Dr. Lal Pathlabs harnesses the power of digitalization

How data and automation revolutionized a reference laboratory network in India

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Case Study

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Moving from evolutionary to revolutionary

Dr. Lal Pathlabs Organization

190+ satellite labs

1700+ patient service centers

6000+ sample pickup points across India, including 38 airports and 500+ bus and railway terminals

20 countries served through 80+ international partner labs, 20+ hospitals, and 2 labs outside India

National Reference Laboratory (NRL) and Primary Spokes

37,000 total tubes/day for testing across a variety of diagnostic specialties

Approximately 3500 tubes per day for specialty testing (i.e., molecular, microbiology, genetics, allergy, etc.)

7 regional labs

Dr. Reena's Team

Dr. Reena leads a team of 60 clinical laboratorians and 400 laboratory technologists responsible for patient service and assay testing, investigations, and reporting across the NRL.

Each day between 4 a.m. and 10 p.m. IST, international aircraft, trains, buses, courier vans, motorcycles, and bicycles deliver 37,000 tubes for testing across a variety of diagnostic specialties within Dr. Lal Pathlabs' National Reference Lab (NRL) facility in Delhi, India. On Sunday, when many of the 190+ satellite labs across this hub-and-spoke network have scaled down processing, volume at the 24 hours per day, 7 days per week NRL facility in Delhi increases by 30%.

Leadership's vision has always been in the direction of continuous improvement while maintaining best-in-class patient services. Furthermore, they have recognized that automation provides the time and space needed to focus on innovations crucial to a laboratory's success. Dr. Lal Pathlabs' network has grown organically, introducing many diagnostic and IT technologies, task-targeted automation, and pre-analytical processing solutions as they were introduced in the marketplace. Following this natural evolutionary path of early technology adoption enabled Dr. Lal Pathlabs to **reduce downtime, increase scalability, and optimize efficiency.**

"Our vision is to broaden pathology testing and the Dr. Lal Pathlabs collection network across India. I look forward to the significant role that Siemens Healthineers will play to support our goals of nationwide expansion and process flow optimization, maximizing the value we deliver to our stakeholders. Our implementation of Atellica® Solution is one step in that direction."

Dr. Om Manchanda, Managing Director, Dr. Lal Pathlabs

Between 2010 and 2017, testing volume doubled in the main lab, which serves millions of healthcare consumers as well as providers in more than 15 countries. Dr. Lal Pathlabs needed to effectively manage these higher testing volumes while meeting aggressive turnaround time (TAT) goals and service level commitments to patients and stakeholders.

In addition to remodeling the lab, they wanted to **consolidate their test menu** and automate the total lab workflow process to **reduce sample touchpoints** and optimize aliquoting. They also sought to **minimize non-value-adding activities** such as running around to **locate shared samples**.

Dr. Lal Pathlabs teams partnered with Siemens Healthineers Healthcare Consulting Solution (HCS) experts to evaluate the NRL's workflows and recommend enhancements for all incoming samples and off-track testing at the lab. Based on these recommendations, Dr. Reena's team implemented one-touch, integrated chemistry and immunoassay testing with 15 Atellica® Solution modules and two non-Siemens Healthineers analyzers connected to Aptio® Automation in the core lab. During this time, the team also validated and implemented eight Atellica Solution instruments across eight satellite labs in the Dr. Lal Pathlabs network. A suite of deeply integrated Atellica Diagnostics IT software has turbocharged operational performance, quality control (QC), and result management at the NRL and two of the satellite labs.
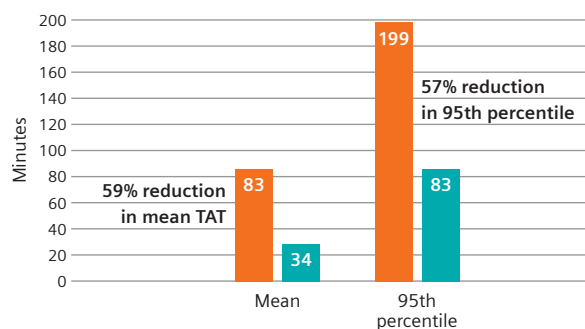
"Siemens Healthineers helped us to quantify the limitations of the five isolated pre-analytical automation solutions that we had been using to support discipline-specific workstreams and also demonstrated how the power of digitalization, cohesive IT, and data could improve operational workflows and quality both at our main lab site and across Dr. Lal Pathlabs' larger laboratory network."

Dr. Reena Nakra, Principal Director of Lab Management and Technical Excellence, Dr. Lal Pathlabs
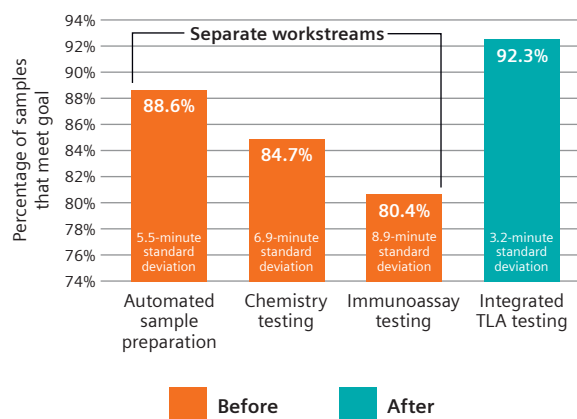

Total lab automation turnaround time (TAT) cut by more than half

TAT measurement begins when a sample is loaded into a rack input module on the total lab automation (TLA) system and ends when Atellica Data Manager releases the result to the laboratory information management system (LIMS).

