NIH Collaboratory Rethinking Clinical Trials®
Health Care Systems Research Collaboratory

Phenotyping in Pragmatic Clinical Trials: The LIRE Case Study

The Phenotypes, Data Standards, and Data Quality Core of the NIH Health Care Systems Research Collaboratory is continually surveying for efforts related to electronic health records (EHR)–based phenotyping to inform work in this area and prevent duplication of effort. This document is part of the **Learning Lab** series exploring challenges and solutions to phenotyping through case studies of clinical trials.

Case Study

Lumbar spine imaging studies frequently reveal incidental findings that have little or no bearing on the patient's back pain, but may have an adverse effect on subsequent healthcare utilization and patient health-related quality of life. LIRE is a large pragmatic, cluster-randomized controlled trial testing the effectiveness of a simple and inexpensive intervention: inserting epidemiologic benchmarks into lumbar spine imaging reports. The goal of the trial is to reduce subsequent tests and treatments, including cross-sectional imaging (such as magnetic resonance and computed tomography), opioid prescriptions, spinal injections, or surgery.

Principal Investigators

LIRE Study: Jeffrey Jarvik, MD, MPH, University of Washington
Data Quality Study: Meredith Zozus, PhD, Duke University

Study Design

Cluster-randomized, stepped-wedge design

Number of Sites

4

Conditions of Interest

Low back pain

Date of First Enrollment

April 2014

Phenotype Development Challenges

For the LIRE trial, the investigators used natural language processing (NLP) approaches to extract findings from the free-text, unstructured radiology reports. For the structured data (e.g., CPT and ICD codes), coding practice variation between sites led to slightly different categorization of relative value units (RVUs). This variation required examining the pattern-of-use across the sites.

The table describes several challenges that arose in our initial phenotype development and the potential solutions.

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Challenge	Solution
Ensuring semantic alignment in *longitudinal data pulls*	• Frequent, regular communication with sites • Testing with index files so risks can be managed early • Document validation process, at both the site level and the central level (pulling data by provider vs. by site) • Validation checks between extractions • Document all processes to enable replicability
Ensuring semantic alignment *within sites*	• Verifying that epidemiological benchmark text is inserted into the appropriate radiology reports where proprietary codes are used to identify reports • Allocating training and validation effort in cases of study staff turnover • Stabilize and document processes for extraction and alignment
Ensuring semantic alignment *between sites*	• Sharing of detailed data specifications with all sites, defining clear inclusion/exclusion criteria and uniform formatting requirements for data submissions to the University of Washington analytic team • Frequent, regular communication with sites' analytic teams, including discussions of extraction methods and data provenance • Applying NLP algorithms uniformly to sites' free-text data to ensure derived datasets were aligned across sites