# EL CAMINO HOSPITAL IMPROVES THE DELIVERY OF PATIENT CARE WITH PROCESS IMPROVEMENT, AUTOMATION AND ADVANCED INFORMATICS

System profile

› El Camino Hospital, Mountain View and Los Gatos, California, USA

› 700-bed, not-for-profit hospital serving Central California communities

› Operates 24/7 with a staff of 50 full-time employee (FTEs)

› 735,000 billable procedures per year, including 1.3 million individual chemistry and immunoassay tests

› Integrated automation system: Power Processor sample-processing system connected to two UniCel DxC 800 clinical systems, two UniCel DxI 800 Access immunoassay systems, a COULTER LH 1500 hematology system, two LH 780 hematology systems

› Business intelligence software

› REMISOL Advance with extended quality control software and third-party instrument integration

› Command Central workflow management solutions

› Continuous Process Improvement (CPI) engagements aimed at improved patient experience on draws

For more than a decade, El Camino Hospital has been a leader in laboratory process improvement. They have achieved a 95% autoverification rate and eliminated unnecessary draws through the implementation and use of integrated automation, LEAN processes and, most recently, truly advanced healthcare informatics solutions. El Camino Hospital's two campuses continually enrich their experiences and contributions to their network by incremental improvements.
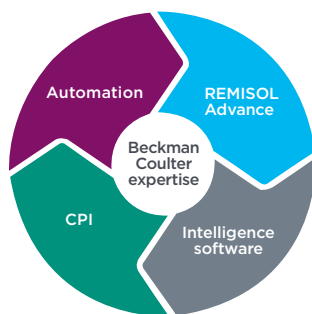
› Streamlined workflow with Power Processor

› TAT reduction through autoverification by Extended Quality Control (EQC)

› Improved operational efficiencies with process improvement engagements

Productivity gains through customized informatics suites

El Camino Hospital first partnered with Beckman Coulter to automate its core laboratory in 2003. Since then, the organizations have continued to partner, implementing multiple workflow optimizations and solution upgrades, building a progressively stronger, more profitable and more efficient laboratory operation at every step of the way.

In terms of information technology, the laboratory's transformation began in 2009, when it upgraded from the DL2000 Data Manager to the REMISOL Advance data management system with Command Central. First, they implemented standardized verification rules—thus eliminating subjective interpretation of results—and added the ability to view information from multiple analyzers remotely from a central location. The REMISOL Advance servers are configured with data redundancy features and automatic backup functions to ensure data integrity.

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"Because of REMISOL Advance and autoverification rules, we were freed up to just look at results that need our attention, and that makes a big difference," said Kelly Abbott, chemistry lead.

In fact, with autoverification, 90% of the laboratory's chemistry results and 95% of its immunoassay results are released automatically, requiring no review from the laboratory staff. This saves time, optimizes labor and decreases TAT for the test results.

In 2013, the laboratory's quality and efficiency took another step forward when it added the optional Extended Quality Control (EQC) module to its REMISOL Advance systems.

"Prior to adding EQC, we had to delay placing patient samples on the instruments every morning until quality control, for all the tests, could be verified. This often added 15-20 minutes to our overall turnaround time," said Abbott. "With EQC, however, we don't have to wait for all QC to finish before loading specimens. Now our operators have full confidence that if any single test's QC value is out, the patient results for that test will be blocked from autovalidation, so nothing gets reported erroneously. This enables us to bring patient specimens onto the instruments sooner, reduce TAT and increase workflow."

The EQC patient protocols also feature exponentially weighted moving averages (EWMA), which add another layer of assurance. This feature continuously monitors patient results between QC runs. If QC values start to drift, it alerts the reviewing technician in real time, stopping autoverification of those affected results.

"In the past, we would occasionally turn out results for five or six hours before we realized the QC was out," explained Abbott. "That meant we had to rerun all those patient samples and re-report the results to the physicians. Having EWMA catch any QC issues right away saves us time and means more efficiency for the entire laboratory."
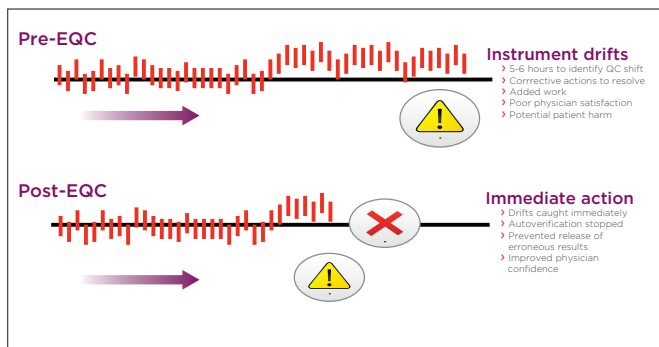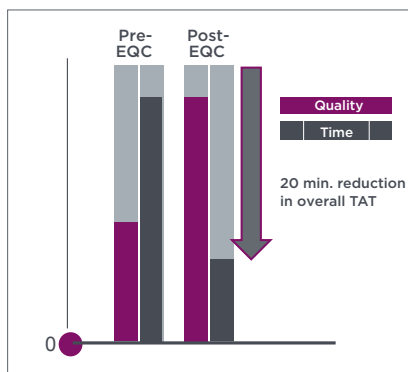
Turnaround time goals (received in the laboratory to results reported)	Minutes	% of time goal is achieved
Chemistry (BMP)	30	90%
Immunoassay (TnI)	35	74%
Coagulation	45	92%
Hematology	30	94%

Bringing the laboratory real-time intelligence through dashboards

Also in 2013, Beckman Coulter helped the laboratory acquire another powerful IT engine—unique business intelligence software that gives real-time alerts to analytical trends within the laboratory.

