



Industrial and Systems Engineering Seminar Series
in conjunction with the ADVANCE Center

**Dynamically Optimizing the Administration of Vaccines
from Multi-Dose Vials**

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Monday, November 12, 2012, 1:50 – 2:40
3024 Emerging Technologies Building

Abstract: Many vaccines are manufactured in large, multi-dose vials which once opened, must be used within a matter of hours. As a result, clinicians (especially those in remote locations) face difficult tradeoffs between opening a vial to satisfy a potentially small immediate demand, versus retaining the vial to satisfy a potentially large future demand. We formulate a Markov decision process model that determines when to conserve vials as a function of time of day, the current vial inventory and the remaining clinic-days until the next replenishment. The objective is to minimize open-vial waste while administering as many vaccinations as possible. We analytically establish that the optimal policy is of a threshold type. Furthermore, we conduct extensive sensitivity analysis that speaks to the benefits of consolidating demand, investing in buffer stock and adopting different vial sizes. Lastly, we evaluate a practical heuristic that performs competitively with the optimal policy.

Bio: Lisa Maillart is an Associate Professor in the Industrial Engineering Department at the University of Pittsburgh. Prior to joining the faculty at Pitt, she served on the faculty of the Department of Operations in the Weatherhead School of Management at Case Western Reserve University. She received her M.S. and B.S. in industrial and systems engineering from Virginia Tech, and her Ph.D. in industrial and operations engineering from the University of Michigan. Her primary research interest is in sequential decision making under uncertainty, with applications in medical decision making, healthcare operations and maintenance optimization. She is a member of INFORMS, SMDM and IIE.