OPEN-SOURCE SOFTWARE FOR SAMPLE INVENTORY CONTROL

INTRODUCTION

The Canadian BioSample Repository (CBSR) has processed and stored biospecimens since 2000. In 2008, CBSR began developing a comprehensive client-server Java application, named Biobank, to be used by nurses, lab technicians, researchers, and lab administrators. Biobank allows multiple users, operating at different computers and different locations, to simultaneously process and log thousands of specimens daily. Nurses can enter specimens into the system, technicians can process and transfer specimens, researchers can request specimens and view inventory information, and administrators can create comprehensive queries and manage users. Biobank is open source and free software, modelled on cTissue from the National Cancer Institute.

Biobank is part of a larger effort by the CBSR to create a network for research collaboration, to facilitate standardization, and to provide help with lab setup, configuration, and training. The system is flexible and can be adapted for almost any storage application, whether it uses handwritten labels, barcodes, test tubes, cryovials, or glass slides to label and store specimens. Currently, CBSR uses Biobank to manage upwards of 480,000 biospecimens and 14,000 patients across 27 studies in dozens of clinics and processing centers around the world (Canada, the United States, and Europe).

METHODS

A team at the Alberta Innovates Centre for Machine Learning (AICML), in Canada, has programmed Biobank using an iterative design methodology with feedback from lab technicians at CBSR. Biospecimens are assigned standards compliant machine-readable barcodes to minimize human errors and improve efficiency. Lab technicians use a downloadable Microsoft Windows thick-client that works with various flatbed scanners and hand-held scanners to identify specimen tube barcodes.

RESULTS

COLLECTION

Clinicians and their staff collect patient biospecimens based on a collection protocol, enter patient consent information into our client, then ship the biospecimens to one of our repository sites. Biobank includes software to print customizable templates with unique 2D and 1D barcode labels, which are scanned for efficient and error-minimized specimen identification. Manifest information is maintained in the collection worksheet and allows technicians at the receiving site to easily track shipments.

SOFTWARE

USERS

ADMINISTRATION

Site and study administrators can control a user’s permission to view or submit individual forms and can restrict those permissions to specific sites and/or studies. Roles and groups provide larger grained control. A role defines a set of permissions characteristic to a particular job, such as, an Administrator, a Study Manager, or a Lab Technician Level Senior or Junior. A group defines a set of permissions or roles for a specific site and/or study.

Storage container configuration is very flexible in Biobank. Any container hierarchy can be represented and containers can be configured to hold only a specific set of specimen types.

Advanced reports provide an intuitive graphic user interface for building complex, filtered queries and aggregations on the database, including only the information the executing user is authorized to see.

Extensive chain of custody information is maintained. Biospecimen collections, transfers, processing, property modifications, and other event data are recorded and searchable. User actions are also audited, logged, and easily queried for regulatory purposes.

CONCLUSION

Biobank is a free, open-source software system designed to offer an affordable solution to research inventory management. Its goal is to advance and support translational research, providing users who have much in common with an integrated way to share their resources.

Because open-source software is extensible, Biobank provides a great launching point. Biobank aims to be standards-compliant and encourages its users to adopt practices that ultimately result in increased compatibility, efficiency, and reliability. As part of our open-source vision, we welcome collaborative development.

Over the last three years Biobank has been used and validated by technicians at CBSR, thirteen collection sites and three processing centres in North America and Europe.