CASE STUDY

Geisinger Medical Center Transforms their Laboratory with a State-of-the-art Total Automation System

When it was time to update their laboratory instrumentation, Geisinger Medical Center wanted a next generation automation system that would serve the laboratory for the next five to seven years.

Facility
Geisinger Medical Center, Danville, Pennsylvania

Annual test volume
Over 7 million

Challenges

- Aging equipment and limited functionality
- Insufficient workspace
- Separate workflows for inpatient and outpatient samples to meet capacity and throughput
- High degree of manual processes
- Labor shortage

Objectives

- Upgrade to state-of-the-art equipment
- Adopt a total laboratory automation (TLA) system that connects front-end processing with three different analytic instruments (chemistry, hematology, and coagulation)
- Consolidate multiple and separate testing areas into a single accessible core laboratory
- Improve efficiency, throughput, and predictability of sample processing
- Accommodate high-volume capacity
- Enhance ability to increase volume and expand services
- Reduce costs and optimize labor use

Solution
cobas® 8100 pre-analytics automated workflow series connecting chemistry, hematology, and coagulation in a new consolidated laboratory space along with Roche Middleware Solutions and automated sample storage and retrieval capability.

Geisinger Medical Center

Since 1915, Geisinger Medical Center has been providing high-quality healthcare services to more than two million residents in central and northeast Pennsylvania.

A regional leader in patient care, Geisinger Medical Center is home to some of the most advanced technology and services in the country, including a Level I trauma center, the region's lone pediatric trauma center, the renowned Janet Weis Children's Hospital, the state-of-the-art Hospital for Advanced Medicine and clinical research facilities.

The laboratory performs over seven million tests annually. Patient samples are received throughout the day, with inpatient volume highest in the early morning and outpatient courier deliveries in the mid afternoon through early evening. In the before state, a dedicated chemistry instrument was used to perform STAT inpatient tests to meet throughput and turnaround times.

GEISINGER MEDICAL CENTER LABORATORY GOALS

Operational Efficiency

- Reduce process steps
- Achieve consistent and predictable turnaround times
- Consolidate testing areas and reduce overall footprint
- Maximize FTE utilization
- Streamline add-on processing

System Requirements

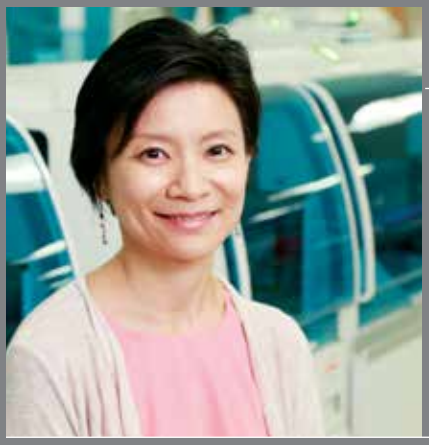
- Growth potential – ability to add testing modules
- Connectivity with multiple analyzers
- Innovative IT solution
- Bi-directional track

An objective and evidenced-based selection process identified the right automation solution and the best partner.[1]

The laboratory previously had an automation system that connected the front-end processing with chemistry analyzers only. In an effort to further improve efficiency, we implemented a new total laboratory automation system to connect front-end processing with 3 different analytic instruments (chemistry, hematology, and coagulation) as well as the sample storage unit. A yearlong, comprehensive evaluation process was conducted to select the optimal automation system.

In addition to selecting a laboratory automation system, we also wanted to use the process to ensure employee engagement in preparation for implementation. A total of 5 vendors were evaluated, of which 4 had analytic solutions for chemistry, hematology, and coagulation. A multidisciplinary approach was used to ensure all aspects of the automation system were taken into consideration in the design of this system.

We created a Laboratory Automation Committee (LAC), composed of 5 subcommittees, each focused on unique aspects of the automation system. Given the impact of this automation system on both people and processes, the medical directors in the laboratory wanted to keep front-line technologists fully engaged in the process and treat them as decision makers. The key committee members included technical specialists in different disciplines: hematology, coagulation, and chemistry. The main role for medical directors and supervisors was to lead and guide their teams in the evaluation process rather than be the sole decision makers for the process.



