Case Study

Key success factors in laboratory automation: Lessons from a Canadian Health System
Implementing automation and lean workflow improvements throughout histology is a significant undertaking for any laboratory – the task becomes exponentially more challenging when a project involves multiple laboratory sites collaborating on the implementation. Such was the case in 2012 when DynaLIFE DX (DynaLIFE), an Alberta-based private laboratory services provider led a collaboration with four Alberta Health Services hospital-based rapid response labs.

**Background**

The majority of the DynaLIFE pathology workload volume comes from Alberta Health Services. Alberta Health Services (AHS) is Canada’s first province wide, fully integrated health system and is responsible for planning and delivering health services for more than 3.7 million Alberta residents.

DynaLIFE functions as a reference lab for AHS, working with contract metrics that include very tight turnaround times (TATs) to provide public healthcare lab services to AHS’ community-based labs and four hospital-based rapid response labs (RRLs) within Edmonton.

From the Rocky Mountains and across the prairie landscapes of Alberta, Canada, surrounded by a range of government-owned labs, is DynaLIFE – the only private laboratory in its geography. Owned by LabCorp of the U.S. and Borealis Infrastructure, a Canadian institutional investor, DynaLIFE is the largest histology lab in the province, with primary responsibility for a 225,000 square-mile service area in Edmonton, one of five health management zones in the Alberta province.

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<thead>
<tr>
<th>DynaLIFE Dx Locations</th>
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<tr>
<td>• 36 patient collection sites</td>
<td>• 7 testing locations</td>
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<tr>
<th>Alberta Health Services Referring locations</th>
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<tr>
<td>• Grey Nuns Community Hospital</td>
<td>• Royal Alexandra Hospital</td>
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<td>• Misericordia Community Hospital</td>
<td>• Sturgeon Community Hospital</td>
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<tr>
<th>Histology volume</th>
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<tr>
<td>• 203,000 specimens/year</td>
<td>• 430,000 blocks/year</td>
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<td>• 1,000,000 slides/year</td>
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<table>
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<tr>
<th>DynaLife staff</th>
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<tr>
<td>• 1,100 employees</td>
<td>• 500 employees at DynaLIFE base lab</td>
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<td>• 31 pathologists</td>
<td>• 70 histology employees</td>
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<th>VENTANA solutions</th>
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<tr>
<td>• VANTAGE workflow solution</td>
<td>• H&amp;E stainers: SYMPHONY system</td>
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<td>• Special stains: NexES stainer</td>
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A Shared Vision for Patient Safety

Patient safety has always been a top priority at DynaLIFE, where for years the histology staff spent countless hours on labor-intensive, manual quality assurance. Already a lean lab in other departments, leaders at DynaLIFE looked forward to further deploying lean principles and automation across histology.

In 2010, as a result of national and international inquiries into Anatomical Pathology quality and patient safety concerns, AHS Laboratory Services formed a quality subgroup to recommend best practices. The Anatomical Pathology Quality Assurance Plan that was approved for implementation included six general principles of error reduction in the AP lab.

Jason Pincock, DynaLIFE Chief Executive Officer, and Norma Page, DynaLIFE Vice President of Clinical Operations, were eager to pave the way by finding and implementing a solution that addressed the best practice recommendations of the APQA Plan. DynaLIFE had already begun to investigate options, having completed an environmental scan looking for systems that would meet operational requirements. Beginning in early 2011, they assembled a team that included medical and technical representatives from both DynaLIFE and the AHS hospital sites to examine five different systems that would help the lab decrease its potential for human error.

In September 2011, Page led a team that included histology technical representatives and three AHS pathologists to another lab to preview the benefits of automation. The lab they visited deploys the VENTANA VANTAGE solution, including barcoding and workflow technology and staining platforms.

The VANTAGE solution emerged from the evaluation process as “the clear winner,” and DynaLIFE was able to build a business case that aligned with the six strategic priorities of the AP QA Plan. According to Page, “Benefits [of the VANTAGE system] include the significant risk mitigation of potential adverse events (e.g., patient misidentification), along with a quantum improvement in productivity.”

