Clinical Trial Innovation Prize Application   Helynx and Jae Kim, MD | 2015-05-18

Describe your solution.

       The widespread adoption of electronic health record (EHR) systems and new, powerful information processing technology afford an unprecedented opportunity to readily identify appropriate trials for patients with cancer. Our software can hone in on patients who are eligible for clinical trials based on their medical history. Then, the software generates a message for each patient's physician, to make her/him aware of the trial opportunity.

       The federal government has provided incentives for providers to use EHRs in a "meaningful" way to improve patient care. Stage 2 of these incentives includes a measure for eligible professionals (oncologists) to report cancer cases to a public health cancer registry electronically through the EHR, which can be facilitated by our system.

How will you do it?

       We will implement the program at City of Hope's community clinics. City of Hope is an NCCN designated comprehensive cancer center located in Southern California. In addition to the main campus, City of Hope operates 13 community clinics in a 100 mile radius. Patients at these locations are predominantly treated by general oncologists whereas most patients on the main campus are treated by specialty oncologists.

       The Helynx software can identify patients to participate in clinical trials by automatically detecting eligibility within the electronic health record (EHR). By cross-referencing clinical information with the published inclusion/exclusion criteria for each study (e.g., on clinicaltrials.gov), each trial can be matched up with the exact patients who could participate.

How does it work?

       EHRs include most of the data needed to identify patients eligible for clinical trials. Some of this information such as age, gender and zip code, is stored in unique entries in the record which are easy for a computer to utilize. Other data, such as cancer staging and treatment history, may be buried in long-form text which was handwritten or typed as prose. For a computer to understand this kind of "unstructured" text requires new techniques, such as natural language processing.

       Helynx incorporates powerful natural language processing to extract clinical meaning from unstructured text. Helynx can use similar techniques to identify the published eligibility criteria for each trial. Once the patient and trial criteria have been identified, Helynx matches each patient to the trials in which he/she could participate. Additional filters can be applied, e.g. only including trials within a 50 mile radius of the patient's home or only including therapeutic trials. When the software identifies a match, it can send out a notification.

What does it look like?

       The doctor and patient will receive a message containing an easily-digestible description of the trial for which the patient is eligible (either as an email, a communication within the medical-record, or a secure website/patient portal).

How will you implement it?

The EHR data from City of Hope's satellite clinics (using the TouchWorks EHR) will be incorporated using secure and HIPAA-compliant (U.S. Health Insurance Portability and Accountability Act) processes.

Helynx incorporates natural language processing (named entity recognition, part-of-speech tagging, tokenizers, regular expressions), as well as several custom statistical estimation components, which automatically identify parts of the medical record which are relevant to clinical trial eligibility. Helynx encodes these data in a format called a graph (also known as a network, or web). This data structure makes it easy link together ideas, such as patients and the trials they could enter.

The central software for this proposal is already complete. If our group is awarded the Innovation Prize, we use it to implement the data load, data analytics and testing phases.

Where will you implement it?

We would pilot the program at City of Hope's community clinics located in Southern California

Who will be involved (stakeholders)?

Jae Y. Kim, MD Assistant Professor and Chief of Thoracic Surgery at City of Hope Cancer Center and **Helynx**, a startup founded by three Ph.D.s in computational neuroscience and physics from Caltech, UCLA and Harvard.

How much will it cost to create and implement the solution (an estimation)?

$19,000 (data load and analytics, testing and rollout, secure servers & insurance)

How many people will be impacted?

The City of Hope community practice sites serve over 20,000 patients annually. However, if the program is successful, we see this as a tool that could be implemented by any EHR and any health system. The Innovation Prize would fund the first implementation. The ultimate goal would be to have this tool be incorporated into meaningful use criteria to encourage widespread adoption, potentially impacting millions of cancer patients.

How long will it take to create the proposed solution?

15-20 person-days, over 1-2 months.

Why will it work? Why is it viable?

Dr. Kim and collaborators have demonstrated the feasibility of using the EHR to identify patients eligible for City of Hope's lung cancer screening program. The program was able to accurately identify patients eligible for lung cancer screening and allowed us to significantly increase screening participation (http://www.ncbi.nlm.nih.gov/pubmed/25063304). Dr. Kim has also used similar natural language processing to accurately characterize smoking history in patients.

Clinical trial eligibility is more complex and will require more sophisticated computing, and Helynx's particular expertise will help in this area. A similar, computer-aided eligibility screening system used in a cancer center in France was able to increase enrollment in clinical trials by 50% (http://www.ncbi.nlm.nih.gov/pubmed/12957785).