Technical Challenges of Syndromic Surveillance System Deployment in a Health Information Exchange

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Objective

The objective is to describe the technical process, challenges, and lessons learned in scaling up from a local to regional syndromic surveillance system using the MetroChicago Health Information Exchange (HIE) and Geographic Utilization of Artificial Intelligence in Real-Time for Disease Identification and Alert Notification (GUARDIAN) collaborative initiative.

Introduction

Adoption of electronic medical records is on the rise, due to the Health Information Technology for Economic and Clinical Health Act and meaningful use incentives. Simultaneously, numerous HIE initiatives provide data sharing flexibility to streamline clinical care. Due to the consolidated data availability in centralized HIE models, conducting syndromic surveillance using locally developed systems, such as GUARDIAN, is becoming feasible. During the past year, Chicago has embarked on a city-wide HIE deployment campaign. Perhaps the most unique aspect of this endeavor is that the data warehouse for the HIE is intricately tied to the GUARDIAN syndromic surveillance system.

Methods

The GUARDIAN surveillance system has been running continuously at Rush University Medical Center (RUMC) for the past six years. In order to support real-time processing and analysis, the components of the system were deployed over six servers within the RUMC data center, specifically four processing servers plus two database servers configured as a single failover cluster.

Higher level (HL7) messages were received through transmission control protocol (TCP) connections and stored in a database-backed work queue. Using multiple servers, these messages were processed through a series of stages, specifically HL7 parsing, patient de-identification and matching, Natural Language Processing (NLP) of free-text, comparison of new patient data to stored disease profiles, report generation and user interaction through a web-based user interface. Based on the load metrics over the past six years, we have been able to scale up to a twelve server deployment (ten processing servers plus two database servers configured as a single failover cluster) which will support up to 30 hospitals within metropolitan Chicago.

Conclusion

GUARDIAN was able to demonstrate scaling up from two to seven hospitals with similar performance measures in terms of on-boarding and message processing times. The GUARDIAN system, and its associated data warehouse, was successfully expanded from one which supported a single group of hospitals, to one which can potentially support the hospitals of a major city.

Keywords
syndromic surveillance; GUARDIAN; Health Information Exchange

Acknowledgments

GUARDIAN is funded by the US Department of Defense, Telemedicine and Advanced Technology Research Center, award numbers W81XWH-09-1-0662 and W81XWH-11-1-0711.

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