

DESIGNING A NEXT GENERATION INTRA-OPERATIVE DECISION SUPPORT SYSTEM

Patrick J. McCormick, MD; Matthew A. Levin, MD; Marina Krol, PhD

Department of Anesthesiology, Mount Sinai School of Medicine, New York, New York

Introduction: Current generation intra-operative monitoring and decision support technology remains primitive in comparison to other information-intensive fields. We hypothesized that open source tools and platforms could be used to build a next-generation intra-operative monitoring platform with near real-time decision support capability at low cost and with excellent interoperability, extensibility, and performance characteristics.

Methods: Using our institution's anesthesia information management system (AIMS) for data acquisition, we designed a network-based monitoring system that streams intraoperative demographic, drug administration, clinical event, and physiologic data into a central SQL relational database. Server-side heuristic and data analysis algorithms identify events or trends of potentially physiologic importance, and then push notifications to the anesthesia workstation. Institutional Review Board approval was obtained for our decision support system. An opt-out mechanism allows anesthesiologists to not participate in our decision support trials.

Results: Initial implementation of the streaming data collection component took approximately 120 man-hours of work. Primary system components are Ubuntu Linux 10.04, MySQL 5.1 and Perl 5.10. The system monitors 87 anesthetizing locations and updates the database every 30 seconds, with a latency of 1-2 minutes. Average data per case is only 16 - 20 KB at case start and less than 1 KB per subsequent update, so bandwidth is not a limiting factor. Assuming worst case performance of 2 seconds per file, 30 active locations can be handled without significant processing delay.

Conclusions: Building next generation monitoring and decision support systems is both feasible and cost-effective, provided baseline data acquisition and computing infrastructure is already in place. Development of such systems is imperative in order to provide a platform that will support both the next generation of prospective anesthesia outcomes research and continuous quality improvement projects. In the future, real-time quality metrics may become standard of care.