

BIOGRAPHICAL SKETCH

NAME: Muffly, Matthew Kurt

eRA COMMONS USER NAME (credential, e.g., agency login): MMUFFLY

POSITION TITLE: Assistant Professor, Department of Anesthesiology, Perioperative and Pain Management

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	Completion Date MM/YYYY	FIELD OF STUDY
University of Colorado, Boulder, CO	B.A.	05/2002	Biology, Philosophy
Jefferson Medical College, Philadelphia, PA	M.D.	06/2006	Medicine
Lankenau Hospital, Wynnewood, PA	n/a	06/2007	Int. Med. Internship
Dartmouth-Hitchcock Medical Center, Lebanon, NH	n/a	06/2010	Anesthesiology Residency
University of Chicago, Chicago, IL	n/a	08/2011	Pediatric Anesthesiology Fellowship
Stanford University, Stanford, CA	n/a	01/2015-12/2015	Quality Improvement, Patient Safety Postdoctoral Fellow
Stanford University, Stanford, CA	M.S.	09/2017- 06/2019	Masters of Science in Health Policy

A. Personal Statement

For the past several years, my clinical focus and interest has been neurosurgical anesthesia and teaching advanced airway skills to the residents and fellows. Teaching advanced airway skills is important to me because future patients depend on their success. In terms of research, I have pursued an array of inter-related research questions in the realm of perioperative patient safety. As an anesthesiology resident, I studied the extent to which intraoperative bacterial contamination of intravenous injection ports occurred.^a I then designed and tested a novel device intended to prevent bacterial contamination of intravenous injection ports with the ultimate goal of reducing morbidity and mortality from catheter-related bloodstream infections. During pediatric anesthesiology fellowship, I spearheaded the design and implementation of a handoff tool intended to improve standardized communication between perioperative teams. After fellowship, I spent three years as a pediatric anesthesiologist in community practice (large free-standing children's hospital, children's units within general hospitals, and general hospitals) where I gained a better understanding of the landscape of community practice patterns and helped implement intraoperative pathways to standardize best practices for children undergoing surgery. This broad experience in multiple practice settings informed my subsequent interest in patterns of pediatric care and perioperative outcomes. In 2015, I joined the Stanford Anesthesiology faculty as an Instructor and Patient Safety and Quality Improvement Fellow. In this position, I continued to advance patient safety causes by implementing a perioperative spinal fusion pathway to standardize care, optimize patient handoff to the Intensive Care Unit, and speed functional recovery. I also worked to increase perioperative critical incident self-reporting as a means to identify and address modifiable systems-based issues^b and currently serve as co-director of the monthly Departmental Morbidity and Mortality conference.

In 2014, the American College of Surgeons (ACS) introduced the voluntary Children's Surgery Verification (CSV) Program with the goal of prospectively matching children to optimal systems of care, including specialty trained pediatric anesthesiologists. Unfortunately, at this time we did not have a complete understanding of where pediatric anesthesiologists were practicing in the US. As an Assistant Professor at Stanford University, I began a series of research studies to describe the geographic locations and demographics of pediatric anesthesiologists.^c After identifying pediatric anesthesiologist practice locations, we reported the number of children who lived in certain driving distance ranges from the nearest practice location.^d Approximately 10.2 million children ages 0 – 17 years old and 2.8 million children ages 0 – 4 years old live greater than 50 miles from the nearest identified pediatric anesthesiology practice location.^d This raised the questions of whether ACS CSV Implementation was possible in these areas? Were we training enough pediatric anesthesiologists to meet the needs of the population? And, to what extent were the risk-adjusted rates of serious adverse events in tertiary care children's hospital different than in other hospital settings for routine procedures?

