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Using BaseSpace® Clarity LIMS for Basic Freezer Management of Samples

Introduction

This technical note presents a simple approach for adding a basic freezer management process to a lab information management system (LIMS). This process is done by using the automation capabilities available through the Application Programming Interface (API) and External Program Plugin (EPP) features of BaseSpace Clarity LIMS Gold Edition.

Extending BaseSpace LIMS

BaseSpace LIMS supports an easy workflow configuration. Within BaseSpace LIMS, a workflow is built from a set of protocols and a protocol is built from a set of steps. Protocols can be used within multiple workflows (eg, a quality control (QC) protocol can be used in multiple workflows) and steps can be used in multiple protocols. Steps represent the most granular component of the BaseSpace LIMS workflow system, and are also the cornerstone for extending LIMS capabilities.

BaseSpace Clarity LIMS Gold Edition includes support for EPPs, a system for extending BaseSpace LIMS in many different ways. For example, using the EPP system, BaseSpace LIMS can connect to scientific instruments, implement complex workflow systems, trigger notifications, and integrate with other software systems. EPPs can be automatically triggered at the beginning of a step, on the Step Setup screen, on the Record Details screen, or at the end of a step. An EPP can be triggered when a screen is entered or exited. An EPP can also be manually triggered using a button displayed on the Record Details screen.

The Sample Management Life Cycle

BaseSpace LIMS provides support for much of the sample management life cycle. For the purpose of this technical note, the life cycle of a sample within a clinical setting includes sample registration, sample receiving, starting of sample work, and completion of sample work (Table 1).

Benefits of Freezer Management

Best practices for freezer management can provide significant benefits for sample management. These include:

- Sample location tracking
- Sample thaw tracking whenever the sample is removed from refrigeration
- Effective use of working freezer space for active samples with inactive samples being moved to archival freezers

Basic Freezer Management With BaseSpace LIMS

Freezer management support features of BaseSpace LIMS can be implemented to extend existing sample management support. Adding user defined fields (UDFs) to each sample increases the ability to track the basic elements of location management, such as freezer name, rack, box, row, and column.

Sample UDFs to support basic freezer management:

- Freezer, Text
- Rack, Text
- Box, Text
- Row, Text

The EPP system provides a new automation feature. Existing or new steps can be configured to use these automations. When a configured step begins, an EPP updates all associated samples and the checkout status shows the current technician who has them. The same EPP will generate a CSV file (Figure 1), named FreezerPickList.csv, which shows the freezer location of each sample. The file is accessible from the Record Details screen where it can be downloaded and opened in Excel. Any changes made to the file are reuploaded on the same screen. For new samples, this new step can be used in the receiving process.

Table 1: Life Cycle of Sample Management in a Clinical Setting

Stage	Description
Sample is registered	Clients register their samples before sending them for sequencing.
Sample is received	Samples are sent to the lab. When samples are received a barcoded label is created for, and applied to, each sample. The samples are then placed in a lab freezer.
Sample work is started	Samples are removed from the freezer and aliquots are made. Any remaining volume of the sample is placed back into the freezer.
Sample work is completed	After results have been reported to a client, samples can be moved from the lab freezer to an archival freezer facility.

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Project 1,Sample 1,RJO101,Freezer 12,Top Shelf,Box 1,A,1,2,In use by Ryan Jones
Project 1,Sample 2,RJO102,Freezer 12,Top Shelf,Box 1,A,2,1,In use by Ryan Jones
The freezer management extension uses two EPPs. They are as follows.
EPP1 – updateCheckoutAndCreateFreezerReport
-u, --username  LIMS API username (Required)
-p, --password  LIMS API password (Required)
-pr, --processURI       URI of a process (Required)
EPP2 – updateCheckoutThawCountAndUploadChanges
-u, --username  LIMS API username (Required)
-p, --password  LIMS API password (Required)
-pr, --processURI       URI of a process (Required)
-f, --file      Shared file LUID for updated freezer pick list (Required)
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Figure 1: An Example of a Freezer Report CSV File.

When first created, the CSV file has empty entries for each of the location management values. A technician fills in the fields for each received sample and then uploads the completed document. When the step is completed, the checkout status resets to show “In Freezer” and the thaw count is increased by one. If the thaw count is blank, as it is during receiving, then it is set to zero.

An additional enhancement, which completes the sample life cycle, combines the BaseSpace LIMS off-the-shelf bartender integration with freezer management integration. During the sample receiving process, a single step can encapsulate both bar coding of samples and freezer location management. With bartender integration, customized sample bar codes can be automatically printed.

Conclusions

BaseSpace Clarity LIMS provides an easy way to implement semi-automated basic freezer management of samples. Essential tracking information for all samples (location, thaws, work completed) can be standardized, centralized, and accessible. With off-the-shelf bartender integration, a simple sample accessioning process can be implemented and combined with automated barcode printing.

Learn More

To learn more about BaseSpace Clarity LIMS, visit www.illumina.com/products/by-type/informatics-products/basespace-clarity-lims.html.

To learn more about freezer management, contact us at informatics@illumina.com.

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