

## Operations Research in Medical Decision Making: Insights for Chronic Diseases

**Shan Liu**

Assistant Professor  
Industrial & Systems Engineering  
University of Washington

**Abstract:** How can patients and health care providers make the best screening and treatment decisions under uncertainties and resource constraints? We investigate this question by evaluating new medical technologies and health care interventions in the context of chronic disease management. I discuss some of our past and on-going research in the field of medical decision making using chronic hepatitis C (HCV) and depression as two case studies. Chronic HCV is a difficult to treat disease affecting approximately 3 million Americans. Newer treatments show great promise in providing better health outcomes at significant costs. I will present an overview of several cost-effectiveness studies to evaluate the U.S. HCV screening and treatment guidelines, and a study on how to optimally allocate screening and treatment resources in an integrated health care system to improve long-term population health outcomes. Next, I will present a theoretical study on the impact of uncertainty about future technological progress on patients' treatment adoption decisions. In particular, how long should a patient with a treatable chronic disease wait for more effective treatment before accepting the best available treatment? We explore this patient-level treatment adoption decision as an optimal stopping problem using a discrete-time, finite-horizon Markov Decision Process. Finally, I will briefly discuss our current research on designing optimal personalized monitoring schedules for depression care. Mitigating depression has become a national health priority as it affects 1 out of 10 American adults and is the most common mental illness seen in primary care. Our objective is to translate electronic health record data into solutions regarding who should be screened/monitored and how often, and how cost-effective of these adaptive screening and monitoring strategies could be.

**Bio:** *Shan Liu* is an assistant professor of Industrial & Systems Engineering at the University of Washington. She received her Ph.D. in Management Science & Engineering from Stanford University, a M.S. in Technology and Policy from MIT, and a B.S. in Electrical Engineering from The University of Texas at Austin. Her research focuses on the evaluation of new medical technologies and healthcare interventions to improve patients' health and enable cost-effective care delivery. She integrates techniques such as optimization, decision analysis, and systems modeling to solve both patient-specific and population healthcare problems. She is interested in developing decision theory and applied mathematical models for optimal disease management when there is rapid technological development. Prof. Liu has on-going collaborations with the Stanford Center for Primary Care and Outcomes Research, the Veteran Affairs Palo Alto Health Care System, and the Group Health Research Institute in Seattle. She is a member of INFORMS, the Society for Medical Decision Making (SMDM), and the Tau Beta Pi Engineering Honor Society.

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