Minutes — Mean / 95th percentile

- **59% reduction in mean TAT**: Mean — Before 83, After 34
- **57% reduction in 95th percentile**: 95th percentile — Before 199, After 83

More samples meet TAT goal with greater consistency

More than 92% of samples are introduced, tested, and released from the TLA system in less than 120 minutes. Prior to TLA, only 80–88% of samples achieved this goal, and they exhibited greater variability.

Percentage of samples that meet goal — Separate workstreams

- Automated sample preparation: 88.6% (5.5-minute standard deviation)
- Chemistry testing: 84.7% (6.9-minute standard deviation)
- Immunoassay testing: 80.4% (8.9-minute standard deviation)
- Integrated TLA testing: 92.3% (3.2-minute standard deviation)

Multifaceted solution improves overall time to report (OTR)

The solution has enabled Dr. Lal Pathlabs to meet its OTR target of 3 hours. This key performance indicator reflects how long it takes from the time the tube is scanned in (arrival to Sample Receiving Area of main lab facility) until the result is released via LIMS to the healthcare provider or patient.

Percentage of results released — <3 hours: Before 80%, After 95%

Before (orange) **After** (teal)
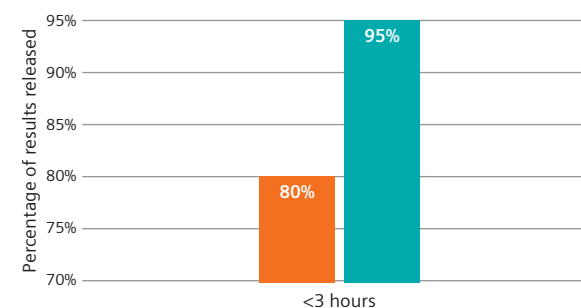
Anatomy of a revolution: Data-driven analysis and simulations hold key to success

Dr. Lal Pathlabs' journey to transform its NRL facility in Delhi took nearly 2 years to design and plan. Because the team defined a clear **scope of work** and **careful execution plan, actual project implementation and transition management** were achieved without any disruption to routine operations and without a single hour of downtime! The overall scope of the project, and its ultimate success, can be found in Dr. Lal Pathlabs' commitment to:

- Conducting a **comprehensive workflow analysis** and use of **data-driven simulations** to define performance goals and measurement **metrics** for proposed solutions throughout the project
- Adopting a **multidisciplinary** approach to total lab automation
- Amplifying what automation could achieve with innovative diagnostics and **integrated IT**

Conducting a comprehensive workflow: Quantify it!

The Siemens Healthineers HCS team began the project with a 5-day on-site study to observe and rigorously measure workflows—from tube arrival in the Sample Receiving Area (SRA) to verification and release of results. They explored the challenges and goals of department heads and conducted process mapping exercises with junior and senior staff to break down manual processes and discrete testing workflows. HCS organized a series of follow-up Lean practice workshops, making Dr. Lal Pathlabs' personnel integral partners in this analysis. Together they used actual lab data to uncover areas of inefficiency and quantify the impact of non-value-adding activities.

Developing a strategy: Blend TLA with task-targeted automation

Insights gained during the data-driven workflow analysis encouraged Dr. Lal Pathlabs to re-evaluate its use of separate workflows in its discipline-specific early automation. In addition to remodeling and automating the Sample Receiving Area (SRA) to include high-capacity bulk sorters for all incoming sample tubes, the lab was able to visualize the benefits of a synergistic approach and chose to co-locate SRA with integrated chemistry and immunoassay testing—including TLA—on the same floor.

Bulk sorting in the SRA could optimize processes and save technologists time. Fully automated sample preparation with TLA would further increase these labor savings. Likewise, primary tube aspiration and integrated testing on the track would reduce the need for aliquots.

"Siemens Healthineers demonstrated exceptional skill in their ability to mine the available data to quantify the shortcomings of existing processes during the workflow analysis.

"The HCS team's proficiency at gathering and interpreting granular operational data was instrumental to our plan and to the project's success."

