Adoption of an Open-Source Biospecimen Information Management System by a High-Throughput CAP Accredited Biorepository

Washington University in St. Louis

BACKGROUND

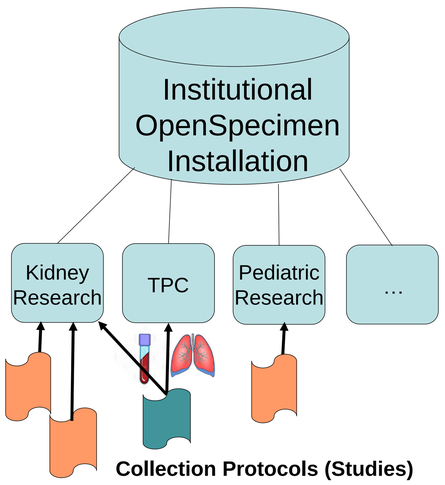
The Laboratory for Translational Pathology (TPC) at Washington University in St. Louis is a highly active biorepository that accessions, processes, stores and distributes various types and quantities of biospecimens. The TPC is one of several biorepositories operating independently to facilitate the storage of biospecimens from participants enrolled on specific clinical studies and the use of their derivatives to further institutional research.

The informatics system that was used to support biorespository operations was developed for the National Cancer Institute's cancer biomedical informatics grid (caBIG) program. The application was heavy with core components designed to facilitate interoperability but in practice this architecture, along with lack-luster user interface designs, led to poor system performance and end-user experiences.

PROPOSED SOLUTION

We proposed to implement an open-source, vendor supported, application called OpenSpecimen in order to replace the outdated system. Specifically, we looked heavily at system performance, streamlined user workflows and application programming interface features. System performance was measured as the time to render user interface pages for specific actions (e.g. query, specimen collection, bulk operations). The legacy caBIG system had workflows that didn't necessarily benefit the technician, as such, any new system we implemented had to be biobank-centric while still allowing for engaged study teams and principle investigators the freedom to navigate and utilize the system with minimal training requirements. Lastly, internal partnerships and integrations rely heavily on the programmatic creation and consumption of electronic data so it was absolutely critical that the Application Programmers Interface (API) was comprehensive and robust.

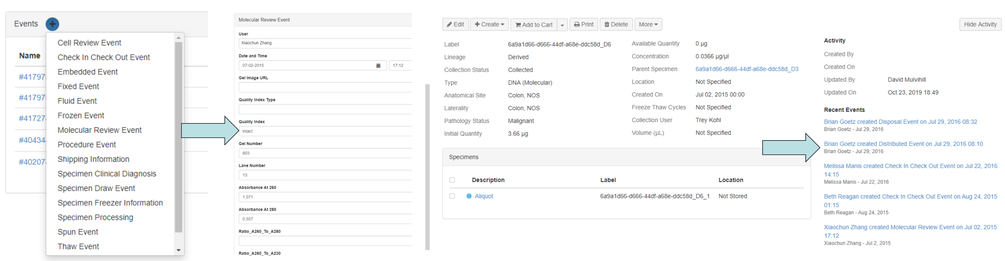
MULTI-TENANT



A single installation of OpenSpecimen can allow for the operation of multiple, independent repositories which may or may not elect to share responsibilities for biospecimen collection and processing from a single protocol. Role based access allows individual users to be assigned add / edit / read privileges based upon their affiliation with an individual repository or their involvement in a particular collection protocol (study). *Left* shows a virtual representation of a multi-repository environment.

BIOSPECIMEN LIFECYCLE

Events that occur in the lifecycle of individual specimens (collection, receipt, transfer, freezing, fixation, centrifugation, etc.) as well as quality review parameters can be recorded.



DISCLAIMER

The information provided herein is solely the work of David Mulvihill in my personal capacity and is not related to Washington University in St. Louis or my employment there.

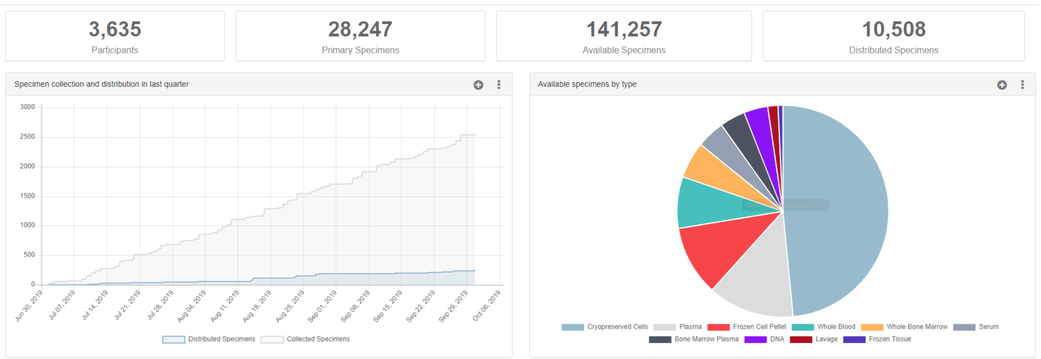
INTEGRATION

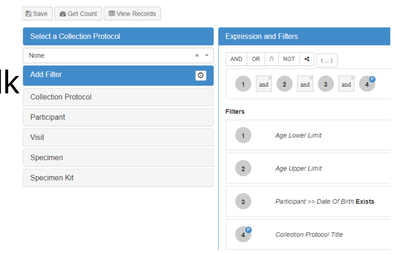
OpenSpecimen has a robust, modern API that allows for programmatic access of functionality and can be used to interface with other applications. The TPC uses the OpenSpecimen API to integrate with an application called BioMS which is used for tracking biospecimens collected for the Alliance for Clinical Trials in Oncology. This creates efficient workflows while reducing error-prone duplicative data entry.

DATA MIGRATION

Since the TPC legacy informatics system was a similar data model to that of OpenSpecimen, the migration of data was effortless. The Krishagni team provided the support necessary to migrate >1.5M biospecimens.

SEARCHING/REPORTING FUNCTIONALITY





Users can create custom dashboards (*above*). Searches can be created, saved and reused to bulk process specimens (*right*).

CONCLUSION

The OpenSpecimen upgrade project was approximately six months in duration. At various stages throughout the upgrade process we engaged end users to 1) verify migrated data 2) perform workflow and performance testing and 3) formally train on the application. We developed a standard set of comparable test cases to confirm and document that system performance had significantly improved. User acceptance testing was a critical component of the upgrade process and we spent significant time training/re-training and verifying workflows with research technicians. Integrations with other systems were tested for load and data accuracy. We were live on OpenSpecimen with one hundred percent of data migrated from our legacy system. Ultimately, OpenSpecimen created efficiencies to include technician workflow, specimen annotation, bulk processing and integrations.

SUPPORT

https://openspecimen.atlassian.net/wiki/spaces/CAT/overview

Technical and end-user documentation, training modules, discussion forums, FAQs, and application updates for OpenSpecimen are supported through the Krishagni OpenSpecimen Support Center.

Krishagni's
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