Monitoring the Function and Use of a Clinical Decision Support System
Elizabeth S. Chen, PhD1*, Tara Borlawsy, MA5*, Khalid Qureshi2, Jianrong Li3, Yves A. Lussier, MD3,4,8, George Hripcsak, MD, MS5,6
1Clinical Informatics Research & Development, Partners HealthCare System, Wellesley, MA
2Dept. of Biomedical Informatics, Columbia University and NewYork-Presbyterian Hospital, New York, NY
3Center for Biomedical Informatics, Dept. of Medicine, and 4UCCRC, The University of Chicago, Chicago, IL
5The Ohio State University Medical Center, Information Warehouse, Columbus, OH

The continuous monitoring of systems that provide healthcare functions is essential to ensuring their constant operation, optimal performance, and value to providers. Log files are rich resources for studying the various aspects of systems including their function and use. Here, we describe the types of log files, applications of results from their analysis, and creation of a monitoring tool for the Vigilens Health Monitor (an operational clinical decision support system at NewYork-Presbyterian Hospital).

Introduction. In the healthcare domain, clinical decision support systems can play a valuable role for supporting decision-making and patient care. The iterative monitoring and evaluation of such systems is essential for ensuring their proper operation and guiding enhancements to better meet the needs of end-users. One approach for assessing functionality and usage is the analysis of log files that record various aspects of system activity.

At NewYork-Presbyterian Hospital, we have been developing the Vigilens Health Monitor to provide decision support functions (e.g., clinical alerts and reminders) to healthcare providers throughout the institution1. The basic components of this system are: (1) an event manager that interfaces with various sources of clinical data (e.g., HL7 data feed or Clinical Data Repository [CDR]), (2) an execution engine that applies logic or rules to these data, and (3) a message router for notifying and delivering alerts to healthcare providers through different modalities (e.g., CIS, Web, email, or pager). Vigilens currently offers a range of asynchronous alerts including those for critical laboratory results, infection control2, and community health activities.

Monitoring Alert Function and Use. As part of Vigilens, several types of log files are maintained that can be used for monitoring function and use. The main set of logs residing on the Vigilens servers are responsible for recording information about basic system and alert functions. For example, there are “error” logs that make note of any issues with input data or database connections (e.g., to the local database or remote CDR). The “alert” logs are informative for conveying the frequency of alerts generated in a particular time period and various characteristics of these alerts (e.g., the infection control alert is for particular organisms and locations in the hospital). Another set of logs is for the clinical applications that Vigilens interfaces with, which reside on remote servers. For example, the critical laboratory and infection control alert messages are posted to WebCIS (electronic health record system) and EpiPortal (infection control system) for viewing by relevant users where interactions are recorded in application-specific or Web server logs. The analysis of these types of logs support alternative purposes such as understanding the usage of alerts and how they relate to the local functions of those systems.

To provide an example of how information within log files have been leveraged to support Vigilens, we summarize a monitoring program for the critical laboratory alert that checks values for over 30 different tests (e.g., sodium and potassium). This program is based on an automated statistical tracker3 (developed for the previous version of the clinical event monitor) that was responsible for monitoring the overall operation of rules in the system and detecting malfunctions based upon a combination of Poisson and normal distributions. This approach has been employed by Vigilens where information from relevant logs are summarized and compared with the expected distributions for each laboratory test. Daily, weekly, and monthly statistics are then sent by email to relevant stakeholders notifying them of either normal alert functions or abnormal activity.

References

AMIA 2007 Symposium Proceedings Page - 902