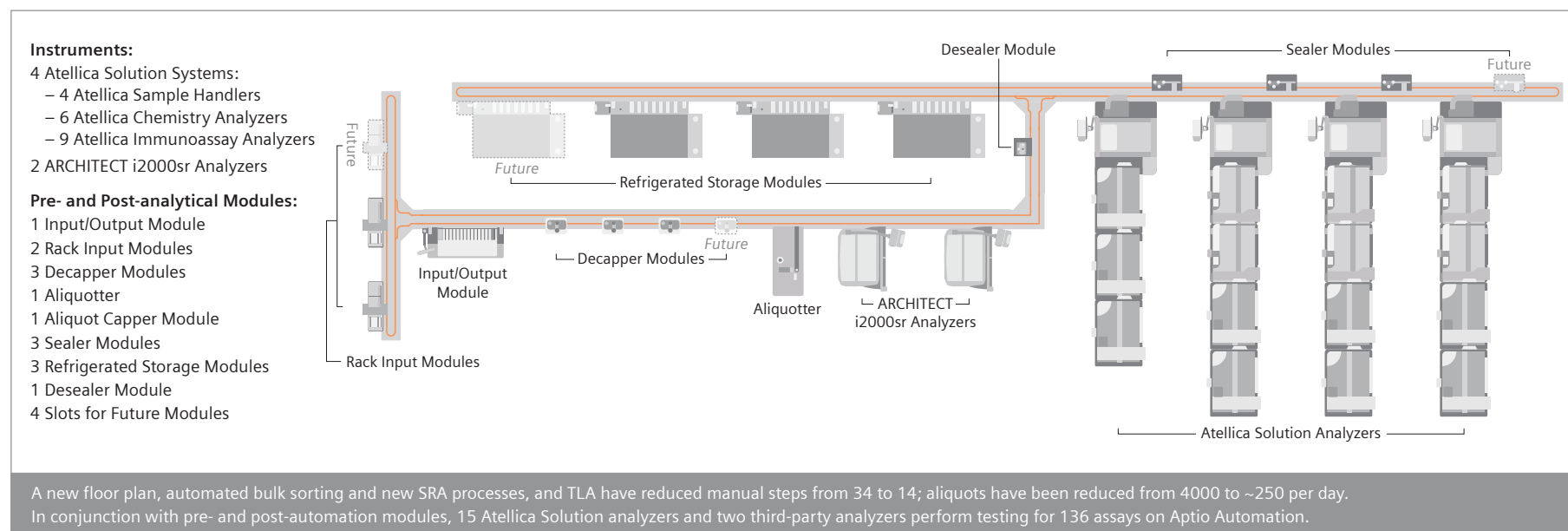Dr. Reena Nakra, Principal Director of Lab Management and Technical Excellence, Dr. Lal Pathlabs

Using the SimFlow™ tool, a highly accurate, performance-proven simulator, the HCS team designed various TLA configuration options that would streamline sample loading; connect dedicated chemistry, immunoassay, and third-party special testing; and enhance sample processing to automate cap removal, split samples, and sort and/or seal tubes. These simulations helped reinforce how a rules-based workflow could improve turnaround time by reducing touch points and non-value-adding activities.

"While our other in vitro diagnostics partners quickly proposed designs that mirrored their product portfolios, Siemens Healthineers collaborated with the lab team and invested more time and effort to quantify the impact of different approaches to ensure that we fully understood both the advantages and/or tradeoffs of any path we chose," said Dr. Nimmi Kansal.

Amplifying the power of what's possible: Integrate IT

As part of its QC management process, Dr. Nimmi's team performs protocol-based reruns and repeat testing whenever required by established College of American Pathologists (CAP) and National Accreditation Board for Testing and Calibration Laboratories (NABL) guidelines. This added to an already high workload. So in addition to using integrated IT to drive workflow efficiency across the open, multidisciplinary TLA solution (see page 8), she saw an opportunity to automatically and efficiently manage reruns, rechecks, reflex testing, and error sample handling using rules-based testing with Atellica Data Manager.

Instruments:
4 Atellica Solution Systems:
– 4 Atellica Sample Handlers
– 6 Atellica Chemistry Analyzers
– 9 Atellica Immunoassay Analyzers
2 ARCHITECT i2000sr Analyzers

Pre- and Post-analytical Modules:
1 Input/Output Module
2 Rack Input Modules
3 Decapper Modules
1 Aliquotter
1 Aliquot Capper Module
3 Sealer Modules
3 Refrigerated Storage Modules
1 Desealer Module
4 Slots for Future Modules

A new floor plan, automated bulk sorting and new SRA processes, and TLA have reduced manual steps from 34 to 14; aliquots have been reduced from 4000 to ~250 per day.
In conjunction with pre- and post-automation modules, 15 Atellica Solution analyzers and two third-party analyzers perform testing for 136 assays on Aptio Automation.

As Dr. Nimmi and the team learned about additional capabilities of Atellica Data Manager and Atellica Process Manager, they began to examine the performance of several of their existing IT systems. Not only could these products streamline testing workflows, but the robust software could also enhance QC and result management (see page 11 and 12) compared with what the lab was able to achieve with its LIMS.

Choosing a more powerful instrument: Atellica Solution transforms the hub and the spokes

Plans for a revolutionized chemistry and immunoassay workflow at the main lab were nearing completion when Dr. Lal Pathlabs decided to anchor the new TLA track with the Atellica Solution. Designed to integrate chemistry and immunoassay testing with cost-saving intelligence, unique features of this new product could save time, reduce expenses, and enhance quality in the main lab as well as throughout eight satellite labs in the Dr. Lal Pathlabs network.