This custom software tool pulls daily extracts from the LIS to create an easy-to-use visual workflow system that provides a variety of workflow, productivity, quality and TAT performance reports. The technology also provides comment codes that eliminate unnecessary investigation, technician codes that identify individuals processing tests and information for further investigation. TAT reports are printed daily, providing timely feedback on performance.

"As far as I'm concerned, we were flying blind before we got that software," said Abbott. "We were doing a good job and trying to get turnaround times as low as possible, but we had no feedback other than complaints. We could only look at extreme outliers, and it was a manual process that often took a long time. We were often looking at issues that happened several days or a week ago—and people simply can't remember what happened a week ago with a problem sample."

"Now we can see all the key indicators at once—the mean, the turnaround time based on time segment, percentage of outliers and even the identification of specific outliers—so we can drill down to examine the problem specifics," said Abbott. "It's a fantastic tool that gives us all the information we simply couldn't capture before—now we have access to it every single day."

Armed with these statistics, Abbott has a daily huddle with her team to discuss findings and post key indicators on a laboratory-wide daily management board for all to see. This process raises awareness, increases accountability and gives staff immediate feedback on how the team is doing.

Do you use rules-based results validation?	Yes / No	% of results autovalidated
Chemistry	Yes	Approx. 90%
Immunoassay	Yes	Approx. 95%

Internal case study

Soon after the business intelligence software was installed, the laboratory started gaining valuable information about turnaround time for critical tests like troponin. The metrics showed they completed troponin in the 98th percentile for the time period between sample collection and sample receipt in the laboratory, but only the 69th percentile for the time period between physician order and sample collection.

That indicated a problem was occurring long before the sample was received. It also provided the ammunition needed to discuss the entire order-to-collection process with the emergency department (ED) and to work together to reduce the pre-analytical variability.

"People simply don't believe us if they can't see the data," said Abbott. "But with the right metrics, they can see that it really has been taking them three hours to deliver a patient sample and that maybe it's not the laboratory's error that the results aren't done on time. I think having this information has created a greater sense of collaboration behind the scenes."

Since addressing several pre-analytical issues with the ED and working together on solutions, the laboratory has witnessed a dramatic 30% decrease in troponin outliers.

More positive results

For El Camino Hospital, healthcare informatics advancements are also helping the laboratory work toward meeting strict new government mandates. One regulation specifies that troponin results be completed in less than 60 minutes. Before changes were incorporated, El Camino Hospital had been struggling to meet that goal. Today, the right data—at the right time—is helping the laboratory drive new LEAN strategies throughout the hospital, all of which are helping bring its TAT into compliance.

Leveraging the vendor partnership: delivering continuous process improvement

Prevented 150,000 draws
Standard work developed to reduce unnecessary draws

Savings in consumables: $25,000 annually per site
Reduction in unnecessary labor

Eliminated 2.5 tons of biohazardous waste cost annually
Reduction of 200 gallons of blood managment

Thanks to data-driven software and valuable new process insights, El Camino Hospital is focusing on bold, new LEAN initiatives that help bolster system-wide efficiency and improve patient satisfaction. The core laboratory has also received a lot of help from Beckman Coulter's Continuous Process Improvement (CPI) Team, who has been instrumental in providing LEAN training and guidance.

El Camino Hospital partnered with Beckman Coulter to review their processes within and outside of the lab and to look for areas to improve their value and relations within the hospital network.

With education around LEAN and waste, the hospital began seeing areas of improvement outside of the laboratory. Soon enough, they noticed waste through excess draws within their phlebotomy and processing department. Through LEAN guidance from Beckman Coulter's CPI team, they conducted a series of events to find the root cause as well as quantify the waste. What they found by going to "gemba" (or the place of work in Japanese) was that only 2.3% of these extra draws were ever used. This finding identified exponential savings in many different avenues, including the following outcomes:

> Prevented 150,000 extra draws annually
> Saved 2.5 tons of biohazardous waste
> Eliminated the need to handle 200 gallons of blood
> Saved $25,000 annually in materials per site
> Saved on time spent on non-value added tasks

"Over the years, Beckman Coulter has proven its excellence in all areas from sales to service," said Abbott, "but these value-added resources like the business intelligence software and the LEAN expertise we've received over the past 18 months really put our hospital way ahead."

Events completed in partnership with Beckman Coulter	
Sept 2012	Beckman Coulter "Lean in the laboratory" seminar
Jan 2013	Waste walk
April 2013	5S - laboratory
Sept 2013	Kaizen specimen processing and outpatient draw site
Feb 2014	Kaizen transfusion service

El Camino Hospital case study

Laboratory goal	Laboratory results
› Decrease turnaround time variability	› Decreases PCT outliers by 54% › Decreases troponin outliers by 30% › Meets 30-minute goal for chemistry (BMP) 90% of the time › Meets 35-minute goal for immunoassay (TnI) 74% of the time › Meets 45-minute goal for coagulation 92% of the time › Meets 30-minute goal for hematology 94% of the time
› Improve overall lab efficiency	› Autovalidation automatically releases 90% of chemistry results › Autovalidation automatically releases 95% of immunoassay results
› Identify and implement LEAN strategies	› Business intelligence software identifies specific areas for improvement › Metrics drive external department collaboration and better delivery of patient care

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