Research

EXECUTIVE SUMMARIES : EDITED BY SUSAN ALBIN

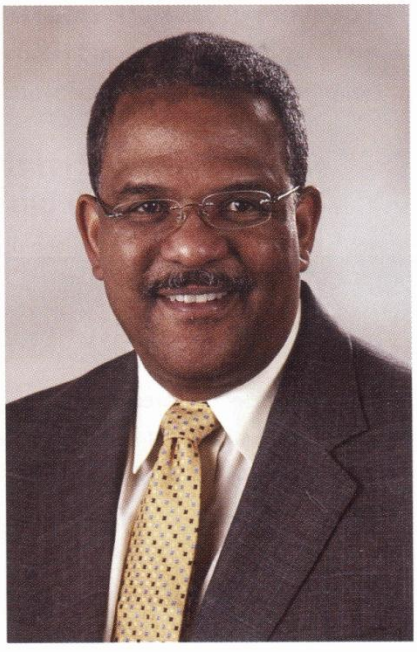
Our first research highlight shows how to predict the length of surgical procedures to aid in scheduling and resource utilization. Our second highlight evaluates the quality of data obtained from sensors and its value in process control. Both articles show the impact of their analysis with real data — from the operating room and from the factory floor — and will appear in the February issue of IIE Transactions *(Volume 42, No. 2).*

Professors Jianhua Huang (from left) and Ying Li and Ph.D. student Saijuan Zhang of Texas A&M University

Predicting the length of a surgical procedure

Hospitals, in an effort to contain costs, seek to use existing resources efficiently. Operating rooms, surgeons, anesthesiologists and nurses are all indispensable and expensive resources. Scheduling these resources requires hospitals to estimate the length of each surgery, and surgeries are inherently variable. Predicting surgery length poses a serious challenge to surgical scheduling and resource utilization.

Current procedural terminology (CPT) codes are five-digit numbers assigned to every service a medical practitioner provides to a patient. The codes are developed by the American Medical Association (AMA) and are used by insurers to determine the amount of reimbursement that a practitioner will receive. Prior research indicates that CPT codes can be helpful in predicting surgery lengths.



Dr. Reginald Baugh, professor and chief in the Department of Surgery, Division of Otolaryngology at the University of Toledo College of Medicine

To date, there has been little reporting of a general predictive methodology to extract information from CPT codes to predict the length of a surgery. A major obstacle is that a single CPT code or a combination of several CPT codes can be associated with each surgery. There are a large number of CPT codes and, of course, an extremely large number of possible combinations.

One way to approach this is to construct a design matrix to reflect CPT code combinations. However, this matrix is intractable, both sparse and ill-conditioned.

In their article "Predicting Surgical Case Durations using Ill-Conditioned CPT Code Matrix," professor Ying Li, professor Jianhua Huang and doctoral student Saijuan Zhang of Texas A&M University, along with Dr. Reginald Baugh of the University of Toledo College of Medicine, address the very important problem of predicting surgery length using two regression models. To perform the regression analysis, they devised a systematic procedure to construct a full-ranked, tractable design matrix by sifting out the CPT codes without any predictive power while retaining the

useful information as much as possible. Their proposed models can be applied in general situations where a surgery can have any number of CPT codes and any combination of CPT codes. Using real surgical data, they compared the proposed models with benchmark methods and found remarkable reductions in prediction errors.

CONTACT: Ying Li; yli@mays.tamu.edu; (979) 458-4787; 4217 TAMU, Department of Information and Operations Management, Texas A&M University, College Station, TX 77843