"We all know we are not going to see another new lab in our lifetime. So we have to make sure that there's potential for growth within the space that we have, and Roche can do it. There is room for more testing modules."

— Elsie Yu, PhD, DABCC, System Director, Clinical Chemistry, Toxicology and Point-of-Care Testing

A TWO-PHASED APPROACH – EVALUATION AND SELECTION

Given the amount of information each vendor provided for evaluation, the committee decided that it would be best to use a two-phased approach in the selection process. In Phase I each vendor provided on-site presentations to showcase their automation system and instrumentation to all members of the laboratory, as well as, in-depth presentations to committee members and separate IT presentations focusing on the instrument software and middleware solution.

Phase I also included site visits to hospital laboratories that shared similar test volume and IT infrastructure (laboratory information system (LIS) and electronic health record (EHR) system). To facilitate an unbiased evaluation of each vendor choices, the LAC developed a weighted decision matrix to score each vendor's option. At the end of Phase I the selection was narrowed from five vendors to two. Then additional, more detailed evaluations were conducted with the two finalists.

In Phase II a side-by-side detailed comparison of the two vendors was performed. A formal request for proposal (RFP) was sent to each vendor to determine how each would fit with the hospital laboratory space and workflow. In addition, an evaluation of pricing for the final contract negotiation and capital request was conducted and meetings with each vendor took place to begin discussions on the implementation process.

Why Roche?

Selecting an automated solution for multiple analytics is a complicated and time-consuming process. A perfect solution is rare for an automation system. Therefore, understanding the limitation of the system is as important as knowing the capability to mitigate risk and safeguard a smooth implementation. The laboratory staff met key team members from the vendors who would be implementing the instrumentation, including the application, service, and installation teams to discuss installation and validation plans, an IT support person to discuss IT management, and a project manager to discuss overall timelines. In the end, Roche provided the best solution and gave us confidence in how they would carry out the implementation and support the instrumentation installation.

From left to right: Elsie Yu, PhD, DABCC, System Director, Chemistry, Toxicology, and Point-of-care Testing; Jeanene Contreras, BS, MT, Core Laboratory Manager; Aleksander Kolovic, Pre-analytical Specialist; Jordan Olson, MD, Director, Clinical Pathology Informatics; Jared Shepherd, BS, MT, Analytical Specialist, Automated Chemistry.

"We really put the vendors through their paces. We looked carefully at ease of use, ease of maintenance, and the subtle differences between them. For example, Roche puts a pipette tip in-between every patient specimen that gets sampled, versus an acid wash that some of the others do. And these subtle little differences made people feel really good about the system that we selected."

– Myra Wilkerson, MD, Chairman, Division of Laboratory Medicine

ROCHE KEY ADVANTAGES

Roche 8100 Pre-Analytics (option)

- Upfront integrity checks confirm sample volume and quality, remove high-touch manual steps, and identifies errors within first 15 minutes for earlier intervention
- Multi-level, bi-directional tube transportation, throughput 800 to 1,100 tubes/hour
- Ability to run both primary tubes and make aliquots to run in mixed mode-workflow flexibility
- Ability to use all sample tube sizes in mixed mode, single tube transport with RFID
- No compressor to run specimen track system

Roche cobas System

- TAT (Receipt to Result/Verify) less than 45 minutes using one standard process
- Mid-term storage for hands-free add-on/repeat testing and archiving
- Fewer processing steps even when starting from a partially automated laboratory
- Superior Middleware – true autoverification, no enter/edit needed, tracks TAT
- Largest test menu of all vendors and small sample volume requirements

Roche Value Drivers

- Lean-certified, Six Sigma Black Belt consultants guide design of overall workflow processes
- On-site training at customer facility
- Proactive support

"Service is huge with us. The technical support from Roche is top notch. They are extremely responsive. I couldn't ask for better."

– Jeanene Contreras, BS, MT
Core Lab Manager

More work can be done in a smaller space, which equals fewer steps and more efficiencies for staff.

