Leveraging Decision Support Analytics, FHIR, and Case Reporting for Information Exchange

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Abstract

Historically, reportable conditions were manually submitted to public health agencies. This practice is now being modernized by electronic reporting from either the laboratory or from the electronic health record (EHR). The electronic lab report (ELR) is a reliable method to report cases to public health as commercial and clinical labs send positive test results to the local health authorities. However, ELRs have less information available as it lacks demographic and additional clinical data. We added clinical and demographic data to the ELR via Fast Healthcare Interoperability Resources (FHIR) queries. To complete the information loop, we have used automated case reports as a data source for analytics and decision support. Patient data, including demographics, medications, and allergies, were analyzed by the clinical decision support algorithm to return gonorrhea treatment and screening recommendations to the provider. This continuous update of patient records (using FHIR) and bi-directional exchange of information enables electronic case reporting and actionable clinical decision support (CDS) to simulate a learning health system prototype.

Panel description and each panelist’s presentation

We will discuss system architecture for each component of the project and how this architecture functions together as a learning health system. The panel draws from public and private sectors and has experts working on different aspects of the problem. Mainly, two different approaches have been considered for automating case-reporting of notifiable diseases. We will discuss these approaches, how ECR creates an automatic case report with enriched demographic and pertinent clinical information once the case criteria have been met. Similarly, the ELR generates a case report based on laboratory test results but lacks much of the clinical and demographic information required for a complete case report. The FHIR-based approach is triggered by an incoming ELR and extracts demographic and clinical information from the EHR from where the laboratory request first originated. While the ECR provides a snapshot of the case in time, the FHIR-based enhancement of the ELR and the ECR has the potential to continuously update the record as new information becomes available. This provides a more complete and enhanced case report. As a feedback loop, the same ECR generated from an EHR is also used for analytics and clinical decision support which returns specific gonorrhea treatment and screening recommendations to the provider.

Presentations

Moderator: Dr. Ninad Mishra, who has led this program with partners from public and private sectors, will moderate this panel discussion and would present on the bidirectional nature of the project including how analytics and decision support is applied to the process of electronic case and lab reporting.

Speaker 1: Why Gonorrhea is chosen as a use case for bi-directional information exchange

Dr. Saugat Karki will describe Gonorrhea case reporting and treatment as a use case. In 2017, over 500,000 cases of Gonorrhea were reported to public health. This pattern of increasing cases over the years with reduced antibiotic susceptibility to mainline treatment portrays a worrying trend.

Speaker 2: Electronic Case Reporting from EHRs
Natalie Viator Collins will describe how case detection logic can be implemented within existing clinical IT systems to identify suspected cases of chlamydia and gonorrhea based on a patient diagnosis or positive laboratory result. Coded values sets for diagnoses (ICD-10-CM and SNOMED CT) and laboratory observations (LOINC and SNOMED CT) consistent with narrative criteria published by the Council of State and Territorial Epidemiologists are available to implementers based on input from subject matter experts. Once relevant cases are identified, patient encounter data are used to populate the Health Level 7 electronic initial case report and transmitted to the jurisdictional public health agency in accordance with existing laws and regulations. Previous pilot work found that the case detection logic demonstrated sensitivity and specificity values above 99% for both conditions relative to paper case reports from provider offices. Use of ECR in the community health center setting more than doubled provider-based reporting compared to traditional reporting methods.

**Speaker 3 Enhanced ELR using FHIR**

Dr. Jon Duke will describe the use of FHIR for enhancing the ELR. As noted above, this approach can add to the data provided by the ELR and ECR received from the EHRs as they are both a snapshot of the case at a particular time. In contrast, the FHIR based method has the potential to continuously update the record as more information becomes available such as information on treatment that may not be available at the time of initial ECR. Specifically, Dr. Duke will discuss an implementation of a FHIR-based system that automatically retrieves relevant clinical data for patients with positive laboratory results for Gonorrhea/Chlamydia. Notable features of this system include clinical quality language (CQL) based queries, automated repeat data pulls to populate data that may not be available at the time of diagnosis (e.g. treatment), data filtering and redaction capabilities, and a FHIR-based terminology server to expand term sets without requiring access to the open internet. We will review a pilot of the system and the results from a pilot test implementation.

**Panel importance and urgency**

Gonorrhea cases have been continuously increasing for the past few years, with 555,608 cases reported in 2017. More accurate, complete, and timely data are needed for enhanced public health surveillance and clinical case management. Increases in antibiotic resistance further complicate this situation and demand timely attention. Due to decreased susceptibility to antibiotics, dual therapy with Ceftriaxone and Azithromycin is the only CDC recommended treatment regimen for Gonorrhea. Treatment guidelines are also subject to periodic changes, and hence, it is challenging to ensure continued provider adherence to the most recent treatment guidelines.

Although this use case is for Gonorrhea, similar architecture can be implemented for most of the notifiable conditions that are reported via ELR. The target audience includes health informaticians, EHR vendors, health IT leaders, clinicians, government officials, computer scientists, and public health professionals.

**Discussion Questions**

- What is the current status of ELR, ECR and their FHIR based enhancement?
- What is a learning health system prototype including both case reporting and decision support?
- How a bi-directional information exchange between public health and private providers could simulate an early prototype for a learning health system?

**Assurance**

The panel organizer (Ninad Mishra) vouches that all listed participants have agreed to take part on the panel.