In their business case, DynaLIFE leaders also recommended purchasing automated staining platforms, including five VENTANA SYMPHONY systems and two NexES special stainers, to effectively manage patient safety risks of multiple slide labeling steps and tissue cross contamination. In addition, SYMPHONY stainers would equip the lab with new levels of productivity. In October 2011, the DynaLIFE board approved Ventana as the lab’s patient safety partner and each of the four AHS hospital-based RRLs concurred. The wheels of change were officially set in motion.

AHS Laboratory Services APQA Plan

1. Improvement of information access at each point in the histology workflow
2. Automation of the complex multi-step procedures, manual memory aids and checklists
3. Reduction of the number of options to ensure consistent quality and standardization
4. Utilization of 2D barcoding solutions to eliminate reliance on vigilance at each process step
5. Standardization of tasks and language supporting standardized procedures and method consistency
6. Simplification of process and design to limit hand-offs and build Quality Assurance and Quality Control monitors into each function
Moving from Manual Processes to Automation

Implementation of the VANTAGE solution brought about a dramatic reduction in manual processes within the DynaLIFE histology department, streamlining a complex array of double and triple-checks that utilized multiple master logs, handwritten sticky notes and more. These time-consuming, resource-draining manual processes had been the norm for DynaLIFE histology staff for four decades. So one might expect a lot, or at least a little, frenzy on the Go Live date, especially considering all five labs “flipped the switch” all in one day. But for DynaLIFE and its four AHS-RRL partners, it was nothing of the sort. “Go Live was practically a non-event – it was like any other day,” says Page.

The efficiencies gained from VANTAGE automation enabled DynaLIFE to absorb a 15 percent spike in volume the very next month, without any disruption to their rigorous TATs. While Pincock emphasizes that the “can do” culture of DynaLIFE means they would have met TATs despite the sudden spike even without the VANTAGE system, he also acknowledges that “it would have been a lot more painful.” By contrast, “with VANTAGE comes increased capacity, and we very quickly were able to put that extra capacity to good use,” he says.

Prior to the installation of the VANTAGE solution, DynaLIFE relied on paper-based master logs like the ones shown here for chain of custody integrity.

Success Factors

How is it possible for a department that had minimal process changes over 40 years to achieve a seamless launch across five sites in one day and increase throughput by 15 percent with no TAT or identified process errors?

The answer to that is fivefold.

1. Foresight kick-starts effective change management.
   “For this to work, implementation had to be an integrated approach with substantial cooperation between everyone at the lab and the public sector hospitals,” explains Pincock. “If any one of the AHS sites had said no, our VANTAGE solution couldn’t have worked – massive workarounds would have been required to run workflow two different ways, and we would not have met the AHS quality goals.”

   Jason Pincock, DynaLIFE Chief Executive Officer

Fortunately, the DynaLIFE team had the foresight to identify the biggest operational challenges upfront and design the Implementation Plan accordingly.

Trish Dola, DynaLIFE Project Manager, led the Implementation Plan. She created a living document complete with action logs for accountability across all stakeholders. Often referred to by others at DynaLIFE as “the glue that kept it all together,” Dola managed implementation internally and served as primary liaison between DynaLIFE and the four hospital RRLs.

Page and Dola worked closely with Ventana workflow consultants to identify specific action plans to improve existing operational process and thereby improve patient safety, productivity and the chain of custody for each bench. “We leveraged Ventana workflow expertise to facilitate change management at the RRLs,” explains Page. “Hylton Surrett, Senior Manager for the Ventana workflow consulting team collaborated with the teams to lead workflow improvements with the RRLs and implement a standardized process across four hospitals and at DL Histology.”

Highlights of the most important workflow improvements achieved include:

- At all sites, the RRLs and Base Lab Histology, workflow changes completely redesigned the accessioning process from pre-labeled batch cases to one case at a time, start to finish.
- Before the VANTAGE system implementation, according to the DynaLIFE Process Improvement Specialists Sharon Hildebrand and Brenda Matheson, up to 3,000 slide labels were pre-printed every evening for next-day cases. This created significant error opportunities and wasted time in next-day matching. “It was a paper-intensive process with a lot of double-checking and double-handling to prevent errors,” says Matheson. Ventana workflow consultants conservatively projected an added 1,000 hours per year
of label production – including pre-labeling, sorting and staging – plus nearly 5,000 hours spent matching case items together to ensure case integrity. “Today slide labeling is done once microtomy is complete, and there is no more pre-labeling,” Matheson explains.