"Instead of 28 analyzers offered by other IVD manufacturers, we realized that we needed only 15 high-throughput Atellica Solution modules to support our main lab," said Dr. Nimmi Kansal. Importantly, this created a smaller TLA footprint that allowed Dr. Lal Pathlabs to add refrigerated storage modules onto the track—currently configured with a total capacity of 45,000 tubes—enabling the organization to reallocate staff that previously transported tubes to refrigerated storage locations from 7 a.m. to 8 p.m. daily.

Automatic startup, calibration, and QC routines without staff intervention further increased labor savings. For example, QC is performed automatically

"As a longtime investor in IT solutions, I required the software and informatics implementation process to be seamless and free of disruption. Over 20+ years, we've deployed successive generations of LIMS, analyzers, and automation-specific software that typically required intensive effort for time-consuming—sometimes costly—customizations. Rather than overpromise and underdeliver, Siemens Healthineers IT experts engaged us in two-way conversations and acted as a strategic partner committed to ensuring that our next IT pursuit would meet all user and stakeholder expectations for digital pathways that complement our processes."

Dr. Reena Nakra, Dr. Lal Pathlabs

each morning, with no manual preparation required, and results are available when the staff arrives. If reagents or QC were needed for a particular module, Atellica Solution's ability to automatically reroute tubes to another available module within the solution configuration and across the TLA track helped to minimize delays in TAT. Onboard refrigerated storage of prepackaged and bar-coded QC material also saves money by extending material life and eliminates waste from daily dead volume and manual pouring errors.

In conjunction with the lab's reduced aliquoting practices, the microvolume sampling technology of Atellica Chemistry Analyzers helped to avoid insufficient-sample errors that had plagued the main lab. Finally, the ability to load tubes directly onto the instrument—as well as from the track—promised peace of mind to an organization that had historically rejected TLA to avoid operational risk posed by potential track downtime.
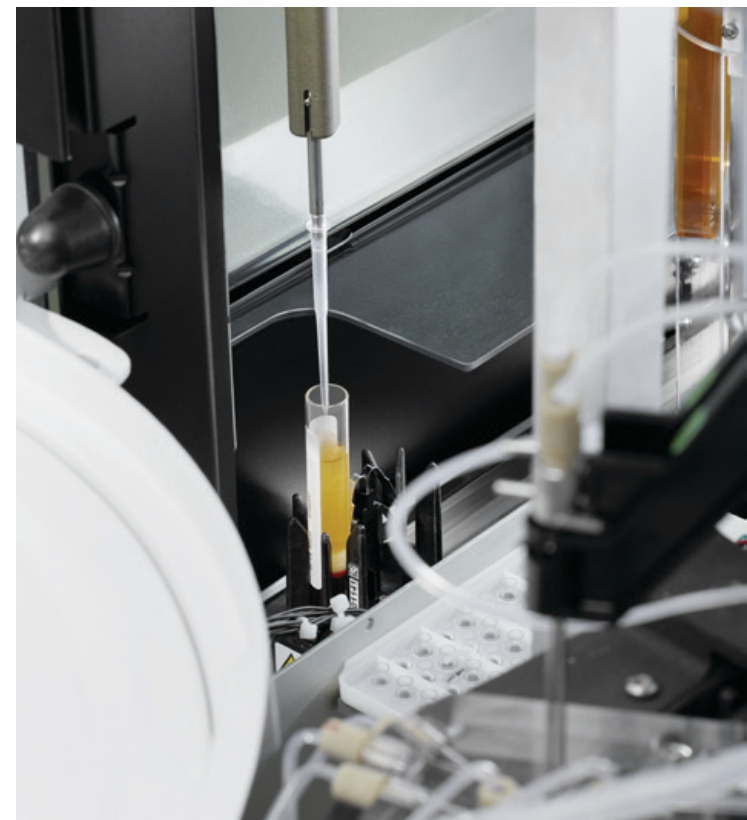
"Innovative Atellica Solution sampling technology enables processing of up to 15 photometric assays from a single aspiration, so now we can complete an entire biochemistry panel, repeats, or dilutions ordered for a specific specimen using only one or two aspirations. In general, specimen volumes required for immunoassay testing have been reduced by 20–50% in comparison to our lab's previous analyzer."

Dr. Kamal Modi, Consultant – Clinical Chemistry and Biochemical Genetics, Dr. Lal Pathlabs

Atellica Solution's potential to improve satellite operations while simultaneously standardizing operations across the laboratory network was also impressive. Its robust sample handler provided a single place to load samples, enabling a smaller staff to support this spoke-lab testing. To further reduce work in these stand-alone spoke labs, the system automatically sorts tubes for additional testing or send-outs.

