

Application of Reverse Federated Database System for Clinical Laboratory Service

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Content

Traditionally, healthcare organizations utilize electronic health record (EHR) system as a federated database system for end users to retrieve data from a multitude of separate dependent databases through a uniform interface. Increasingly, the dependent databases and their originating clinical services require more information from the EHR in order to function. To fill the gap, numerous workarounds with significant limitations have been devised to allow the originating clinical services to function. Here we have created a novel web service application (WSA) for protein electrophoresis that applies reverse federation database system (RFDS) by interfacing the federated EHR as a dependent database to automatically gather information to streamline the laboratory workflow.

Technology

Web Application Programming Interface (API), JavaScript Framework, Representational state transfer (REST), Virtual Private Network (VPN), OS-level virtualization (San Francisco)

Design

Using JavaScript framework and OS-level virtualization container, we created a server that can query EHR for essential laboratory values (e.g., total protein) through an EHR Web API REST interface. The queries are initiated by the WSA based on the patient identity and information pulled from the protein electrophoresis instrument database. Additional clinical information including medications, documents, radiology, and other additional laboratory results are also queried and compiled. Security and access are achieved through VPN, Web API key, dedicated machine account, and end-user authentication. Additionally, the use of a server to handle EHR query reduces the exposure of EHR Web API to end user tampering.

Results

Figure 1 shows WSA querying data from both EHR (A) and protein electrophoresis (B) and synthesizes a dashboard (C) and presents other pertinent information including medications (D), other laboratory results (E), and clinical documents (F). Preliminary alpha testing and feedback from the laboratory staff and pathologists indicates the WSA will significantly improve the workflow.

Conclusion

We have successfully designed a WSA that applies RFDS to streamline the workflow of a laboratory service. The secure design and the opportunities it offers can be used on any clinical

service that relies on low throughput and error-prone manual information extraction from the federated EHR for routine operation.

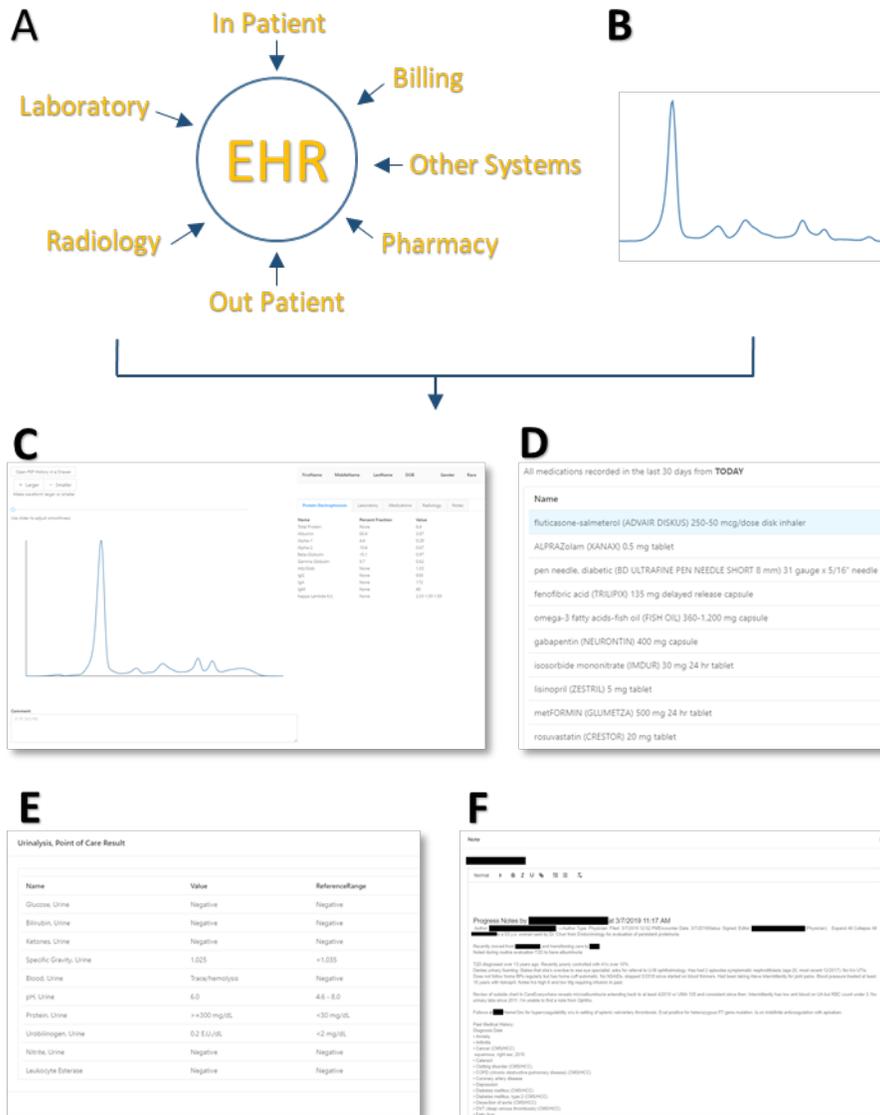


Figure 1. The EHR (A), as a federated database system, allows multiple dependent databases to be accessed uniformly. The protein electrophoresis workflow (B) requires some information from the EHR and can treat it as a dependent database to provide a dashboard (C) medication reference (D), additional laboratory result (E), and clinical documentation (F).