- When specimens were brought to the base lab, they were numbered, but out of order. DynaLIFE histology technologists used a laborious four-way case verification process to match the requisition, master log, cassettes and specimens for every case.

Along with workflow, specific action plans were in place to guide facility and information technology changes. AHS Laboratory Services has a centralized LIS system for AHS and DynaLIFE. Managing the VANTAGE system interface for four of the hospitals was a significant operational hurdle, according to Cam Telford, Manager of IT Infrastructure at DynaLIFE. “The support we received from Ventana throughout technical implementation was invaluable – we spent many late hours working together to make this all happen, and the whole Ventana group was more than accommodating,” he says.

Dola formed a set of cross-functional implementation teams between all five labs and held regular weekly meetings with representatives from all teams. By design, this strategy facilitated on-track project management to ensure timely progress, troubleshooting and follow-up, as well as individual accountability.

According to Leanne Michalchuk, Manager of Anatomic Pathology at DynaLIFE, the cross-functional team meetings were critical to getting things done and keeping everyone on the same page across all five sites. “It was teamwork at its best,” says Michalchuk, “and I was very proud to be a part of it.”

In fact, everyone from DynaLIFE who was involved in the cross-functional team effort is quick to emphasize how important collaboration between the five labs was to successful implementation. “It all comes back to that shared vision between DynaLIFE and AHS to reduce potential for errors that impact patient safety,” says Telford, who spearheaded IT planning as well as project work. “It was all about cooperation and willingness to work together toward a common goal, and from start to finish, it was a success.”

3. All-inclusive staff participation speeds buy-in.
DynaLIFE leaders understood they needed input and buy-in from stakeholders, including AHS Laboratory Services Leadership Team, front-line staff and pathologists. To do so effectively, “it’s very important to identify who your key internal and external stakeholders are, and encourage them to engage and involve their team members,” says Page.

For example, Page knew right away that Tech II Sandra Pereira was integral to successful implementation because Pereira was best positioned to get histology techs actively engaged and participatory with regard to lean workflow improvements. Says Page: “I haven’t worked in histology in many years, so if the techs only heard about VANTAGE from me, they might assume I’m forcing change on them that conflicts with their day-to-day operations. Not so with Sandra – they really look to her as a front-

“We certainly improved patient safety via operational improvement and VANTAGE by moving to positive ID of the case every step of the way,” concludes Hildebrand.

regardless of source. The process caught errors of accessioning and cassette marking while also verifying that the grossing bench had complete cases. Improvement action plans yielded approximately 1,000 to 2,000 hours per year of time AP staff could deploy on value-added work.

- Master logs had become a way of life for the RRLs and base lab. When the RRL finished grossing and preparing cassettes for transport, the RRL printed a master log from the Laboratory Information System (LIS). The master log served as a packing sheet and became the base lab’s primary “go-to” documentation. Dog-eared, highlighted, and covered in handwritten marks and sticky notes, the master logs were the glue that held the chain of custody together for the base lab (see image). According to Surrett, minimizing dependence on master logs and replacing them with automation represented a significant improvement and upwards of 500 annual hours of non-value added activity. “The RRLs and base lab were dependent upon the master logs; removing them was a huge cultural shift. For many staff, it felt as though we removed their safety net, but automation swiftly became the new way of life,” adds Page.

“The pathologist is very dependent upon accuracy of the whole system – from accessioning through diagnosis,” explains Dr. Raymond Lai, DynaLIFE Medical Director. Deficiencies in the workflow process are common problems for AP labs that do not use barcoding and automation. But with the VANTAGE system, explains Dr. Lai, “we now know the entire history of who’s touched the case, how many slides and tissue blocks are associated with the case, and which pathologist has consulted on the case.”
line leader and they value her input and direction on process improvements."

Engaging pathologists early on, and keeping them engaged throughout, is equally important, says Page, who welcomed pathologist involvement at every step. Pathologists from both DynaLIFE and AHS were part of the original Request for Information team and the September 2011 lab site visit, making them an integral part of the decision to go with Ventana.

