Engineering Management, Information, and Systems

PROCESS REENGINEERING AND OPTIMIZATION IN HEALTHCARE FOR TREATING THE UNINSURED

Ph.D. Dissertation Defense

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Room 115 (Huitt Zollars Pavilion), Embrey Building

Abstract: Uninsured patients suffering from chronic diseases may have access to medical treatment under federal law, EMTALA, only after being evaluated as in 'emergent, life-threatening condition' in the emergency room (ER). These patients seek regular treatment typically at the ER of county hospitals throughout the nation. In the case of End Stage Renal Disease (ESRD), uninsured patients needing recurring dialysis receive the treatment conditional on a screening assessment in the ER. Unfortunately, depending on the screening outcome, some of these patients may not qualify for immediate treatment, and hence, may be rejected service under the existing treatment protocol. This practice is known as "compassionate dialysis", and it is aimed at relieving overcrowding in the dialysis unit of county hospitals. However, due to the chronic nature of the disease all rejected and treated patients eventually return to ER for their recurring dialysis needs. Hence, the screening assessment itself may lead to severe congestion in the ER and significant treatment delays for patients. In this dissertation, we aim to reengineer the compassionate dialysis process by proposing systemic changes to the existing care delivery process and treatment protocol. To this end, we model the underlying process as a queueing network, and we propose new (i) queuing-theoretic, (ii) stochastic-simulation, and (iii) simulation-optimization models contributing to the literature on stochastic modeling and informing the practice of healthcare operations. Our modeling efforts investigate alternative service and patient-flow protocols that rely on the use (i) dynamic rejection rates, (ii) patient scheduling as well as (ii) prioritization schemes. We quantify the benefits of these alternatives relative to the congestion and treatment delays associated with the existing process and protocol. To the best of our knowledge, there does not exist previous work that offers a quantitative analysis of a queuing system with repeated (chronic) interactions with customers (patients) that keep coming back for service (treatment) but qualify to receive service only if they meet the established screening protocol criteria. The targeted analysis of such a generic problem setting is precisely the core intellectual merit of this dissertation.

Biography: Farnaz is a Ph.D. candidate in Operations Research at the Lyle School. She joined SMU in 2016 after earning two Master's degrees in Industrial & Management System Engineering and Mechanical Engineering & Applied Mechanics from the University of Nebraska-Lincoln, where she was a Teacher/Research Assistant. She received her B.Sc. in Industrial Engineering from Mazandaran University of Science & Technology. Her research interests include service system optimization under uncertainty, statistical/mathematical modeling, and decision analytics, with an emphasis on healthcare applications. She is a research associate of UT Southwestern Medical Center, Internal Medicine.

Everyone invited and welcome!