The New Laboratory

The consolidation of multiple and separate testing areas into a single accessible core lab space reduced our footprint by 45% from 3,118 sq. ft. to 1,708 sq. ft. This created a more efficient workflow and greater testing per square foot, freed up space to be repurposed for other departments, and reduced our overall facility costs.

THE IMPLEMENTATION PROCESS

Roche provided strategic workflow analysts, who are Lean certified, Six Sigma Black Belts, to document our processes so that we could understand our overall workflow. Time and motion studies were generated for all the testing processes from sample receipt to results and results to specimen archival including add-on testing. Two of the drivers for the shift to a TLA system were to eliminate or automate non-value added steps and to reduce variability as a result of our manually heavy processes. These critical tools allowed us to effectively redesign our layout and workflow.

"I'm very proud of my whole team. These changes weren't easy. There were challenges every step of the way. In some cases, it was very traumatic. But they pulled through, and I'm very proud of them."

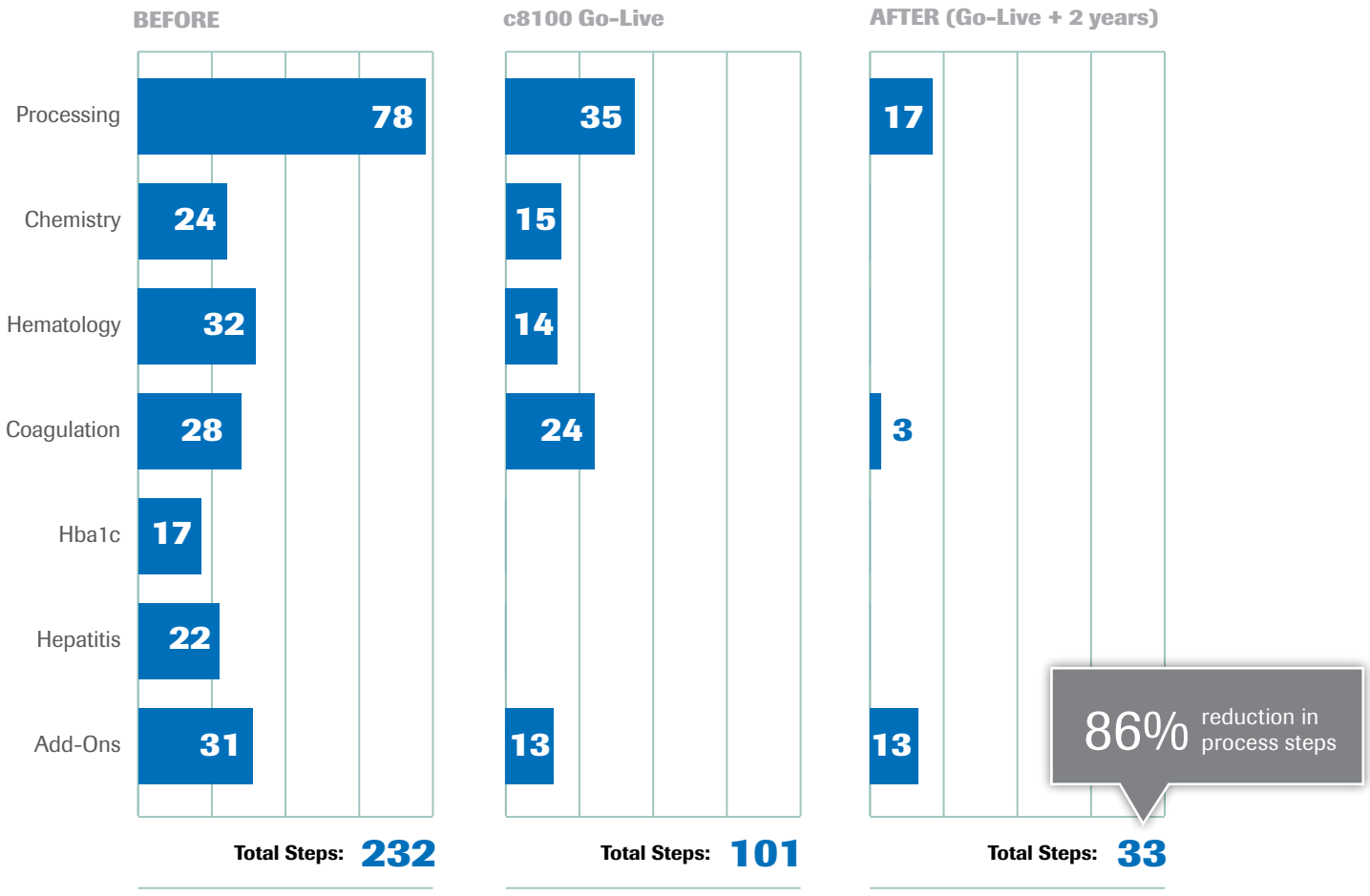
– Elsie Yu, PhD, DABCC, System Director, Chemistry, Toxicology and Point-of-care Testing

