

Predicting Opioid Trajectories After Surgery: Interpretable AI Under Real-World Constraints

Sesh Mudumbai, MD, MS,

**Associate Professor, Department of Anesthesiology, Perioperative, and Pain Medicine,
Stanford University School of Medicine; Director for Clinical Informatics Systems and
Perioperative Analytics; Staff Anesthesiologist, VA Palo Alto Health Care System**

May 21, 2026

1:30PM-2:50PM

Li Ka Shing Center, Room:130

Abstract:

Surgery is a common entry point for prolonged opioid use, yet predicting which patients will transition from acute to persistent use remains an open problem. The outcomes are longitudinal and policy-shaped. Missingness can be informative. Clinician behavior acts as both a confounder and an intervention target, and standard prediction frameworks can be suboptimal.

In this seminar, I'll present a research program developed around perioperative opioid risk in the Veterans Health Administration. Rather than showcasing a single model, I'll focus on the design choices that shaped our approach: why we treated interpretability as a first-order constraint, how deployment pressure forced us to rethink modeling decisions, and where clinician feedback surfaced assumptions that benchmarks alone never would. I'll close with open methodological questions around longitudinal harm modeling, actionability as an objective, and clinician decision-making as an endogenous variable, where collaboration between biomedical data science and clinical informatics could open new ground.

Reading list:

1. Mudumbai SC, Chen JQ, Hunter OO, Nool D, Pham J, Morse CA, Kumar G, Harrison TK, Mariano ER, Clark JD. Utilization and opioid outcomes of a transitional pain service in high-risk surgical veterans: A cohort study. *Reg Anesth Pain Med.* 2025 Dec 24:rapm-2025-107092. doi: 10.1136/rapm-2025-107092. PMID: 41443747.

2. Rudin C. Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead. *Nat Mach Intell.* 2019;1(5):206-215. doi: 10.1038/s42256-019-0048-x.