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## Coordinating Clinic and Surgery Appointments to Meet Access Service Levels for Elective Surgery

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Providing timely access to surgery is crucial for patients with high acuity diseases like cancer. We present a methodological framework to make efficient use of scarce resources including surgeons, operating rooms, and clinic appointment slots with a goal of coordinating clinic and surgery appointments so that patients with different acuity levels can see a surgeon in the clinic and schedule their surgery within a maximum wait time target that is clinically safe for them. We propose six heuristic scheduling policies with two underlying ideas behind them: (1) proactively book a tentative surgery day along with the clinic appointment at the time an appointment request is received, and (2) intelligently space out clinic and surgery appointments such that if the patient does not need his/her surgery appointment there is sufficient time to offer it to another patient. A 2-stage stochastic discrete-event simulation approach is employed to evaluate the six scheduling policies. In the first stage of the simulation, the heuristic policies are compared in terms of the average operating room (OR) overtime per day. The second stage involves fine-tuning the most-effective policy. A case study of division of colorectal surgery (CRS) at the Mayo Clinic confirms that all six policies outperform the current scheduling protocol by a large margin. Numerical results demonstrate that the final policy performs 52 percent better than the current scheduling policy in terms of the average OR overtime per day under the same access service level. In conclusion, urgical divisions in which a surgery may be offered to the patient following a clinic consultation should consider using scheduling policies that take the surgical availability of surgeons into consideration when scheduling a clinic appointment.

**Pooyan Kazemian** is currently a research fellow in the Division of General Internal Medicine at the Massachusetts General Hospital (MGH) and Harvard Medical School (HMS). Prior to joining MGH/Harvard, he worked at the Mayo Clinic as an operations research intern. Pooyan got his Ph.D. from the department of Industrial and Operations Engineering at the University of Michigan in April 2016. His research is focused on designing new data-driven optimization models for improving healthcare operations and disease management and aims to improve the quality of care, access, patient safety and health outcomes at lower cost. Pooyan's research has been recognized by a number of awards including the INFORMS Bonder Scholarship for Applied Operations Research in Health Services for the potential in making a significant contribution to the field of applied operations research in healthcare systems, Rackham Predoctoral Fellowship for working on a dissertation that is unusually creative, ambitious and risk-taking, and first place winner of the POMS College of Healthcare Operations Management Best Paper Competition.

**Mark Van Oyen** is a Professor of Industrial and Operations Engr. (IOE) at the University of Michigan, which he joined in 2005. His interests include the analysis, design, control, and management of operational systems and queueing networks. His current research focuses on healthcare operations or medical decision making. He co-authored papers that won the 2016 Manufacturing and Service Operations Management (MSOM) Best Paper award, 2010 Pierskalla Award, first prize winning papers in the 2016 and 2011 POMS CHOM competitions (with second prizes in 2013 and 2011). His awards with student advisees include first prize in the 2012 MSOM Student Paper Competition (and two other finalist paper in other years) and the 2012 INFORMS "Doing Good with Good OR" first prize. He was the IOE Dept. Faculty of the Year for 2008-9, and the 2003 Researcher of the Year at Loyola University Chicago's School of Business. He has served as Associate Editor for Operations Research, Naval Research Logistics, and IIE Transactions and Senior Editor for Flexible Services & Manufacturing. He was a faculty member of the Northwestern Univ. Sch. of Engr. (1993-2005) and Loyola Univ. of Chicago's Sch. of Bus. Admin. (1999-2005). He has received grant funding from the NSF, NIH, NEI, ONR, EPRI, Glaucoma Research Found., ALCOA, GM, and the VA.

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