



**Workshop:**  
**Patient Centered (Health) Care Solutions**

**Development of a Clinical Pathways Analysis System with Adaptive  
Bayesian Nets and Data Mining Techniques**

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**Abstract**

Information and communication technologies, and new governmental directives that have been implemented by academic and private health science centers, are paving the way for a new era of patient centered care in the United States. As quality of care becomes a major focus in the 21st century, U.S. healthcare research has begun to address, and more accurately assess, the nature of medical error in the U.S. Healthcare System. These errors are alarmingly common, costly, and often preventable [IOM Report Ref]. Implementing automated error-checking information systems has shown a marked improvement in reducing error incidence [Kopec/Kabir Paper]. This research will describe three internet-based applications that were developed with the objective of reducing the incidence of medical error(s) in health care practice.

Clinical pathways define the essential components of complex care processes. For example, a patient with total hip replacement is at higher risk for developing pressure ulcers. In the Clinical pathways developed for total hip replacement, skin care is addressed through specific key interventions such as a consultation with a nutritionist or physical therapist. For clinical pathways analysis we identified important aspects of patient treatment, such as age, weight, treatment, medication, monitoring process, and clinical outcomes, such as pressure injuries. We evaluated data mining software as a tool for an action-oriented framework for making decisions directed toward improving care delivery, organizational performance, and patient outcomes. We built a decision support system (DSS) model based on the adaptive Bayesian networks (ABN) methodology and a data mining engine. An ABN provides a fast, scalable, non-parametric means of extracting predictive information from data with respect to a target attribute. (Non-parametric statistical techniques avoid assuming that a family of simple distributional models, such as standard linear regression, characterizes the population where different members of the family are differentiated by a small set of parameters.)

We performed

- (1) installation and tuning of the Oracle database and data mining engine and
- (2) the following data mining tasks in the following order: collection and preprocessing of patient data, building and testing a model, computation of lift.

This paper will explain the methodology for developing our ABN and our data mining techniques as well as our results using them.

Telecommunication can be used to disperse the expert knowledge in the healthcare care domain. Currently, many healthcare data systems have been developed around the world with varying degrees of success. Many of these have been stand-alone applications, which create disparities for those in rural or remote locations who cannot benefit from the technology. This research will explore how new and emergent technologies like telemedicine can engender this evolving field of healthcare informatics.

Kohn, L. T., Corrigan, J. M., Donaldson, M. S., et al. To err is human: building a safer health system. Institute of Medicine, Committee on Quality of Health Care in America. Washington, D.C.: National Academy Press, 1999.

Kopec, D., Kabir D., Reinharth, D., Rothschild, O., Castiglione, J.). Human Errors in Medical Practice: systematic classification and reduction with automated information systems Journal of Medical Systems (Florida), Plenum Publishers, August, 2003.

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