Comparative evaluations only served to reinforce Atellica Solution as the preferred instrument choice. As an example of operational cost savings, Dr. Lal Pathlabs would be able to reduce annual calibration testing by 76%, yielding cost savings of 83% with nine Atellica Immunoassay Analyzers vs. 15 alternative instruments (from both Siemens Healthineers and another IVD manufacturer) that would have been required to support TLA testing in the core lab.*

After completing a CAP-accredited validation of Atellica Solution, Dr. Lal Pathlabs was ready to begin rebuilding a revolutionary diagnostics lab turbocharged by IT. With required infrastructure to accommodate the new floor plan already in place, the 4-month implementation took place seamlessly, even while the world struggled with the COVID-19 pandemic. Perhaps the best example of smooth project management was the remote deployment of Atellica Process Manager from the Siemens Healthineers support center in Bombay, to the surprise and delight of Dr. Lal Pathlabs. Staff training—subject to pandemic safety protocols and employee absences—took a bit longer than usual, but the world-class laboratory was operating as planned! "The whole project was expertly delivered and is continuously being optimized based on new observations and learnings," said Dr. Reena Nakra.

Dr. Lal Pathlabs has increased Six Sigma assays from 9 to 21

Analysis of 14 immunoassay parameters

Six Sigma	Previous Instrument	Atellica Solution
>6	4.0	**8.0**
3–6	10.0	6.0
<3	0.0	0.0

Analysis of 22 chemistry parameters

Six Sigma	Previous Instrument	Atellica Solution
>6	5.0	**13.0**
3–6	16.0	9.0
<3	1.0	0.0

"With Atellica Solution, 21 assays meet our Six Sigma goal—more than doubling what we achieved with our previous instruments."

Dr. Kamal Modi, Consultant – Clinical Chemistry and Biochemical Genetics, Dr. Lal Pathlabs

*Evaluation based on annual projection of consumables, calibration intervals, replicates, and cycles needed to support Dr. Lal Pathlabs' 2020 testing volume for 50 analytes according to published user guides and references of relevant IVD manufacturer and Atellica Chemistry Analyzers.

†Analysis performed by Dr. Lal Pathlabs' Quality Management team comparing month/year to month/year performance for 14 immunoassays and 22 chemistry tests transferred from either Beckman Coulter AU5800 or ADVIA Centaur® XP analyzers to Atellica Solution as part of the new TLA solution.

Atellica Diagnostics IT portfolio conquers workflow challenges on multiple fronts

Speed processing: Integrate IT with task-targeted automation and one-touch testing

To speed processing for overall testing at the main site, Dr. Lal Pathlabs implemented both manual and automated process improvements. The multifaceted solution leverages deeply integrated IT to amplify the performance of both task-targeted, automated sorting for incoming samples and Aptio Automation for open, integrated chemistry and immunoassay testing.

"Thinking about automation as simple mechanization ignores the importance of data integration," said Dr. Nimmi Kansal, technical director for clinical chemistry and biochemical genetics, Dr. Lal Pathlabs. "Total lab automation must do more than use robotics to perform highly repetitive routine tasks normally performed by knowledge workers. It also demands the application of digital intelligence to the data sets generated during the workflow."

SRA sorting, which used to take up to 2 hours and required a staff of five, is now completed in less than an hour by a single employee. Incoming tubes scanned by the bulk sorter capture a time code to start TAT tracking. IT rules prioritize sorting to redirect samples to one of several dedicated labs within the facility for off-track electrophoresis, microbiology, hematology, or other testing.

Approximately 10,000 serum tubes/day are redirected to the nearby Aptio Automation track, where automated triage work is performed with greater efficiency as guided by Atellica Data Manager. Approximately 20% of this volume may not require on-track chemistry and/or immunoassay testing. However, the software applies expertly crafted sample management rules to automate lab-specific workflows, including:

✓ Sample inspection, decapping, and immediate output sorting for serum testing elsewhere in the lab.

✓ Immediate creation of one or more required aliquots as determined by Atellica Data Manager. The primary tube may be retained for on-track testing or join the aliquot(s) being sorted for parallel off-track testing. In this workflow, aliquots are created to help speed TAT for testing in other departments.

✓ High-speed chemistry and/or immunoassay testing quickly followed by output sorting for low-priority off-track testing. If no further testing is required, tubes are redirected to refrigerated storage on the TLA track for future retrieval and/or disposal.

Dr. Lal Pathlabs uses open, multidisciplinary TLA to perform integrated chemistry and immunoassay testing on 15 Atellica Solution analyzers and two third-party analyzers with the added speed of automated sample inspection, prioritized tube routing, decapping, aliquoting, sealing, and refrigerated storage/disposal. **Standardized testing rules** and IT-powered workflows also drive fully automated, result-based **repeat and reflex testing** across the TLA solution. Likewise, Atellica Data Manager enables Dr. Lal Pathlabs to automatically apply predilution rules to avoid wasting time and materials.

Approximately 3000 fluoride tubes are bulk-sorted in the SRA for glucose testing on stand-alone third-party analyzers. With only one test per tube, HCS recommended these samples be segregated from the TLA workflow rather than analyzing them on the track. In this way, Dr. Lal PathLabs achieves faster TAT for both the glucose tubes and samples that require more complex testing across the 136-assay TLA solution. Nonetheless, result management for this off-track testing is still performed within the open Atellica Data Manager software.

