RLab: A Lightweight Freezer Management System for Small Laboratories
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INTRODUCTION
In small laboratories, technicians frequently use spreadsheets to log the type and location of biospecimens. Even for studies with a small number of subjects, the use of spreadsheets can lead to complex workflows. For example, maintaining a master version of each document is required to avoid conflicting updates. Restricting document access in order to protect patient privacy requires planning and oversight. Validation of spreadsheet fields is needed to ensure data integrity. Some of the currently available freezer management systems address security, accessibility and validation (i.e., Freezerworks, CAISIS, eTarissue), but expensive licensing, difficult learning curves, and complex administration often make existing solutions inaccessible to small laboratories with limited budgets.

HISTORY AND REQUIREMENTS
Our goal is to help small laboratories migrate away from using spreadsheets for managing their inventories, and to introduce them to scalable web-based solutions. We proposed building a lightweight tool with the following requirements:

- tool can be easily installed and administered by individual researchers.
- tool provides a web-based interface for accessing to freezer inventory
- tool's scope is kept narrow and focused on basic freezer management tasks
- tool needs to provide an externally queryable API to facilitate export and integration of freezer data with data from other systems.

To address the hurdle of licensing fees, we chose to release our freezer management tool as open source.

Our first attempt to build a freezer management system for use by small laboratories resulted in creation of the Customizable Electronic Laboratory Online (CELO) framework. An instance of CELO was deployed to a small laboratory at the Seattle Children’s Research Institute (CRI). Users at CRI found CELO’s interface less user-friendly and harder to navigate than the spreadsheets they previously employed. Based on user feedback obtained during the CRI pilot, we have designed a new freezer management system called RLab. RLab’s feature set (current state of which is presented in Figures 1-7) continues to evolve through close observation of CRI’s workflow.

CONCLUSION
RLab is an affordable, easy to use alternative to commercial freezer management products. It allows multiple users access to freezer inventory data without versioning concerns and provides for both data validation and integrity checks. The application’s query API makes it easy to integrate freezer data with that of other laboratory systems, providing the ability to ask queries across all of a study's data.

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REFERENCES