



Providing Better Healthcare Through Systems Engineering: Seminars and Discussions

Addressing Multi-criteria Objective Functions in Healthcare Provider Scheduling Projects

Amy Cohn, PhD | Krishnan Raghavendran, MBBS

Monday December 9 at 4:30PM in 1123 LBME



Specializing in trauma, burn, surgical critical care, and emergency surgery areas, the surgeons in the Division of Acute Care Surgery at Michigan Medicine care for our most critically injured patients. Ensuring that this team is able to properly staff its units at all times is essential to Michigan Medicine's mission and role as a Level 1 Trauma Center and Burn Verified Center. However, traditional methods for scheduling healthcare providers are time-intensive and may fail to meet the needs of the providers and units they serve. For Acute Care Surgery, the task of creating the schedules, which often follows a complex set of rules and preferences, falls on the Division Chief, consuming valuable time and sometimes not satisfying each surgeon's preferences. To improve this process, we have created a computerized decision-making tool to ease the burden of creating such schedules. We formulated an integer program to automate the creation of this department's six-month-long schedule, which assigns 15 attending surgeons to 5 units for weekly time intervals. Users can input schedule parameters such as the attending surgeons' time-off requests and targeted number of weeks on service. Moreover, metrics enable generating the highest-quality schedule that simultaneously meets the needs of the department, the surgeons' preferences, and balances the schedule fairly. This scheduling tool has drastically decreased the production time of the schedule. Whereas previously creating the six-month schedule required multiple weeks of the division chief's time, using the scheduling tool requires only a few hours of the division chief's time. Additionally, the transparent schedule metrics defined by the tool can increase a sense of fairness among surgeons, increasing job satisfaction and reducing physician burnout.

Amy Cohn, PhD, joined the faculty in the Department of Industrial and Operations Engineering at the University of Michigan in 2002 as an Assistant Professor and was promoted to Associate Professor in 2009; in 2011, she was also named a Thurnau Professor and in 2017 was promoted to Full Professor. She currently holds the position of Associate Director for the Center for Healthcare Engineering and Patient Safety. Her primary research interest is in robust and integrated planning for large-scale systems, predominantly in healthcare and aviation applications. She also collaborates on projects in satellite communications, vehicle routing problems for hybrid fleets, and robust network design for power systems and related applications. Her primary teaching interest is in optimization techniques, at both the graduate and undergraduate level.

Dr. Raghavendran is Professor of Surgery and the Division chief of Acute Care Surgery, Section of General Surgery. He received his medical education in India and immigrated to the United States in 1991, wherein he completed his Surgical Residency and subsequent fellowship in Surgical Critical Care. Dr. Raghavendran has been continuously funded by the National Institutes of Health (NIH) from both NIGMS and NHLBI for the past 14 years. The current R-01 is on the study of Hypoxia-inducible factor 1 α in the pathogenesis of acute inflammatory response following lung contusion. The focus of his clinical interest is with ARDS and ventilator-associated pneumonia. He currently serves as the director of the newly formed Michigan Center for global surgery. Additionally, he serves as the lead physician for the University of Michigan India collaborative. He has also received funding from the NIH US/India collaborative with an R-03 award examining the role of ultrasound and measurement of optic nerve sheath diameter as a surrogate marker for traumatic brain injury.

1123 LBME is room 1123 in the Ann & Robert H. Lurie Biomedical Engineering Building (LBME). The street address is 1101 Beal Avenue. A map and directions are available at: <http://www.bme.umich.edu/about/directions.php>.

This seminar series is presented by the U-M Center for Healthcare Engineering and Patient Safety (CHEPS): Our mission is to improve the safety and quality of healthcare delivery through a multi-disciplinary, systems-engineering approach.

For additional information and to be added to the weekly e-mail for the series, please contact genehkim@umich.edu.

Photographs and video taken at this event may be used to promote CHEPS, College of Engineering, and the University.