Solution Methods for Integrated Surgery Scheduling and Inventory Allocation Problem

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Abstract: Considering the availability and cost of surgical instruments while creating operating rooms (ORs) schedule provides an opportunity to reduce the cost of healthcare. We propose a mixed integer programming (MIP) model for the integrated problem to determine the schedule of surgeries and assignments of instruments to surgeries over a week. The objective of the model is to minimize the cost of opening the ORs, overtime, idle-time, and the cost of using/borrowing instruments to satisfy the demand. To generate solutions in reasonable time, a Lagrangean decomposition-based heuristic is proposed in which the integrated problem is separated into a surgery scheduling problem and an instrument assignment problem. The surgery scheduling model has a special structure that has no resource sharing among surgeries assigned different (day,OR) tuples in the planning horizon. This renders the sequencing decisions for each (day,OR) assignment independent once a patient to (day,OR) schedule is given. A partitioning procedure based on Logic Based Benders Decomposition is used to solve the scheduling problem and results in MIP sequence optimization problem one for each (day,OR). The results of our experiments indicate that integrating decisions lowers the total system costs.

Talk will take place on July 28, 2021 from 1:00PM - 2:00PM through Zoom.