

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF ANESTHESIOLOGY

Michael Mathis, M.D., assistant professor of anesthesiology, Department of Anesthesiology, Medical School, is recommended for promotion to associate professor of anesthesiology, with tenure, Department of Anesthesiology, Medical School.

Academic Degrees:

M.D.	2010	University of Michigan
B.S.E.	2006	Duke University

Professional Record:

2017-present	Assistant Professor of Anesthesiology, University of Michigan
2015-2017	Clinical Lecturer of Anesthesiology, University of Michigan

Summary of Evaluation:

Teaching: Dr. Mathis is an active clinical, didactic, and research educator. Given his clinical role in the perioperative care of complex cardiothoracic and vascular surgical patients, he is responsible for teaching residents advanced therapeutic and diagnostic procedures in high-acuity operating rooms and intensive care unit environments. His resident evaluations demonstrate his patient, effective, and committed clinical teaching role. From a didactic perspective, he has helped to develop our transesophageal echocardiography anesthesiology resident rotation and provides cardiothoracic anesthesiology fellow lectures on advanced perioperative echocardiography and cardiothoracic anesthetic management. He has led the drafting of several of our department's current clinical policies for the management of patients with advanced heart failure referenced by faculty and residents, such as anesthesia for total artificial heart placement and left ventricular assist device management for non-cardiac surgical procedures. Additionally, he is responsible for mentoring our department's cardiothoracic anesthesia fellows in developing and disseminating a scholarly project as part of ACGME requirements for the fellowship. Finally, he is a lecturer and faculty mentor for our anesthesiology intern research rotation, a month-long intense didactic and practicum exposure to perioperative research and evidence-based medicine.

On a national level, he has provided panel talks and problem-based learning discussions at national meetings on the perioperative management of patients with advanced heart failure. Additionally, within the Multicenter Perioperative Outcomes Group (MPOG), he serves as a mentor for anesthesiology faculty across more than 20 MPOG research projects from 10 institutions. He has also led the development of a series of web-based learning modules to guide clinicians through the research pipeline of developing and presenting a research proposal, querying and curating electronic health data, and executing complex multivariable statistical modeling.

Research: Dr. Mathis is an internationally renowned perioperative outcomes researcher, widely regarded as a leader in translating real-world electronic health record data into actionable inferences informing the care of patients undergoing major surgeries. He is the director for

outcomes research within our Department of Anesthesiology and serves as an affiliate faculty for the University of Michigan Center for Computational Medicine and Bioinformatics. He has produced 52 publications, many of which are in the field's flagship journal, *Anesthesiology*.

At a national level, much of his research recognition stems from academic outputs of the Multicenter Perioperative Outcomes Group (MPOG), a consortium of over 50 academic and community hospitals across the United States for which the University of Michigan serves as the Coordinating Center amassing over 18 million anesthesia records. His consistent, ongoing contributions to MPOG have led to his appointment as the research director on the MPOG executive board where he meets with anesthesiology department chairs and other internationally recognized anesthesiologist clinician-scientists as a consultant in guiding the development of multicenter observational research manuscripts and grants. He also led the integration of MPOG data, with other existing multicenter surgical registries, including the Society of Thoracic Surgeons (STS) Adult Cardiac Surgical Database (STS-ACSD) and General Thoracic Surgical Database (STS-GTSD).

Beyond large multicenter observational database research, another core component of his research focuses on the application of data science techniques, including machine learning, waveform processing, and natural language processing to health data to solve complex classification and prediction problems. This work was first catalyzed by his National Institutes of Health K grant: Early Diagnosis of Heart Failure: A Perioperative Data-Driven Approach, through which he successfully leveraged data captured within intraoperative anesthesia records including hemodynamic responses to surgical and anesthetic stressors to inform the early detection of cardiovascular diseases such as heart failure. Since then, he has made connections with other clinician-scientists who are leaders in machine learning applied to health care, yielding the University of Michigan Precision Health Investigator's Award Funding (Predicting Cardiac Surgery-Associated Acute Kidney Injury using Federated Learning) as well as National Institutes of Health R01 Funding (Cardiac Surgery Anesthesia Best Practices to Reduce Acute Kidney Injury; R01 DK133226).

Recent and Significant Publications:

- Mathis MR, Schonberger RB, Whitlock EL, Vogt KM, Lagorio JE, Jones KA, Conroy JM, Kheterpal S, "Opportunities beyond the anesthesiology department: Broader impact through broader thinking," *Anesth Analg* 134(2): 242-52, 2022. PM33684091
- Mathis MR, Engoren MC, Joo H, Maile MD, Aaronson KD, Burns ML, Sjoding MW, Douville NJ, Janda AM, Hu Y, Najarian K, Kheterpal S, "Early detection of heart failure with reduced ejection fraction using perioperative data among noncardiac surgical patients: A machine-learning approach," *Anesth Analg* 130 (5): 1188-1200, 2020. PM32287126
- Colquhoun DA, Shanks AM, Kapeles SR, Shah N, Saager L, Vaughn MT, Buehler K, Burns ML, Tremper KK, Freundlich RE, Aziz M, Kheterpal S, Mathis MR, "Considerations for integration of perioperative electronic health records across institutions for research and quality improvement: The approach taken by the Multicenter Perioperative Outcomes Group," *Anesth Analg* 130(5): 1133-1146, 2020. PM32287121
- Mathis MR, Naik BI, Freundlich RE, Shanks AM, Heung M, Kim M, Burns ML, Colquhoun DA, Rangrass G, Janda A, Engoren MC, Saager L, Tremper KK, Kheterpal S, Multicenter Perioperative Outcomes Group Investigators, "Preoperative risk and the association between

hypotension and postoperative acute kidney injury,” *Anesthesiology* 132(3): 461-475, 2020. PM31794513/PMC7015776

