CENTER FOR
HEALTHCARE ENGINEERING & PATIENT SAFETY
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PROVIDING BETTER HEALTHCARE THROUGH SYSTEMS ENGINEERING:

A Simulation Based Comparison of Point-of-Care Testing and Central Laboratory Testing

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4:30 PM EST, Monday 8/31 (RSVP for Zoom Link)

In response to demand for fast and efficient clinical testing, the use of point-of-care testing (POCT) has become increasingly common in the United States. However, studies of POCT implementation have found that adopting POCT may not always be advantageous relative to centralized laboratory testing. We construct a simulation model of patient flow in an outpatient care setting to evaluate tradeoffs involved in POCT implementation across multiple dimensions, comparing measures of patient outcomes in varying clinical scenarios, testing regimes, and patient conditions. We find that POCT can significantly reduce clinical time for patients, as compared to traditional testing regimes, in settings where clinic and central testing areas are far apart. However, as distance from clinic to central testing area decreased, POCT advantage over central laboratory testing also decreased, in terms of time in the clinical system and estimated subsequent productivity loss. For example, testing for pneumonia resulted in an estimated average of 27.80 (central lab) versus 15.50 (POCT) total lost productive hours in a rural scenario, and an average of 14.92 (central lab) versus 15.50 (POCT) hours in a hospital-based scenario. Our results show that POCT can effectively reduce the average time a patient spends in the system for varying condition profiles and clinical scenarios. However, the number of total lost productive hours, a more holistic measure, is greatly affected by testing quality, where POCT often is at a disadvantage. Thus, it is important to consider factors such as clinical setting, target condition, testing costs, and test quality when selecting appropriate testing regime.

Vikrant Vaze is the Stata Family Career Development Associate Professor at Thayer School of Engineering at Dartmouth College. He is interested in developing optimization, game theory, and analytics approaches for improving large-scale complex systems, such as transportation and healthcare. In June 2020, Vikrant was selected as one of 85 engineers who will participate in the National Academy of Engineering's 2020 US Frontiers of Engineering (NAE) Symposium. He holds two master's degrees and a Ph.D. from the Massachusetts Institute of Technology in transportation and operations research, and a bachelor's degree in civil engineering from the Indian Institute of Technology in Mumbai. Before joining academia, he worked as a Research Scientist in Philips Research and as an algorithmic trader on the Wall Street. Joint research work by Vikrant, his students and collaborators has been honored with best paper awards from AGIFORS in 2010, 2017, and 2019, from FAA/Eurocontrol in 2011 and 2017, and most recently with the INFORMS TSL Outstanding Paper Award in Air Transportation. He is the recipient of a number of academic and research honors including the Faculty Early Career Development Program (CAREER) Award from the U.S. National Science Foundation, as well as awards from the U.S. Department of Defense, Federal Aviation Administration, National Institutes of Health, World Wildlife Fund, and several other industry-sponsored awards.

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