1. Background

The Center for Biologics Evaluation and Research (CBER) uses VAERS (Vaccine Adverse Reporting System) as a passive surveillance system of post-vaccination adverse events (AE), which relies on manual AE case reporting. This process starts with the manual recognition of AEs by a provider, a manual review of records, and manual data entry into case review forms for submission. Reports may also be submitted by patients. The multiple non-assisted steps lead to inaccuracies and incompleteness of the data, resulting in barriers to rapid assessment and comprehensive safety surveillance. For identified AEs, there is often a lengthy process for the FDA to obtain medical records, or electronic health records (EHR), for outcome validation. CBER’s Office of Biostatistics and Pharmacovigilance (OBPV) team, in collaboration with eHealth Exchange (eHx), is developing a Fast Healthcare Interoperability Resources (FHIR)-based infrastructure under the Biologics Effectiveness and Safety (BEST) Initiative to address these challenges. The present pilot study describes a platform to showcase the added value of enhancing and scaling AE surveillance capacity across the United States.

2. Objectives

1. Demonstrate the feasibility of semi-automated case validation, reducing time to obtain EHRs, while minimizing burden on providers
2. Examine data obtained from FHIR-based platforms and determine its fitness for AE surveillance use case
3. Streamline the process of recognizing, reporting and validating VAERS AEs
4. Increase platform visibility to raise awareness of innovative AE surveillance efforts

3. Research Design and Pilot Platform Description

The BEST team connected a cloud platform with tools for detection, validation, and reporting of AE with eHx, which has national coverage. For this pilot platform, 12 eHx network participants connected FHIR endpoints which enabled the platform to retrieve/receive AE case data from the partners’ EHR systems. Data was exchanged in the FHIR HL7 format for interoperability. This platform has two distinct use cases:

Table 1: BEST Platform Use Cases

<table>
<thead>
<tr>
<th>Push Use Case (Figure 4)</th>
<th>Pull Use Case (Figure 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enables providers to push AE reports to the BEST Platform, either using their own, or claims comparable interoperable (FHIR COC, OMOP) adverse event detection algorithms used by multiple agencies (e.g., FDA and CDC)</td>
<td>Allows BEST Platform to pull data from a wide network of providers to confirm or add data to already AE reported cases or add additional information for a patient that may have their medical history spread across providers</td>
</tr>
</tbody>
</table>

The data flow occurs across different secured platforms and allows processes to be initiated by FDA (Figure 2 #1) or the participants themselves (Figure 2 #4), routed through the eHx Hub.

4. Results and Evaluation

A data quality service analyzed 271 Epic post vaccination adverse event live patient records that were pulled into the platform from 11 different data partners’ production EHRs. These records contained the FHIR elements associated with barriers to rapid assessment and comprehensive safety surveillance. For identified AEs, an automated data quality (DQ) service was developed, based on an existing framework, to characterize the current state of FHIR endpoints for conformance, completeness and plausibility of AE-relevant data. 210 different data tests were run on the data elements required/optional for a VAERS form or elements helpful for case AE analysis or validation.

5. Conclusion

Building on the FHIR data quality assessment, the BEST team continues to develop the infrastructure to efficiently federate AE detection logic and conduct clinical validations of identified cases, toward the goal of enhancing passive and active surveillance capabilities. This initiative will further CBER’s goal of obtaining AE-relevant quality data to support the FDA’s post-marketing safety and effectiveness surveillance mission.