"When you visit our core lab you will see a beautiful laboratory that is well organized and runs very efficiently. And you'll find a happy crew."

– Tammy Germini, MBA, MT(ASCP), Clinical Pathology Operations Director

Fewer Process Steps

The implementation of our TLA system resulted in 86% fewer discrete processing steps in specimen handling, even when starting from a partially automated laboratory. Before total automation there were 232 steps in our processes, with only two steps that created value for the patient: analysis and resulting.



Labor Savings

Reducing manual sample handling freed 22 hours per day for staff to focus on more value-added activities.

*Labor figures for various activities are based upon averages for non-technical staff at $23 per hour, for Technical Staff at $35 per hour. These figures include wages and benefits.

Department	Hands-on Time (hours/day)	Labor-equivalent per year*
Chemistry	5.1	$55,500
Hematology	5.2	$57,150
Coagulation	4.1	$44,300
Immunology	2.7	$29,400
HbA1c	1.0	$11,100
Add-Ons	3.9	$35,200
TOTAL	**22.0**	**$232,650**

"It's amazing, to go from having to do everything by hand to basically not even touching a tube. It's astounding just to see how tubes will just flow like traffic on a busy street and they know where they're going."

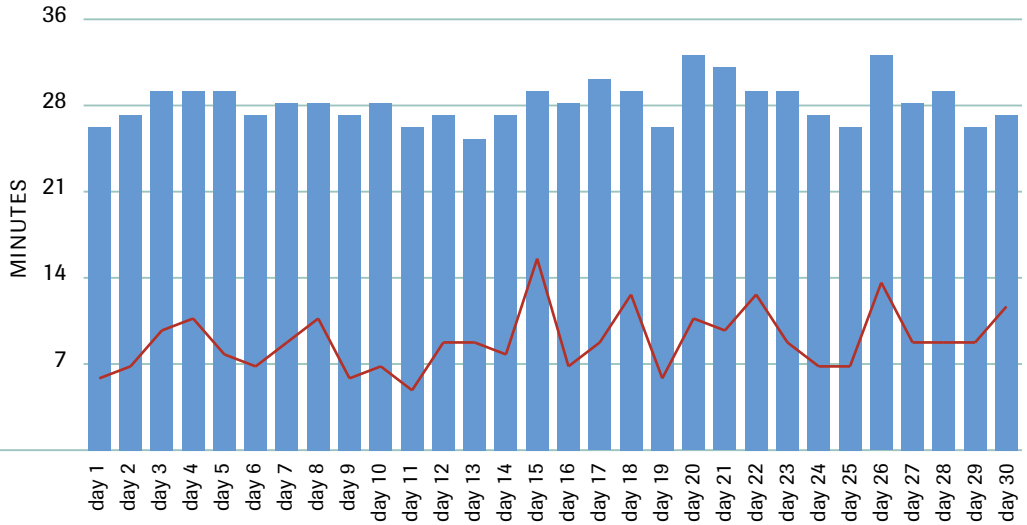
– Aleksander Kolovic, Pre-analytical Specialist

Consistent and Predictable Turnaround Times[2]

Turnaround time remained comparable after consolidating the STAT chemistry instrument into the automated Chemistry testing system where outpatient and routine priority tests were also performed.