Automation with advanced data management reduced sample splitting by 93%

Sample splitting has been reduced by 93%, and now 97% of tubes loaded on the TLA solution complete their prescribed menu of tests without requiring an aliquot. Adding intelligent data management to what might have been an automation-only solution had the potential to save the lab €238.500 annually based on the cost of aliquot tubes alone.[§]

"Thinking about automation as simple mechanization ignores the importance of data integration."

Dr. Nimmi Kansal, Technical Director of Clinical Chemistry and Biochemical Genetics, Dr. Lal Pathlabs

"We found it easy to grasp why multidisciplinary testing on Aptio Automation reduced daily aliquots by nearly two-thirds, from 4000 to 1500, but were astonished to see how applying advanced workflow rules with Atellica Data Manager drove even further reductions—down to a mere 250 aliquots/day," said Dr. Nimmi.

Improved QC and result management

To provide a high degree of quality assurance and avoid costly and time-consuming repeat testing, the combined power of several Atellica offerings proactively manage QC in real time.

Atellica Solution instruments perform QC automatically using onboard refrigerated materials as outlined in detail on page 6. Removing human error and variations related to test and thaw time increases the effectiveness and consistency of QC. In addition to alerting staff if no QC material is available on the instrument, Atellica Process Manager software supports remote control of analyzers across the network, enabling staff to troubleshoot and resolve these and other issues from a centralized location.

A dedicated QC alert donut graph on the Atellica Data Manager software's home screen displays the number of low-, medium-, or high-severity QC alerts as defined by the operator (i.e., due to QC rule violations). Levey-Jennings graphs display assay-specific QC trends, and the software works with Aptio Automation to suspend testing and redirect samples to an alternate instrument for a given test.
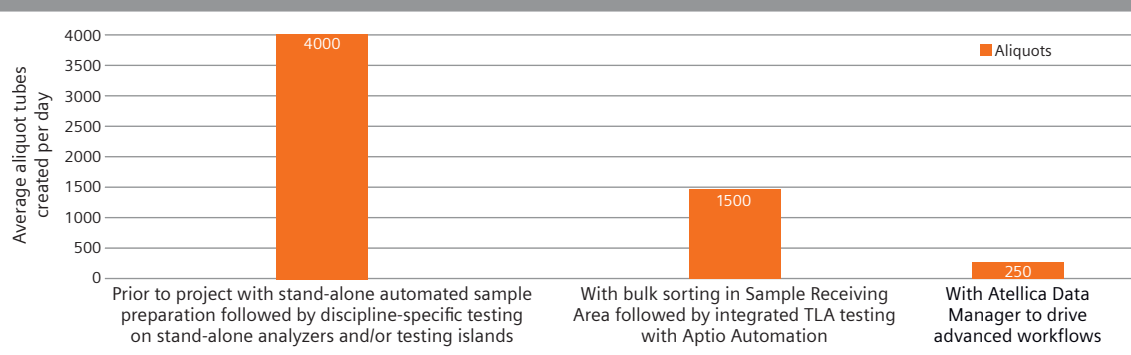
To supplement daily quality control testing, Dr. Nimmi's team also uses Atellica Data Manager to continuously track patient moving averages (PMA) for key analytes on the TLA track and for instruments elsewhere in the main and satellite labs. "PMA tracking helps detect errors earlier for better patient care," said Mr. Santosh Tiwari, section officer.

"In addition to strengthening our QC management, we are leveraging the rich autovalidation capabilities of Atellica Data Manager to enhance quality assurance and customer service," said Ms. Richa Khanna, Dr. Lal Pathlabs deputy manager of operations. Dr. Lal Pathlabs configured the software to evaluate patient results based on a robust set of autovalidation criteria, including instrument flags, reference ranges, and QC performance with PMA tracking.** Importantly, the lab's efforts at PMA tracking have enabled them to hold results based on these data points. This integrated capability adds an actionable new level of control to automated result management.

"We've been able to double our Six Sigma assay performance (see table on page 7) by leveraging the performance of the Atellica Solution," said Dr. Kamal Modi. "The combined capabilities of Atellica Data Manager, Atellica Process Manager, and Aptio Automation products have further enabled us to improve quality, and the way that they all work together has been a game changer for our patients as well as for our workflow."

93% reduction in required aliquots/day

Sample splitting was initially reduced 62% with automated bulk sorting in the Sample Receiving Area followed by chemistry and immunoassay testing on Atellica and third-party analyzers connected to the TLA solution. Sample splitting declined an additional 83% as Atellica Data Manager applied increasingly complex rule sets to drive advanced workflows on Aptio Automation.

