EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Optimization of Biomarker-Based Screening Strategies for Early Detection of Prostate Cancer

ABSTRACT – Prostate cancer is the most common cancer in men. Screening typically involves the use of prostate specific antigen (PSA) tests. However, the imperfect nature of PSA tests and the fact that many cancers are likely indolent, means there is the potential for screening to cause harm due to unnecessary biopsies and treatment. Newly discovered molecular biomarkers offer the opportunity to improve screening protocols by discriminating between low and high risk cancers, but their high cost and imperfect predictive value has raised many questions about whether and when to use them. In this talk I will provide some background on the clinical process for prostate cancer screening and treatment and opportunities for operations research to improve decision making in clinical contexts such as this. Next, I will discuss some models for the optimal design of screening strategies, including a partially observable Markov decision process (POMDP) model. Some properties of the optimal policy will be discussed, and an approximation method suited to solving finite horizon non-stationary POMDPs will be presented. The results of computational experiments will be used to illustrate the use of the model for making screening protocol design decisions, such as if and when to recommend a patient for biomarker testing, and when to refer patients for additional testing and subsequent treatment. The talk will conclude with a discussion of future research directions.

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SPEAKER BIO – Brian Denton is a Professor in the Department of Industrial and Operations Engineering at University of Michigan, in Ann Arbor, MI. He is also a Professor in the Department of Urology and a member of the Cancer Center at University of Michigan. Previously he was an Associate Professor in the Department of Industrial & Systems Engineering at NC State University, a Senior Associate Consultant at Mayo Clinic, and a Senior Engineer at IBM. He is past president of the INFORMS Health Applications Section and he served as Secretary on the INFORMS Board of Directors from 2012 to 2015. He is also Past President of INFORMS. He has served on several editorial boards including the INFORMS Journal on Optimization, IISE Transactions, M&SOM, Interfaces, Operations Research, and Medical Decision Making. His current research interests are in optimization of decision making under uncertainty with applications to chronic diseases including cancer and cardiovascular disease. He completed his Ph.D. in Management Science at McMaster University, his M.Sc. in Physics at York University, and his B.Sc. in Chemistry and Physics at McMaster University in Hamilton, Ontario, Canada.

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