Pathologists from the four RRLs were also involved in the evaluation, validation and selection of the first DynaLIFE venture into automated staining equipment, which ultimately led to the purchase of five SYMPHONY systems and two NexES special stainers from Ventana. This installation put an end to decades of high-cost, high-maintenance and highly manual staining processes at DynaLIFE – across an average of 25,000 manual special stains and 1,000,000 H&E slides per year.

4. Ongoing communication builds confidence.
Given that manual staining and other processes had been the same at DynaLIFE for many years, another “key to instituting such far-reaching change was to clearly communicate to all stakeholders that advantages are not limited to DynaLIFE – everyone benefits,” says Andrew Schell, MD, DynaLIFE AP Medical Director.

Through ongoing external communications that included AHS’ province wide newsletter and meetings with clinical operations leaders from AHS hospitals, Page spread the word about DynaLIFE’s progress toward AHS’ AP QA plan. Communications proactively addressed potential skepticism by illustrating the benefits, offering updates and sharing success stories to highlight progress. In addition, weekly implementation meetings kept the two-way communication flowing across internal and external stakeholders.

5. Mock Lab inspires change.
Using equipment that was part of their total purchase and approximately 20 linear feet of counter space in their research and development lab, the DynaLIFE team created a “Mock Lab” to see and try all aspects of the automated histology workflow prior to going live. Described by Pereira as “the perfect situation,” the Mock Lab enabled stakeholders (including the RRL staff) to better understand single piece flow from bench to bench and receive hands-on training that built confidence and competence before launch.

“Creating a Mock Lab was based on the idea that we were going to flip the switch on everything all in one day,” explains Pincock. “In order to do that, everyone needed the opportunity to use the system before they saw it on launch day.”

Training staff in advance wasn’t the only advantage the Mock Lab delivered. It also enabled collaborative exchange and input on changing workflow patterns from those who understood it best: the staff on the benches at both DynaLIFE and AHS.

Everyone, from lab assistants, histotechnicians and technologists to pathologists across all five labs, had the opportunity to actively participate in lean histology workflow optimization, which enabled widespread “ownership” of the new processes. As a result, there was very little left to adjust once launch day arrived. And, because the Mock Lab was separate from regular operations for both DynaLIFE and the AHS RRLs, “people got to try it without having to deal with their daily volume – they were coming offsite, out of their facilities, so they weren’t distracted,” explains Pincock. “If they were over in the Mock Lab for the day, they had their creative juices flowing because work wasn’t piling up behind them. That allowed a lot of communication and key engagement.”

Because the Mock Lab was built with equipment purchased for the actual installation, all work stations were redeployed into the histology lab – no additional purchases were necessary to create the trial environment. “If I could make only one suggestion for other labs looking to automate, it would be the Mock Lab,” says Greg Rozak, Manager of Facilities and Materials at DynaLIFE. “If anyone had uncertain notions about what VANTAGE installation would do for operations, the Mock Lab addressed those concerns and removed their uncertainties.”
Moving Forward: Implications for Other Laboratories

In an effort to help other labs across the entire Alberta province meet the AHS AP QA Plan, Pincock also invited participation from public sector advisors at AHS labs elsewhere in the province. This allowed others to learn how to improve AP workflow and patient safety in their own territories and help the entire provincial health system accelerate the quality initiative.

“Using the work we’ve done here as a reference, other labs can move forward with automation when the time is right for them. The way forward is very clear, and thanks in no small part to the cooperation we received from our AHS partner RRLs, now there’s people who have done it in the system to help.”

Carolyn O’Hara, MD, FRCP, FCAP, a senior leader in pathology at AHS and consultant pathologist for DynaLIFE, says the implementation of the VANTAGE system is “a great example of how we can make the private-public partnership work here in Alberta. It was a great partnership, and kudos to DynaLIFE for taking this on.”

“We involved them in the process early on because, at the end of the day, what we’ve done here in Edmonton can very quickly be translated through the balance of the province and be made available to the public on a standardized access basis across Alberta,”

Jason Pincock, DynaLIFE Chief Executive Officer