



The University of Liverpool use Achiever LIMS for longitudinal birth cohort study, C-GULL

The brief

In 2022, a team from the University of Liverpool identified the need for a laboratory and sample management system to support their longitudinal birth cohort study, Children Growing up in Liverpool (C-GULL).

The research is focused on improving the health and wellbeing of children and their families who live in the Liverpool City region and other similar areas within the UK. 10,000 families will be invited to participate in the study and the overall aim of the project is to reduce health inequalities within these regions by developing clinical understanding and addressing the many underlying health and social issues which drive these differences.

The study is funded by the Wellcome Trust Longitudinal and Population Study Award, and will be delivered by the University of Liverpool in partnership with Liverpool Women's NHS Foundation Trust, The NIHR North West Coast Clinical Research Network and the Civic Data Cooperative (CDC), with additional support and partnership working from colleagues from Liverpool City Region Combined Authority, Liverpool City Council and many other local partner NHS Trusts.

The remit given to Dr. Victoria Shaw, Head of Biobanking and GCP Laboratories Oversight and Nicole Maziere, LIMS Manager at the University of Liverpool when searching for suitable laboratory information management system (LIMS) software was that C-GULL needed to be an entirely paperless project. The number of participants involved with the research, the amount of data being generated, and the throughput of information anticipated over a long period of time meant that any software used would have to be efficient, robust, and simple to use, without any reliance on paper forms. The project brief also wanted to remove as much data entry as possible to reduce the possibility of researcher input error.

One of the major assets of the C-GULL project is the collection of blood samples from the study participants. Therefore, another consideration was how the team would log samples in the biobank. The researchers aliquot blood into numerous small vials which is a time-consuming activity, and also has the potential to introduce human error. The LIMS needed to link the blood samples to the relevant patients in a secure, time efficient manner while at the same time eliminating the risk of sample mix-up.



The University of Liverpool had a number of key objectives required of the LIMS software used in the C-GULL study. These included:

- An entirely paperless system for everyday practicality, ease of use and to reduce the risk of human data input error,
- The integration of the LIMS software with external systems critical to the day-to-day research project management,
- A secure, robust software system which aligns with the timeframe of a potentially multi-decade, longitudinal birth cohort study,
- The provision of accurate and timely patient consent data. Due to the number of study participants and the timeframe involved in the project, the LIMS has to provide details and easy to access consent information for individual patients ensuring informed consent is correctly captured and patients' preferences are being honoured at all stages during the trial.

The solution

The biobanking team at the University of Liverpool has been using Interactive Software's Achiever LIMS software since 2015 and this existing relationship allowed the University and Interactive Software to work closely together to design LIMS software to manage the project requirements. There were two system integrations that were necessary to make the C-GULL study possible and critically, paperless.

Remote Data Capture for Clinical Information (REDCap) system integration with the LIMS

The C-GULL team log clinical information from study participants into a Remote Data Capture for Clinical Information (REDCap) system. They also log sample information into the LIMS. The C-GULL team involved in data capture and security required an automatic link between these two completely separate databases to ensure process efficiency and to remove the risk of human input error. Interactive Software were able to build the required integration between their LIMS software and the external REDCap system used by the clinical team.

The research nurses involved with the C-GULL project use sample collection kits which include consumables such as sample tubes for blood collection, cleaning materials etc. A large number of kits will be used in any one day at the clinic due to the number of participants involved in the project

The clinical team enter the kit ID at the sample collection point into the REDCap system and then via the integration, the LIMS can then take the participant ID and link it to the kit ID. Without that link in place, the risk of human errors occurring would increase and the data processing element of the study would be extremely complex.



Dr. Victoria Shaw, Head of Biobanking and GCP Laboratories Oversight, commented: “For example, the laboratory team might be given five kits in the lab at any one time. There's no paperwork with those kits so how does the lab manager then link that particular kit back to the participant? It could be any one of those five participants. That is where the system integration has been critical, not just beneficial, it's actually been critical to this process and will probably change how we work going forward as well.”

Integration of the plate scanner

The integration of the plate scanner to scan multiple bar codes helps to increase process efficiency and reduces the manual effort required by project staff. Each C-GULL kit contains approximately 30 pre-barcoded tubes. These barcodes are not generated by the LIMS so the technicians need to scan them to link the physical sample to the sample record generated on the LIMS. Without the aid of the plate scanner integration, the lab technicians would have needed to scan 30 tubes individually with a handheld scanner rather than just once with a plate scanner.

As well as increasing process efficiency, automated integration of the plate scanner dramatically reduces the likelihood of human errors. An additional element that ISL provided was ensuring that the barcodes can only be assigned to a specific sample type. Green-topped vials for instance have a prefix of GRN which, thanks to the integration, can only be assigned to plasma vials, so there is no risk of assigning a tube as the incorrect type on the LIMS.

Without these two factors the system would have been over complicated and too time consuming to be practical in everyday use. In addition, without having these integrations, the risk of human input errors would be massively increased.

The outcome

Through a collaborative project approach Interactive Software Limited has delivered a LIMS solution to support the C-GULL study.

“I think the simplest way to explain it is that the project wouldn't have been paperless without the support of Interactive Software and Achiever LIMS. Given the scale and complexity, it simply wouldn't have been feasible without their system.”

Nicole Maziere, LIMS Manager at the University of Liverpool



In terms of timeframe, from project initiation through to the LIMS implementation, was only a few months. Project Managers at Interactive Software worked through a system release process which would then be tested by the University and the subsequent findings from this test would be fed back to Interactive Software so that the LIMS could be updated as required and a system update performed.

Discussing the project timeframe, Nicole explained: “(ISL) sent us an initial release and then we would test it and then send it back to them. I think there was maybe two to three releases – it really wasn't too long at all.”

The laboratory staff that would be using the LIMS software for the project were involved in the testing phase of the project implementation to ensure they would have a full understanding of how the system functioned and how it would be used on a day-to-day basis. Working together, Interactive Software and the university C-GULL laboratory team have created Standard Operating Practices (SOPs) so that all system users will follow the same processes. These SOPs, together with the system release notes provided by Interactive Software, allow current LIMS users to train new staff as and when required. Interactive Software also have trainers and system support staff on hand to provide further training and assistance should it be needed.

Main benefits

The integration of three separate systems including the plate scanner and the REDCap system with Interactive Software’s Achiever LIMS has allowed the C-GULL study to function as an entirely paperless project which was the main objective given to the laboratory team at the outset of the research.

The vast number of data sets being generated by the study cohort and the extensive timeframe of the project means that a robust and secure laboratory data management system is imperative to the researchers involved in the project’s data analysis and potentially the long-term outcomes of the C-GULL project.

The C-GULL Project is an important one for Liverpool, the University, and its project partners. Ultimately the main beneficiaries are the children and families that will be supported and whose lives will be improved through the study’s findings.