With these questions in mind, in 2016 I performed a workforce analysis of pediatric anesthesiologists to determine future needs relative to the estimated future number of children undergoing surgery.^e As a result of these efforts, I currently participate in the American Society of Anesthesiologists (ASA) Center for Anesthesia Workforce Studies group, the ASA Subgroup on Pediatric Anesthesia, and the Society for Pediatric Anesthesia Graduate Medical Education subgroup to update future workforce trend estimates. Predicting future workforce trends requires an estimation of future surgical and procedural volumes and so we used the California Office of Statewide Planning and

Development (OSHPD) database to describe historical hospitalization patterns to inform this work.^f

For more formal training in population health and sciences, I enrolled as a graduate student in the Stanford Population Health and Sciences Master's program. Here I worked closely with Dr. Jay Bhattacharya to understand whether risk-adjusted rates of serious adverse perioperative events in children differ by hospital type. To explore this question, we used the CA OSHPD database from 2000-2016 to analyze rates of serious adverse respiratory events, serious adverse cardiac events, surgical complications, and in-hospital mortality among children ages 0 – 5 years old. We found that the predicted probability of serious adverse events for the three most common surgical procedures was not lower in tertiary care children's hospitals than other hospital types. Since tertiary care hospitals do not have the capacity to treat all pediatric patients, and because of long geographic distances to specialty centers of care for many children, an important question is which pediatric patients should go to tertiary care children's hospitals? This is the focus of the current proposal -- to prospectively identify and match a child's needs to an optimal system of care. This area of research is exciting to me because of the potential to positively impact many children and families and to understand what truly impacts pediatric perioperative outcomes.

- a. Loftus RW, **Muffly MK**, Brown JR, et al. Hand contamination of anesthesia providers is an important risk factor for intraoperative bacterial transmission. *Anesth Analg*. 2011;112(1):98-105.
- b. Williams GD, **Muffly MK**, Mendoza JM, Wixson N, Leong K, Claire RE. Reporting of Perioperative Adverse Events by Pediatric Anesthesiologists at a Tertiary Children's Hospital: Targeted Interventions to Increase the Rate of Reporting. *Anesth Analg*. 2017;125(5):1515-1523.
- c. **Muffly MK**, Muffly TM, Weterings R, Singleton M, Honkanen A. The Current Landscape of US Pediatric Anesthesiologists: Demographic Characteristics and Geographic Distribution. *Anesth Analg*. 2016;123(1):179-185.
- d. **Muffly MK**, Medeiros D, Muffly TM, Singleton MA, Honkanen A. The Geographic Distribution of Pediatric Anesthesiologists Relative to the US Pediatric Population. *Anesth Analg*. 2017;125(1):261-267.
- e. **Muffly MK**, Singleton M, Agarwal R, et al. The Pediatric Anesthesiology Workforce: Projecting Supply and Trends 2015-2035. *Anesth Analg*. 2018;126(2):568-578.
- f. **Muffly MK**, Honkanen A, Sheinker D, et al. Hospitalization Patterns for Inpatient Pediatric Surgery and Procedures in California: 2000–2016. *Anesthesia & Analgesia*: November 28, 2019 - Volume Publish Ahead of Print - Issue - doi:10.1213

B. Positions and Employment

2006-2007	Internal Medicine Resident; Lankenau Medical Center, Wynnewood, PA
2007-2010	Anesthesiology Resident; Dartmouth Hitchcock Medical Center, Lebanon, NH
2010-2011	Pediatric Anesthesiology Fellow, University of Chicago, Chicago, IL
2011-2013	Pediatric Anesthesiologist; Advocate Medical Center, Oak Lawn, IL
2013-2014	Pediatric Anesthesiologist; Community Practice at Multiple Hospitals, Denver, CO
2015	Clinical Instructor and Patient Safety/Quality Improvement Fellow Stanford University, Stanford, CA

2015- Co-Director of monthly Morbidity and Mortality Conference
2016- Clinical Assistant Professor, Stanford University, Stanford, CA
2017-2019 Master's Degree in Population Health and Sciences, Stanford University, Stanford, CA

Certification and Licensure

2011-2021 Board Certification, American Board of Anesthesiology
2014 Certification, Pediatric Anesthesiology
2014- California Medical License (active)

Professional Memberships and National Activities, Selected

2010- Member, American Society Anesthesiologists (ASA)
2011- Member, Society for Pediatric Anesthesia (SPA)
2016- Manuscript Reviewer, Anesthesia & Analgesia
2016- Manuscript Reviewer, Pediatric Anesthesia
2018- Member of ASA Ad Hoc Committee on Anesthesia Workforce
2019- Member of SPA Quality and Safety Committee
2019 – Committee on Pediatric Anesthesia, ASA

