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Monday
November 30, 2015
4:30PM
in 1123 LBME

Using Optimization to Assist in Surgical Nurse Scheduling

Every month, the three Operating Room Clinical Supervisors at the University of Michigan Health System each spend one week scheduling approximately 200 nurses and surgical technicians by hand to staff the operating rooms. The schedules must consider hospital policies, nursing contract language and staff preferences. Given the conflicting constraints, a feasible solution may not exist. To address this, we present a mixed-integer linear programming optimization model that minimizes a measure of infeasibility and produces an initial schedule in only minutes of computing time. The significant reduction in effort allows the Clinical Supervisors to spend more time on their other duties, including hiring, patient safety reviews, policy updates and nurse mentoring. We discuss the importance of allowing for infeasibility in preference-based optimization and present examples of how to model it appropriately.

Mark S. Daskin is the Department Chair of, and Clyde W. Johnson Collegiate Professor in, the Industrial and Operations Engineering Department at the University of Michigan. Prior to joining the faculty at Michigan, Daskin was on the faculty at Northwestern University (1980-2009) and the University of Texas (1978-1979). Daskin received his Ph.D. from the Civil Engineering Department at M.I.T. in 1978. He also holds a B.S.C.E. degree from that department and a Certificate of Post-Graduate Study in Engineering from the University of Cambridge in England. Daskin's research focuses on the application and development of operations research techniques for the analysis of health care problems, as well as transportation, supply chain, and manufacturing problems. He is the author of over 75 refereed papers and of two books: *Network and Discrete Location: Models, Algorithms and Applications* (John Wiley, 1995) and *Service Science* (John Wiley, 2010).

Kayse Lee Maass is a Ph.D. candidate in the Department of Industrial and Operations Engineering at the University of Michigan. She is a recipient of the NSF Graduate Research Fellowship Program Award, the Richard and Eleanor Towner Prize for Outstanding PhD Research, and the Judith Liebman Award. She also serves as President of the University of Michigan INFORMS Student Chapter and as a Graduate Student Advisor. Her primary research focuses on new methods of integrating various operational strategies into facility location models to mitigate the traditional hard capacity constraints. She also has research interests in the application of operations research methods to healthcare and humanitarian logistics.

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