BEFORE

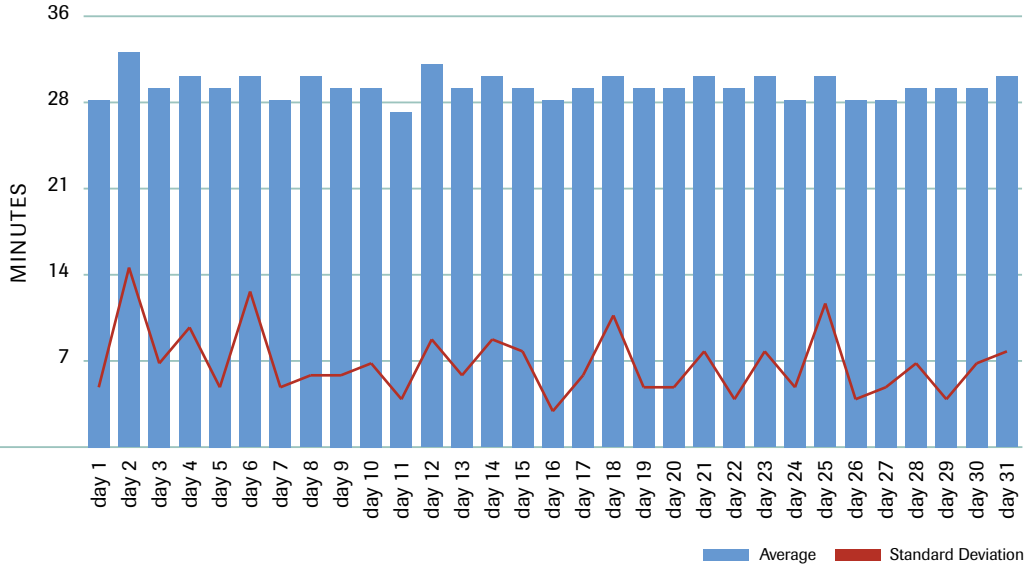
Receipt to Result time for STAT inpatient basic metabolic panels when STAT test was run primarily on a standalone STAT only Chemistry analyzer



The average standard deviation went from 9 minutes to 7 minutes, representing less variability in the process.

AFTER

Receipt to Result time for STAT inpatient basic metabolic panels after the implementation of the total laboratory automation system.



Geisinger Medical Center, Danville, Pennsylvania

RESULTS SUMMARY

LABORATORY GOALS	LABORATORY RESULTS
Reduce process steps	86% fewer discrete processing steps in specimen handling
Achieve consistent and predictable turnaround times	Turnaround time goals met with one system and one standard process for all samples, and with substantially less variability
Consolidate testing areas and reduce overall footprint	Instrument consolidation reduced the testing footprint by 45%
Maximize FTE utilization	Reduced testing personnel by 2.5 FTEs
Streamline add-on processing	82% reduction in hands-on time associated with add-on processes was achieved. Combining both STAT and outreach work on the testing system did not impact turnaround time

"More than ever before, the organization is viewing the laboratory as a strategic partner in providing patient care. We're just not a place where specimens come in and results go out. We're a key resource that provides useful and beneficial information in a strategic way that can support diagnosis, as well as to help coordinate delivery of care. For example, the middleware takes decision making to new level. It ensures that the right test is performed for a patient. The middleware analyzes preliminary results and identifies reflex testing needs, as well as, produces a consolidated report for the physician."

– Tammy Germini, MBA, MT(ASCP), Clinical Pathology Operations Director

Discover how you and Roche can redefine the value of your laboratory together. Contact your Roche Diagnostics representative: call 1-800-346-8606, or visit usdiagnositics.roche.com

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2. Yu HE, Lanzoni H, Steffen T, Derr W, Cannon K, Contreras J, Olson JE. Improving Laboratory Processes with Total Laboratory Automation. *Lab Med. 2018*