Honors and Awards

2008 FAER Research Scholar Award, Dartmouth- Hitchcock Medical Center
2010 Excellence in Research Award, Dartmouth-Hitchcock Medical Center
2016 Society for Pediatric Anesthesia Young Turk
2018 Society for Pediatric Anesthesia Best Article Mention of 2017-2018
2019 Society for Pediatric Anesthesia Best Article Mention of 2018-2019

C. Contributions to Science

1. In residency I contributed to the body of work linking anesthesiologists' hands to contamination of intravenous injection ports and demonstrated that injection port contamination represents a specific, but insensitive method of detecting injection port contamination.^{22,23} This is important because injection port contamination is associated with morbidity and mortality.²⁴ As a result of this work, I developed a novel device to shield the injection port from manual contact and tested the device in over 400 patients undergoing general anesthesia

Citations:

- a. Loftus RW, **Muffly MK**, Brown JR, et al. Hand contamination of anesthesia providers is an important risk factor for intraoperative bacterial transmission. *Anesth Analg.* 2011;112(1):98-105.
- b. **Muffly MK**, Beach ML, Tong YC, Yeager MP. Stopcock lumen contamination does not reflect the full burden of bacterial intravenous tubing contamination: analysis using a novel injection port. *Am J Infect Control.* 2010;38(9):734-739.
- c. Loftus RW, Patel HM, Huysman BC, et al. Prevention of intravenous bacterial injection from health care provider hands: the importance of catheter design and handling. *Anesth Analg.* 2012;115(5):1109-1119.

2. I subsequently studied the potential for injection volume errors when administering small volume, concentrated intravenous medications to children. We found that

administering 0.1 mL volumes or less were associated with large deviations from the intended injection volume due to variations in injection technique.²⁵ We then intervened by implementing a sustained educational program, diluted medications when possible, and used smaller syringes with fixed safety needles to prevent dosing variability.

Citation:

- a. **Muffly MK**, Chen MI, Claire RE, et al. Small-Volume Injections: Evaluation of Volume Administration Deviation From Intended Injection Volumes. *Anesth Analg*. 2017;125(4):1192-1199.

3.I created a list of pediatric anesthesiologists in the US, described their demographic characteristics, charted their geographic locations^a, and performed a survey of nearly 1000 pediatric anesthesiologists to report practice patterns.^b We then performed a workforce analysis to estimate the future number of pediatric anesthesiologists relative to the demand (case volumes).^c

Citations:

- a. **Muffly MK**, Muffly TM, Weterings R, Singleton M, Honkanen A. The Current Landscape of US Pediatric Anesthesiologists: Demographic Characteristics and Geographic Distribution. *Anesth Analg*. 2016;123(1):179-185.
- b. **Muffly MK**, Scheinker D, Muffly T, Singleton M, Agarwal R, Honkanen A. Practice Characteristics of Board-certified Pediatric Anesthesiologists in the US: A Nationwide Survey. *Cureus*. 2019;11(9):e5745.
- c. **Muffly MK**, Singleton M, Agarwal R, et al. The Pediatric Anesthesiology Workforce: Projecting Supply and Trends 2015-2035. *Anesth Analg*. 2018;126(2):568-578.

4. We then evaluated where children ages 0 – 5 years old undergo the most common surgeries in California. We discovered a large shift in hospitalization patterns from 2000 – 2016 for young children in favor of tertiary care children’s hospitals.^a We then evaluated whether hospital type was associated with higher risk-adjusted rates of serious adverse respiratory events, serious adverse cardiac events, surgical complications, or mortality for the three most common pediatric inpatient procedures. We did not detect lower adjusted rates of serious adverse events in tertiary care children’s hospitals for the most common procedures (unpublished data).

Citation:

- a. **Muffly MK**, Honkanen A, Sheinker D, et al. Hospitalization Patterns for Inpatient Pediatric Surgery and Procedures in California: 2000–2016. *Anesthesia & Analgesia*: November 28, 2019 - Volume Publish Ahead of Print - Issue - doi:10.1213

Complete List of Published Work in MyBibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/matthew.muffly.1/bibliography/public/>

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support:

n/a