School of Science Institute
for Mathematical Modeling and Computational Science

iM²CS Guest Lecture

When: **February 24th, 2012**
12:00-1:00 pm
Where: **LD030**

Joint seminar with the Mathematical Statistics seminar series

Title:

A predictive model of serial, patient-specific colonoscopy results

Abstract:

The use of regular colonoscopy has increased considerably since Medicare began covering screening colonoscopy in 2001 for average-risk patients and the objective of our research is improve the efficiency and effectiveness of post-colonoscopy care by tailoring recommendations for a specific patient. In particular, the model was developed to capture the clinical result that a patient's risk for colorectal neoplasia varies most strongly with his baseline colonoscopy findings. The model framework relies on a neoplasia natural history model to describe progression through four neoplasia development states with patient age. We use multiple possible combinations of natural history model parameter sets, whose a priori likelihoods are a function of patient sex, to model the overall neoplasia formation and, after a colonoscopy, the parameter set combination likelihoods adjust in a Bayesian manner based on the results and conditions of the colonoscopy and their model predictions can. The adjustment of model predictions operationalizes, and is necessary to capture, the clinical results that multiple or advanced neoplasia at baseline colonoscopy is an independent predictor of multiple or advanced neoplasia at follow-up colonoscopy, and vice versa for negative colonoscopies, and the adjustment of parameter set combination likelihoods accounts for the possibility that patients may have different neoplasia development rates. To support model identification, observational longitudinal colonoscopy results, procedure details, and patient characteristics were collected for 4,084 patients. We found that at least two parameter sets specific to each sex with model adjustments was required to capture the longitunidal colonoscopy data and inclusion of multiple possible parameter set combinations, which account for random variations within the population, was necessary to accurately predict the second-time colonoscopy findings for patients with a history of advanced adenomas. Application of this model to predict CRC risks for patients adhering to guideline recommended follow-up colonoscopy intervals found that there are significant differences in risk with patient age, gender, and preparation quality and demonstrates the need for a more rigorous investigation into these follow-up recommendations.

Biography

Eric A. Sherer, PhD is a fellow in CTSI Disease and Therapeutic Response Modelling Program at IUPUI and an Investigator in Residence at the Roudebush Veterans Affairs Medical Center in Indianapolis. He is currently designing the use of screening tests for the prevention of colorectal cancer (CRC), application of genetic algorithms for pharmacokinetic model building, and a disease progression model of abdominal aortic aneurysms. He came to Indianapolis after receiving a PhD in chemical engineering from Purdue University where he used stochastic population balance models to model the effects of chemotherapy on cell populations.