

## **ENGINEERING THE HEALTH CARE DELIVERY SYSTEM**

Organizers: Stephanie Guerlain, University of Virginia, and Eva Lee, Georgia Institute of Technology

U.S. health care expenditures, at \$2.0 trillion in 2005 and 16.2% of the US GDP are projected to reach \$4.0 trillion in 2015 and 20.0% of the US GDP. Approximately 31% of health care costs are administrative, 35% are elderly consumed, 80% are related to chronic disease management, and 25% are related to spending linked to risky behaviors. These expenditures are expected to continue to be nearly evenly split between public funding and private funding. Thus, healthcare's impact on the economy is substantial in relation to public spending, private funding and US competitiveness in the international economy.

The medical and healthcare industries are fragmented and complex, with multiple stakeholders and processes that are dynamic and rapidly evolving. As such, when compared to other industries, healthcare presents very unique challenges. For instance, compared to the 1 out of 100,000 parcels being misplaced by couriers, 5-10% of medical records are reportedly misplaced. Whereas the banking industry has a transaction error rate of 1 in ten million, hospital transaction errors are over 2%. The airplane landing and takeoff accident rate is on the order of 1 in a million, whereas adverse events related to medication administration occur in approximately 7% of cases.

Due to the enormous cost of care, the burden of optimal decision making on both the provider and consumer has grown astronomically. A spectrum of engineering tools have been beneficially employed in designing optimal policies for the design and operation of healthcare delivery systems. With the increased use of electronic medical records, and the availability of data and information, we see increased importance and potential for their use in designing and evaluating individual choices of care, for both the providers and for the patients themselves. There are a multitude of challenges, however, due to the nascent use of standards for data interchange, privacy and security concerns, and special interests across the insurance, medical and consumer advocacy groups.

For this session, we focus our talks on the area of health information technology, diagnosis and treatment advances, patient safety and detection of adverse events, and effective chronic disease management.

The first presentation will highlight the current status of health information technology (HIT) and discuss promising research directions in biomedical informatics that have the potential to improve HIT. The second presentation focuses on the technical aspects of measuring calibration in medical decision support models, and implications of applying un-calibrated models to make healthcare-related predictions. The third presentation will review classes of adverse event detection systems, describe some recent advances in this area, and highlight the technical challenges. The fourth presentation will present a care management model intended to create a reliable and effective system of care for older adults with multiple chronic illnesses, and prevent unnecessary decline, hospitalizations, and death.

The session will conclude with a panel discussion.