skilled and potentially high-risk procedure that should be performed only when physiologic, pharmacologic, and contextual conditions are optimal.[1] Complications at this stage of patient care can result in decreased oxygen delivery to the brain and body, sometimes leading to serious adverse events such as cardiac arrest, brain damage, or death. Indeed, one quarter of airway complications that result in death or brain death occur at the time of extubation.[2] Despite the frequency of extubation and the potential for life-threatening complications, we lack systematic data on the rate and circumstances under which these severe complications occur. The limited data indicate 10–30% of extubations may lead to severe complications, depending on the population and outcome definition.[2-4] However, the certainty of these estimates is severely limited because they are based on studies that are small, mostly single-center, based on clinician recall, only capture a small portion of extubation complications (e.g., malpractice claims), or do not reflect current clinical practice. In addition, most lack a denominator and exclude successful extubations, making estimates of actual complication rates and risk factors impossible. Promisingly, a recent focus on intubation complications, risk factors, and best-practices has decreased intubation complications by up to 26%,[5] suggesting that a similar program of research focusing on extubation could have a comparable impact on patient safety and outcomes. As a result, there have been calls for a large, systematic study to identify risks of extubation complications and effective extubation techniques, fitting with the APSF priority in Airway Management difficulties. In particular, high-quality baseline data on complication rates are needed to evaluate future interventions and clinical practice guidelines. There has been no large study of extubation techniques or adherence to guidelines; so procedural factors associated with complications must be elucidated. While adherence to clinical practice guidelines has not been formally evaluated, surveys show nonadherence to some best practices and considerable variation in practice, and data from audits and medicolegal claims show that lack of adherence to best practices is frequently at the root cause of severe adverse extubation outcomes with half of the complications deemed preventable.[2-4] Therefore, data on the frequency and nature of extubation complications, patient and procedural risk factors for complications, and guideline adherence rates are needed before these preventable events can be addressed.

Aims: Our primary question is "What is the incidence of severe extubation complications within 60 minutes after extubation in adults who have undergone mechanical ventilation for general anesthesia or critical illness?" Severe complications will be measured by i) Severe hypoxemia (SpO_2 < 80% for >5 minutes); ii) Unplanned noninvasive ventilation; iii) Cardiac arrest; iv) Need for airway management (reintubation, insertion of a supraglottic airway, bag-mask ventilation). Our secondary questions are: 1) "What is the incidence of mild extubation complications?"; 2) "What are patient- and procedure-related risk factors for extubation complications?"; 3) "Is there an association between extubation complications and outcomes until hospital discharge?"; 4) "What is the rate of adherence to extubation clinical practice guidelines?"

Implications: EXTUBE will establish the burden of extubation complications and the extent to which they are preventable, which could guide future interventions and guideline updates. This information will directly contribute to the advancement of the APSF priority in Airway Management difficulties, skills, and equipment, moving the field forward in improving patient safety in this fundamental area of care.

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