

**DANIEL J. EPSTEIN DEPARTMENT OF  
INDUSTRIAL AND SYSTEMS ENGINEERING**

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**EPSTEIN INSTITUTE SEMINAR • ISE 651 SEMINAR**

***Dynamic Abandon/Extract Decisions  
for Failed Cardiac Device Leads***

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**ABSTRACT**

Pacemaker and defibrillator lead wires fail stochastically, requiring the surgical implantation of a new lead. Whenever a lead fails, it may be beneficial to extract one or more of the failed leads currently implanted, including previously abandoned leads. Extracting a lead carries life-threatening risks that increase in the dwell time of the lead. However, there are situations in which extraction is not optional: the total number of implanted leads (both failed and functioning) is subject to a maximum limit, typically five, and infections can occur requiring the mandatory extraction of all implanted leads. To study the tradeoff between avoiding risky extractions and maintaining space for future leads, we develop Markov decision process models to determine patient-specific extraction policies for various types of cardiac devices as a function of patient age and the age of every implanted lead. We use clinical data to calibrate the model and present insightful numerical results, including comparisons to heuristics commonly used in practice.

**TUESDAY, MARCH 11, 2013  
VON KLEINSMID CENTER (VKC) ROOM 100  
3:30 – 4:50 PM**

## SPEAKER 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 and maintenance optimization. She is a member of INFORMS, SMDM and IIE.