Bar chart — Average aliquot tubes created per day:
- Prior to project with stand-alone automated sample preparation followed by discipline-specific testing on stand-alone analyzers and/or testing islands: 4000
- With bulk sorting in Sample Receiving Area followed by integrated TLA testing with Aptio Automation: 1500
- With Atellica Data Manager to drive advanced workflows: 250

IT workflow rules have the potential to reduce material costs

TLA Default Rules: Integrated chemistry and immunoassay testing on Atellica Solution as part of Aptio Automation initially decreased the lab's daily aliquot needs from 4000 to 1500.

1500 aliquots/day x **12** months/year **30** days/month = **540,000** aliquots/year x **€0.53** per tube‡ = **€286,200** annual cost

vs.

IT-driven Workflow Rules: Progressively complex Atellica Data Manager workflow rules applied to the TLA solution reduced the lab's daily aliquots from 1500 to 250.

250 aliquots/day x **12** months/year **30** days/month = **90,000** aliquots/year x **€0.53** per tube‡ = **€47,700** annual cost
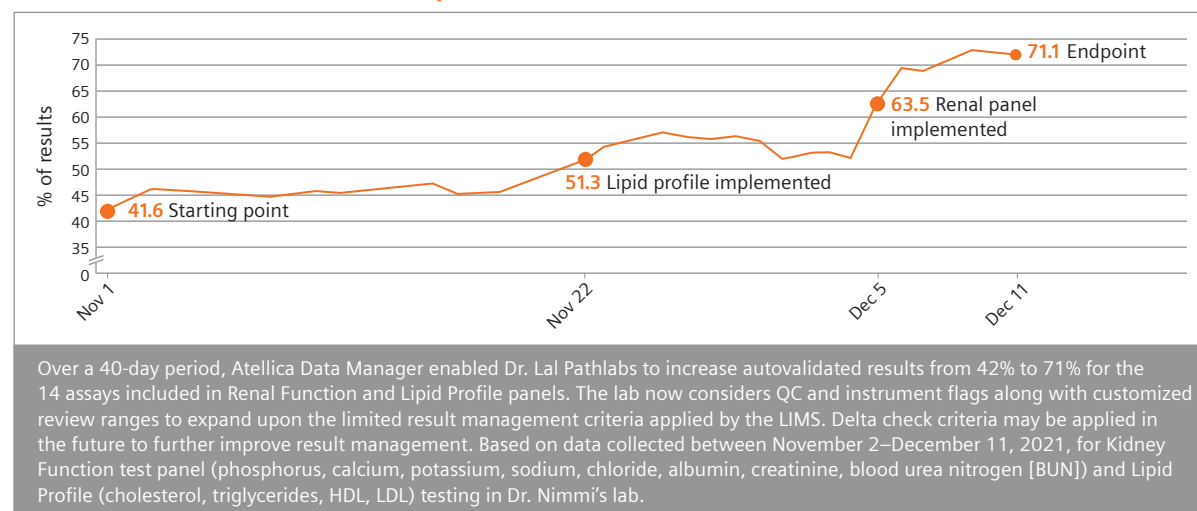
Total Yearly Savings: €238,500§

‡Global currency conversion rate: 1Rs @ €0.012 on 1/13/2022.
§Actual savings achieved depend on test mix variability and aliquot tube prices in the local market over time.
**Atellica Data Manager can also support the use of delta checks as an autovalidation criteria.

Today, the organization confidently autovalidates and releases more results faster than was possible when their LIMS software only evaluated reference ranges. "Using the library of result management rules that Siemens Healthineers has implemented for labs worldwide, we initially increased our autovalidation rate from 42% to nearly 71%," said Dr. Kamal Modi, "and we believe Atellica Data Manager will help enable us to achieve best-in-class performance for this metric in the future." The software also works synergistically with Aptio Automation to automate repeat or reflex testing to save staff time.

73% increase in autovalidated samples

Over a 40-day period, Atellica Data Manager enabled Dr. Lal Pathlabs to increase autovalidated results from 42% to 71% for the 14 assays included in Renal Function and Lipid Profile panels. The lab now considers QC and instrument flags along with customized review ranges to expand upon the limited result management criteria applied by the LIMS. Delta check criteria may be applied in the future to further improve result management. Based on data collected between November 2–December 11, 2021, for Kidney Function test panel (phosphorus, calcium, potassium, sodium, chloride, albumin, creatinine, blood urea nitrogen [BUN]) and Lipid Profile (cholesterol, triglycerides, HDL, LDL) testing in Dr. Nimmi's lab.

Moving past uptime: Optimize performance with data-driven intelligence

No matter how innovative its technology or integrated its design, a lab must stay up and running to meet customer expectations and service commitments. Dr. Lal Pathlabs relies on several Atellica products to support these needs and position the lab to continuously monitor and improve performance over time.

Atellica Solution maintains an onboard, temperature-controlled reagent and QC inventory and is programmed to automatically perform periodic QC testing and calibrations. Daily startup and maintenance routines also take place without manual intervention during non-peak hours. Atellica Process Manager can aggregate Atellica Solution's process-related data and help flag similar requirements for third-party instruments connected to Aptio Automation.

