Interactive Visual Presentation of Open Institutional Clinical Trials Using AI-Based Oncology Ontology Model to Structure the Clinical Trial Inclusion-Exclusion Criteria for Efficient Clinical Review

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1. Background

Providers are often pressed to find a potential trial for a patient during a clinic visit to discuss treatment options. Status of trials, particularly early phase trials, can change daily making it impossible for providers to keep up with availability. The Lurie Cancer Center (LCC) of Northwestern University's (NU) Clinical Trial Office (CTO) alongside Cancer Insights (CI), a technology company, developed and piloted an artificial intelligence (AI)-based clinical trial structuring and visualization tool for LCC's trials so care teams can quickly identify open trials.

2. Goals

To build and test an AI-driven technology that integrates with the clinical trial management system (CTMS) and provides a web-based interactive visual hierarchy of available institutional trials.

3. Solution and Methods

Each clinical disease-based team was consulted regarding key disease specific criteria important for trial classification. CI met with LCC CTO, research and clinical teams several times during product design and implementation. Integration between CI's technology platform and the CTO's CTMS was done using application programming interfaces (APIs). Criteria for LCC's clinical trials were extracted from clinicaltrials.gov and combined with trial status, lead disease team, and coordinator details pulled from CTMS. The inclusion and exclusion criteria were structured using Natural Language Processing (NLP) models for cancer site, treatment setting (e.g., neoadjuvant, adjuvant), biomarkers (PDL/1, HER-2 positive), and trial setting. An ontology model was created to standardize the taxonomy across the trials and diseases. The ontology model defined the label (e.g., histology), value set (e.g., invasive ductal carcinoma, DCIS, LCIS), and data standard (e.g., ICD10, SNOMED) for each NLP extracted metric. Disease teams were consulted regarding the organization of the hierarchical structure of the trial visual presentation. Visualization optimized ensuring important high-level information about trial status, principal investigator (PI), available locations, key eligibility, and trial team contacts was easily accessible for potential patient referral. The visual interactive graph was reviewed and published to the web interface. Validation of trial ingestion, extraction, and classification was done by the LCC CTO and disease teams.

4. Outcomes

The OnTrial web interface launched in December 2023 with an initial set of cancers (lung, breast, HNC). Roll out completed in February 2024 across all 14 disease teams with 903 trials. Each team was trained on how to access and use OnTrial. Trial status and other NU specific data elements were successfully updated nightly from CTMS using the API integration. Process management workstreams were successfully established with each disease team for additional OnTrial development and enhancement.

5. Lessons Learned and Future Direction

The use of AI to deliver a streamlined, intuitive, and reliable internal clinical trial reference is enabling providers to easily offer clinical trial options to patients at the point of care. The OnTrial tool is a result of

a productive collaboration between a technology company and the CTO, research, and clinical teams of an academic medical center to support care delivery. Efforts to integrate OnTrial into the electronic medical record (EMR) system are underway. Automatic screening of patients for open trials with OnTrial is in development.