Mathis MR, Duggal NM, Likosky DS, Haft JW, Douville NJ, Vaughn MT, Maile MD, Blank RS, Colquhoun DA, Strobel RJ, Janda AM, Zhang M, Kheterpal S, Engoren MC, “Intraoperative mechanical ventilation and postoperative pulmonary complications after cardiac surgery,” *Anesthesiology* 131(5): 1046-1062, 2019. PM31403976

Service: Dr. Mathis has a strong record of service. He is an adult cardiothoracic anesthesiologist who routinely cares for patients undergoing complex cardiothoracic and vascular surgical procedures, such as heart and lung transplants, mechanical circulatory support, and thoracic aortic and structural heart interventions. He has served in several leadership positions departmentally, institutionally, and at the national level. Within the department, he has served in the clinical, educational, and research directorship administrative roles described above. Additionally, he serves as a peer messenger for the health system’s Professionalism Committee as part of an institutional commitment to integrity in patient care. As a faculty having recently navigated early career stages, he serves on the Institute for Health Policy and Innovation (IHPI) Early Career Faculty Advisory Council (ECFAC) providing feedback to IHPI leadership as to how best to attend to the needs of early career faculty. This has most notably led to his co-chairing of an IHPI Early Career Faculty Workshop, as well as the inception and ongoing development of the IHPI Early Career Roadmaps Tool which is used for early career faculty in health professions to conceptualize their career development and provide a framework for discussions with mentors.

On a national level, he is a founding member of the Early-Stage Anesthesia Scholars (eSAS) group, the academic home for anesthesiologist-scientists, and has served as the Midwest Regional Representative as well as the conference planner within eSAS. In addition to serving as the research director of the Multicenter Perioperative Outcomes Group, he serves as co-chair for the Cardiac Anesthesiology Subcommittee which is aimed at developing quality improvement measures derived from electronic health records and focused on patients undergoing cardiac surgical procedures. He also serves on the Research Committee for the Society of Cardiovascular Anesthesiologists, and within the International Anesthesia Research Society (IARS), he served as a grant reviewer for the IARS Mentored Research Award (IMRA).

External Reviewers:

Reviewer A: “Dr. Mathis is an extremely creative and motivated individual whom I expect to make significant contributions to the field of anesthesiology, perioperative medicine, and clinical informatics...the quality and clarity of his lectures and seminars, in addition to his ability to generate enthusiasm and respect among those being taught has always impressed me...Dr. Mathis has already established himself as a national leader.”

Reviewer B: “He has been prolific in his published work...This pace of objective academic accomplishment is exceptional; in my experience this academic trajectory places him in the top 5% of developing academic anesthesiologists...Dr. Mathis’ substantial contributions to academic anesthesiology have garnered both local and national recognition.”

Reviewer C: “I can confidently say that at the local, national, and international levels, Dr. Mathis is well regarded for his clinical acumen, his research, his teaching efforts, and his professional

leadership. He without a doubt contributes positively and significantly to the field of anesthesiology.”

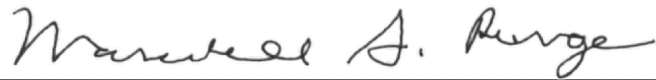
Reviewer D: “Extramural grant funding is a *conditio sine qua non* for promotion on the tenure track and Dr. Mathis meets these criteria with aplomb...Dr. Mathis has been highly productive...His area of research is important and relevant and has advanced the science of perioperative outcomes research.”

Reviewer E: “Academic anesthesia needs more clinician-scientists like Dr. Mathis...In just a short time span Dr. Mathis has carved out a unique niche in Anesthesia research and compiled an impressive and impactful publication record.”

Reviewer F: “Dr. Mathis has a successful track record of research funding...Dr. Mathis has become recognized for his focus on perioperative outcomes, and has given a number of lectures nationally, including at major anesthesia meetings...Dr. Mathis is highly respected by colleagues nationally and he is sought out for his research expertise.”

Summary of Recommendation:

Dr. Mathis has made substantive and meaningful contributions to the field in his research work. He is an outstanding physician-scientist who studies perioperative outcomes and has a unique talent for translating real-world electronic health record data into actionable inferences informing the care of patients undergoing major surgeries. He is a valued member of our faculty. Therefore, I am pleased to recommend Michael Mathis, M.D. for promotion to associate professor of anesthesiology, with tenure, Department of Anesthesiology, Medical School.



Marschall S. Runge, M.D., Ph.D.
Executive Vice President for Medical Affairs
Dean, Medical School

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