Dashboards, error monitors, panic alerts, and other capabilities in Atellica Diagnostics IT software enable lab staff to monitor real-time performance and maintain uptime. "Atellica Solution and Atellica Process Manager work synergistically to alert us when onboard reagents need replenishing or when QC sample levels are getting low," said Mr. Anuj Kumar, section officer. This enables the lab staff to replenish instruments early—before TAT becomes erratic due to automated sample rerouting within an Atellica Solution configuration or across the TLA track.

"Atellica Process Manager has changed how our technical directors work. It is rare to find them standing at an instrument," said Ms. Richa Khanna. "Our LIMS software had limited means to visualize real-time operational information. Whereas the team used to extract LIS reports days later to gain insights on past KPI performance, now—from a remote desktop— they can see real-time workload and know how many tests have been run." The software provides **3D views** of all lab zones, with clear flags to indicate if any instruments are offline or require attention. Staff can remotely access and control those instruments via this **digital twin**.
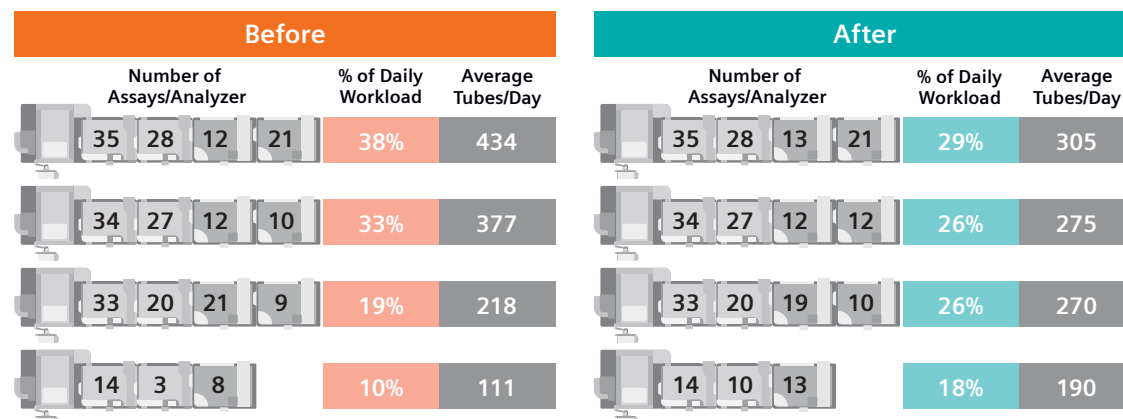

An IT command center provides Dr. Lal Pathlabs with centralized visibility and remote control to manage automation, samples, results, and processes using Atellica Process Manager and Atellica Data Manager.

In addition to monitoring day-to-day operations and maintaining uptime, Dr. Lal Pathlabs is using the out-of-the-box business analytics reports in Atellica Process Manager to optimize ongoing performance of people, processes, and instruments across the lab. The team seized the following improvement opportunities shortly after go-live, well in advance of the regularly scheduled Siemens Healthineers Automation Health Check, which is typically performed every 6 months:

- **Turnaround Time reports and the Automation Utilization report** uncovered variations in tube arrival times and scan-in/scan-out between the pre-analytical SRA sorting area and Aptio Automation. In response, Siemens Healthineers helped coordinate and conduct supplemental training in batching practices to better use the TLA solution.
- **Throughput Analysis and Reagent Utilization reports** were instrumental during the COVID-19 surge of April through May 2021. To maintain peak throughput, Dr. Kamal Modi's team implemented onboard inventory monitoring alerts for key assays associated with care of COVID-19 patients, including CRP, IL6, D-dimer, ferritin, and LDH. In addition, assay menus across the 15 Atellica Solution instruments connected to the TLA solution were rebalanced to speed TAT for what had become a much-used new test pattern.

Continuing to improve processes: Moving ahead as strategic partners

While the changes implemented were revolutionary, the new workflow approach represents a starting point rather than an end state for Dr. Lal Pathlabs. Based on time and cost savings, the mindset of senior management has shifted as they consider how to better automate smaller sites. Meanwhile, the Dr. Lal Pathlabs and Siemens Healthineers IT teams are extending centralized views of the entire hub-and-spoke network via Atellica Process Manager and Atellica Data Manager and implementing PMA tracking across the satellite labs. Beyond the diagnostic testing labs, the HCS team is helping Dr. Lal Pathlabs to improve workflows at blood collection sites to reduce patient turnaround time.

Tubes processed by Atellica Solution lines before and after menu load balancing performed by Siemens Healthineers application engineers

Before					After				
Number of Assays/Analyzer				% of Daily Workload / Average Tubes/Day	Number of Assays/Analyzer				% of Daily Workload / Average Tubes/Day
35	28	12	21	38% · 434	35	28	13	21	29% · 305
34	27	12	10	33% · 377	34	27	12	12	26% · 275
33	20	21	9	19% · 218	33	20	19	10	26% · 270
14	3	8		10% · 111	14	10	13		18% · 190

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We are a team of 66,000 highly dedicated employees across more than 70 countries passionately pushing the boundaries of what's possible in healthcare to help improve people's lives around the world.

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