



## Automation and the LIS

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Molecular Diagnostics is a hot topic. Most laboratories are entering the molecular testing space in one form or another now. There are pure molecular tests and there are crossover molecular tests, which are becoming more and more prevalent throughout any type of lab (clinical, anatomic pathology, toxicology). All the lines are blurring as patient testing is becoming more about the full view of the patient and less about a specific vertical of testing specialty.

Some labs are using this crossover testing to fill a market need – physicians need a more robust view of the patient’s health and not just a singular perspective of the diagnosis. Others are using it as a way to enter the molecular testing forum with minimal risk to their business model. Either way, from the viewpoint of the laboratory as a knowledge platform, dataflow through the laboratory is the mechanical movement – think automation and software platforms that integrate with hardware in a way - that bi-directional information is exchanged.

In today’s connected world the key buzz word is IoT, Internet of Things, where multiple devices are connected throughout the cloud. A mobile phone controls a lamp from miles away, a garage door opens as it senses the home owner’s vehicle approaching, a toaster signals its owner that the bagel is just right...all these, and more, are examples of internet connectivity, with each item that is connected having something in common – regardless of the thread – it is data. The devices receive and pass information through integrated technology via the internet, a single hub with multiple spokes, which acts like a robust, advanced LIS does in a laboratory.

When we think of automation in the medical laboratory setting, it is helpful to keep this analogy in mind.

The laboratory receives its test orders from a variety of sources including paper requisitions, faxed order forms, electronic orders through EMRs/web portals/other HIS or PMS systems and through bar-coded retrieval. These orders are processed through a central laboratory hub, a singular data repository to identify the patient, match records, order supplies, order tests, collect and report results, reflex additional tests if necessary and generate a complete report on a patient’s results.

It is well known that the lab sits on a hub of clinical data that feeds diagnostic data, influencing patient care decisions from all aspects of the patient’s life. We keep talking about patient centric healthcare and that involves a team. Their physician, therapists, pharmacy, lifestyle, diagnosis history, treatment history and outcomes – the lab truly is getting more and more involved in being the central artery of patient centric data and the PhD’s and pathologists are becoming more recognized as a part of the patient care team.

We really can’t discuss automation anymore without it being tied to both software/hardware and data/information. This is the true value of healthcare and best patient outcomes. We have the knowledge and the ability to use it in a generally automated but individually specific manner.

## **Data Handling:**

As we stated earlier, data comes into the lab in a variety of manner, whether automated or manual with the test order. The data contains as much detail or lack of detail necessary for the lab to perform the test. In a reference lab situation, it is usually minimal and not very patient centric. The goal is speed and accuracy. In a more personalize lab setting or physician setting that chooses a lab who can provide additional value, the data can be significant. It can come from multiple sources and needs to be stored, accessed, analyzed and relevant algorithms can be automatically applied based on the source, the test, the result, etc. to provide the best diagnosis and treatment recommendation for that patient.

## **Data Generation Automation**

There are multiple ways that automation in the lab happens; Instrumentation is the one that is most commonly thought of but it is only a part of the equation. Instruments connect in the middle of the lab testing process. The beginning is between external applications or avenues to integrate patient and test information to place an order within the LIS (Outreach modules, EMR's, EHR's, other LIS', POS, PMS'). The middle component is between the LIS and other applications (LIS', EHR's, instruments, pre and post-analytic databases) and the final is for the final report distribution (faxes, EMR's, secure email, other LIS', EHR's, PMS', etc.)

The laboratory needs to understand the capabilities of these solutions in combination with their clients' needs and their own workflow.

The solutions need to be understood in order to work effectively and efficiently with their vendors. With a clear solution understanding, data flow patterns can be configured and libraries to generate the data when necessary can be determined. This will result in optimal automated workflow and communication between hardware and software solutions in play.

Most LIS vendors should be in a place of expertise to be able to lend their knowledge and advice in helping a lab work through these decisions when configuring their setup.

It should be noted that limitations can occur with some technologies and that the lab needs to do their due diligence prior to ordering their instrumentation. Most software applications that are leading edge or innovative can support these flows and automation. However, there are hardware platforms and some software vendors who surprisingly cannot support open communication between platforms and languages. These tend to be longer standing/older companies who have not developed newer applications or aren't built on the newest technologies. – it seems obvious, but sometimes it truly is not.

## **Information Tracking and Retrieval**

A large part of the value of automation in the lab is to be able to track the tests in process, turnaround times, employee productivity and output, corrected reports, reimbursements, slide and sample tracking – in short being able to see the details of the lab's business. These are all important, and very different, tracking needs. Some are business related, some are training and staff related, some are cost related and some are regulatory and safety related. All involved either intensive manual practices, which are very costly to a lab or are automated. If they are automated, then to be efficient AND able to be used in multiple ways – think both patient safety and business analysis or improvement – then a robust LIS with management reporting capabilities is key. Management dashboards are an indispensable way for labs to view their testing, regulatory information and to be able to view and manage their lab as a business.

## Report Automation

The final, and most important step in automation is the assembly and distribution of the result report. This is the lab's final product. It is not only important for a lab to accurately report on their test results, but to do so in the time and manner their client requests. In our recent history we have seen reports go from plain, black and white text output being printed and mailed to faxing that same report to full color, high image resolution, formatted and branded reports being printed automatically in a physician's office or being pushed directly

through to their EMR or PMS within their office. Physician's work at multiple practices on specific days of the week and want to receive their reports when and where they are or want to order, track the status of and receive their reports online 24/7. These are all examples of automation and how it has evolved in our industry.

The healthcare industry has evolved so much in the past 20 years and is still so young in terms of technology that it is exciting watching how automation will continue to effect LIS