CPA Research Speaker Series (OIS)

Alberta School of Business
Department of Accounting, Operations, and Information Systems

Presents:

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Topic:

Timing it Right: Balancing Inpatient Congestion versus Readmission Risk at Discharge

Friday December 7, 2018
1:30pm – 3:00pm
BUS Room 4-16 (Banister Conference Room)

ABSTRACT

When to discharge a patient plays an important role in hospital patient flow management as well as quality of care and patient outcomes. In this work, we develop and implement a practical decision support tool to aid hospitals in managing the delicate balance between readmission risk at discharge and ward congestion. To support hospital daily operations, we formulate the discharge decision framework as a large-scale Markov Decision Process (MDP) that integrates a personalized readmission prediction model to dynamically prescribe both how many and which patients to discharge on each day. Due to patient heterogeneity and that length-of-stay is not memoryless, the MDP suffers the curse of dimensionality. To overcome this challenge, we derive useful structural properties and leverage an analytical solution for a special cost structure to transform the MDP into a univariate optimization; this leads to an efficient dynamic heuristic. Working with our partner hospital to implement our model, we discovered that off-the-shelf statistical methods could not provide adequate input for our decision support framework: a time-based trajectory for the evolution of readmission probability and timing over a patient's hospital stay. To bridge this gap, we integrate several statistical methods to build a new readmission prediction model that supports our decision framework in working with existing hospital data systems.

Through extensive counterfactual analyses, we demonstrate the value of our discharge decision tool over our partner hospital's historical discharge behavior. We also obtain generalizable insights by applying the tool to

a broad range of hospital types through a high-fidelity simulation. Lastly, we discuss the implementation efforts of this discharge optimization tool at our partner hospital.

(Copies of the paper are available in the AOIS Department BUS 3-20A)