Automatic Clinical Alert Creation And Decision Support Through Real Time Event Monitoring And Active Data Feeding

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Abstract

Manual alert input and activation is prone to missing and error. This paper illustrated the potential clinical benefits of an architectural model of continuously screening of clinical data in huge clinical data repository and actively feeding data into an integrated alert framework for automatic alert creation. To illustrate the feasibility of this generic model, a routine screening laboratory test results of Glucose-6-phosphate dehydrogenase (G6PD) in a huge data repository was continuously monitored, screened and fed into an alert framework where G6PD deficiency alert was automatically created in the electronic patient records according to pre-defined clinical criteria. Over three months after live run of the new services, 77 G6PD deficiency alerts were created by continuously screening of 2,073 G6PD reports among 34M of new laboratory results in the study period. Clinicians could be alerted and medication decision support would be activated to prevent clinicians from prescribing contraindicating medications. The model was shown to be performing, reliable and facilitating clinical care.

Keywords:

Alert, Clinical decision support, Event monitoring, Clinical data repository, Automation

Method

A generic and scalable Active Data Feeding (ADF) function for entity-based active data filtering and routing of specified clinical data was developed in the Hong Kong Hospital Authority to facilitate automatic alert creation and subsequent clinical decision support (Figure 1.) Extracted results with data content were delivered to the Alert Auto Input Module where the results were further interpreted according to predefined clinical rules. All laboratory results received from laboratory systems in the study period were examined by traditional SQL query with the data type and entity IDs to identify the all new G6PD laboratory results for verifying the completeness and accuracy of data extraction using the new Active Data Feeding services. Elapse time for each subscribed data to be extracted and delivered was recorded for performance checking.

Results

There were 34M new laboratory test results newly created in the data repository in the study period of 3 months after the services were implemented. Of which 2,073 G6PD results were automatically identified, extracted and delivered from the electronic patient record repository to the data subscriber, Alert Auto Input Module, where 77 laboratory results were interpreted as G6PD Deficiency. The mean elapse time for data extraction and end-to-end delivery is 58.6 seconds (95% CI 12.4 seconds). No missing or mis-identified G6PD results were found in verification with SQL data base query and counter-checking.

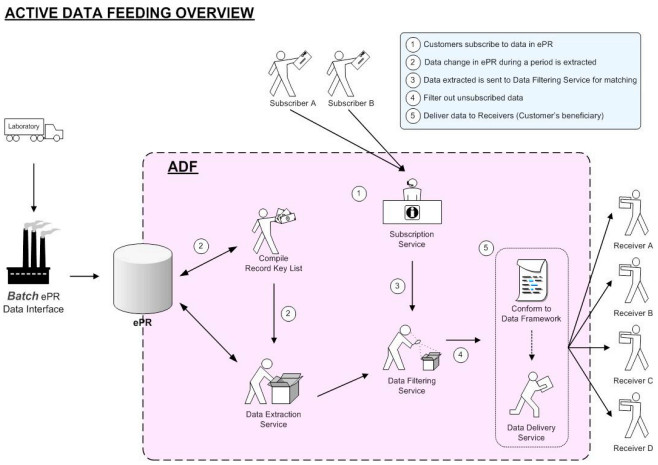

Figure 1-Active Data Feeding (ADF) Model Overview. Data was received from data source (laboratory) into the Electronic Patient Record Repository. Data subscribers specify the data type and rules for data retrieval in Subscription Service (1). Subscribed data was extracted (2) and filtered (3) according to pre-defined criteria in an ongoing and near real time basis. XML messages with the required data content was generated (4) and delivered to data subscribers (5).

Conclusions

It was shown that Active Data Feeding was a reliable and accurate data extraction and delivery model in screening and supporting automatic clinical alert creation. With a well-defined alert framework in automation, clinical data from

source systems could be automatically flagged as clinical alerts provided rules for interpretation were ready and data was in standardized and structured format. Making use of automatic screening, clinical alert could be created reliably and timely. It was demonstrated that it icould accurately extract specified data with good performance and support for data interpretation and automatic alert creation.